ÖSSUR®
LIFE WITHOUT LIMITATIONS

POWER KNEE™

INDICATIONS AND REIMBURSEMENT GUIDE

MATCHING THE PATIENT & PRODUCT

This checklist maps Power Knee's functional benefits to the user's clinical needs, helping ensure that they're aligned for optimal outcomes.

USER TO PRODUCT CHECKLIST	
User clinical issue	Power Knee function
Comorbidity of spine or sound limb that: ☐ Impairs hip extension, or ☐ Impairs quadriceps function ☐ Impairs knee function/causes pain ☐ Impairs ankle function/causes pain ☐ Impairs foot function/causes pain ☐ Causes spinal pain/impairs ROM Comorbidity of upper body that impairs: ☐ Arm function/causes pain ☐ Shoulder function/causes pain	Motor-powered flexion and extension: • allow users with impaired hip or sound side quad/knee/ankle or foot function to walk more naturally
☐ Documented fall history	Motor-powered stance phase stability actively supports user's body weight. Motor-powered swing phase pushes prosthetic foot through obstacles (e.g., rugs, grass, sand, snow) and prevents prosthetic toe from "catching" on underlying terrain, something that passive MPKs and mechanical knees can't.
☐ Inability to walk far enough without stopping	Motor-powered flexion and extension reduce the amount of force and energy required by passive MPK's and mechanical knees to activate appropriate knee function.
☐ Difficulty walking up and down inclines	Motor-powered extension permits users to ascend ramps more easily, as the user doesn't have to physically generate extension momentum in order for the knee to swing through to full extension, something that passive MPKs and mechanical knees can't do. Motor-powered flexion permits users to descend ramps in a controlled, safe manner.
☐ Inability to get out of chair independently	Motor generates force that can actively lift users with arm and/or shoulder deficits out of chair.

POWER KNEE™ INDICATIONS

AMPUTATION LEVEL

- Unilateral Transfemoral
- Knee Disarticulation
- Bilateral Transfemoral
- Hip Disarticulation

FUNCTIONAL LEVEL

- K3-K4

IMPACT LEVEL

- Low to Moderate

CLIENT WEIGHT

- 50kg - 116kg/ 110lbs - 255lbs

CLIENT GOALS

- Improve or maintain endurance, stability, and symmetry with daily mobility
- Increased assistance (active power) from prosthesis with daily mobility
- Avoid a decrease or regression in daily mobility

POWER KNEE is currently under investigation for compatibility with osseointegration. It is not presently recommended for use with Osseointegration. Updates will be provided as soon as they become available.

POWER KNEE™ PRODUCT FEATURES

The POWER KNEE is an actively powered microprocessor knee suitable for unilateral and bilateral transfemoral and knee disarticulation users, as well as hip disarticulation users. Propelled by a harmonic drive motor, POWER KNEE replaces lost concentric and eccentric thigh muscle function throughout the gait cycle – it creates motion. A unique blend of motor, sensors, and responsive technology provides powered swing phase, energy returning stance flexion, powered stair ascent and powered sit-to-stand.

The POWER KNEE is aimed at K3-K4 functional level users, for low and moderate impact activities. These POWER KNEE features provide benefits for sound side health and everything that reduced energy expenditure offers throughout gait: endurance, symmetry, and balance.

SUMMARY OF FEATURES

- Weatherproof for use in wet/humid environments. Rated: IP54
- Powered intelligent swing control
- Spring-controlled energy returning stance flexion
- Powered step-over-step and stair ascent assistance
- Powered sit-to-stand assistance
- Controlled step-over-step ramp and stair descent
- Controlled stand-to-sit
- Standing positional lock
- Exercise mode (free swinging)
- 25 hour battery life, 2 x batteries supplied with unit
- 2-year warranty, with option to extend this up to 6 years
- No mandatory service

HIGH COST OF MOBILITY

Issue	Walking requires a complex pattern of muscle activity. For people with lower limb loss, learning to walk again often results in compensatory motions that come with a high physical cost. As a result, prosthetic users spend 30-60% more energy than those with intact limbs[1] and have asymmetric gait patterns.[2-4] Not only does this impact day-to-day endurance, but it also leads to a greater risk of low back pain and osteoarthritis of the intact limb.[5-7]
References	1. Genin, J.J., Bastien, G.J., Franck, B., Detrembleur, C. and Willems, P.A. (2008). Effect of speed on the energy cost of walking in unilateral traumatic lower limb amputees. European Journal of Applied Physiology, 103(6), 655–63. DOI: 10.1007/s00421-008-0764-0 2. Schaarschmidt, M., Lipfert, S.W., Meier-Gratz, C., Scholle, H-C. and Seyfarth, A. (2012). Functional gait asymmetry of unilateral transfemoral amputees. Human Movement Science, 31(4), 907–17. DOI: 10.1016/j.humov.2011.09.004 3. de Cerqueira, A.S.O., Yamaguti, E.Y., Mochizuki, L., Amadio, A.C. and Serrão, J.C. (2013). Ground reaction force and electromyographic activity of transfemoral amputee gait: a case series. Brazilian Journal of Kinantropometry and Human Performance, 15(1), 16–26. DOI: http://dx.doi.org/10.5007/1980-0037.2013v15n1p16 4. Okita, Y., Yamasaki, N., Nakamura, T., Kubo, T., Mitsumoto, A. and Akune, T. (2018). Kinetic differences between level walking and ramp descent in individuals with unilateral transfemoral amputation using a prosthetic knee without a stance control mechanism. Gait & Posture, 63, 80–5. DOI: 10.1016/j.gaitpost.2018.04.043 5. Devan, H., Hendrick, P., Ribeiro, D.C., Hale, L.A. and Carman, A. (2014). Asymmetrical movements of the lumbopelvic region: is this a potential mechanism for low back pain in people with lower limb amputation? Medical Hypotheses, 82(1), 77–85. DOI: https://doi.org/10.1016/j.mehy.2013.11.012 6. Matsumoto, M.E., Czerniecki, J.M., Shakir, A., Suri, P., Orendurff, M.S. and Morgenroth, D.C. (2019). The relationship between lumbar lordosis angle and low back pain in individuals with transfemoral amputation. Prosthetics and Orthotics International, 43(2), 227–232. DOI: https://doi.org/10.1177/0309364618792746 7. Harandi, V.J., Ackland, D.C., Haddara, R., Lizama, L.E., Graf, M., Galea, M.P. and Lee, P.V. (2020). Gait compensatory mechanisms in unilateral transfemoral amputees. Medical Engineering & Physics, 77, 95-106. DOI: 10.1016/j.medengphy.2019.11.006.

MOBILITY BENEFITS

Product Feature	Powered swing flexion and extension, and stance extension
Mobility Benefit	Reduced energy cost of walking
Reference	Power Knee Mainstream Dynamic – Evaluation Report Synopsis, Össur hf, Steinþóra Jónsdóttir (2021). Data on file at Össur.

Product Feature	Powered swing flexion and extension, and stance flexion
Mobility Benefit	Close approximation of human gait with active assistance to replace lost muscle function
Reference	Creylman, V., Knippels, I., Janssen, P., Biesbrouck, E., Lechler, K. and Peeraer, L. (2016). Assessment of transfemoral amputees using a passive microprocessor-controlled knee versus an active powered microprocessor-controlled knee for level walking. Biomedical Engineering Online, 15(S3), 53-63. DOI: 10.1186/s12938-016-0287-6 Pasquina, P.F., Carvalho, A.J., Murphy, I., Johnson, J.L., Swanson, T.M., Hendershot, B., Corcoran, M., Ritland, B., Miller, M.E. and Isaacson, B. (2017). Case Series of Wounded Warriors Receiving Initial Fit PowerKneeTM Prosthesis. Journal of Prosthetics and Orthotics, 29(2), 88–96 (2017). DOI: 10.1097/JPO.0000000000000123

Product Feature	Powered stance extension
Mobility Benefit	Symmetry with sit-to-stand
Reference	Highsmith, M.J., Kahle, J.T., Carey, S.L., Lura, D.J., Dubey, R.V., Csavina, K.R. and Quillen, W.S. (2011). Kinetic asymmetry in transfemoral amputees while performing sit to stand and stand to sit movements. Gait & Posture, 34(1), 86–91. DOI: 10.1016/j.gaitpost.2011.03.018 Knut Lechler. Biomechanics of sit-to-stand and stand-to-sit movements in unilateral transfemoral amputees using powered and non-powered prosthetic knees - Congress Lecture [5038] Abstract [1459]. (2014). Wolf, E.J., Everding, V.Q., Linberg, A.A., Czerniecki, J.M and Gambel, C.J.M. (2013). Comparison of the Power Knee and C-Leg during step-up and sit-to-stand tasks. Gait & Posture, 38(3), 397–402. DOI: 10.1016/j.gaitpost.2013.01.007

MOBILITY BENEFITS

Product Feature	Controlled yielding resistance
Mobility Benefit	Stability for ramp descend
Reference	Morgenroth, D.C., Roland, M., Pruziner, A.L. and Czerniecki, J.M. (2018). Transfemoral amputee intact limb loading and compensatory gait mechanics during down slope ambulation and the effect of prosthetic knee mechanisms. Clinical Biomechanics, 55, 65–72. DOI: 10.1016/j.clinbiomech.2018.04.007 Wolf, E.J., Everding, V.Q., Linberg, A.L., Schnall, B.L., Czerniecki, J.M. and Gambel, J.M. (2012). Assessment of transfemoral amputees using C-leg and Power Knee for ascending and descending inclines and steps. Journal of Rehabilitation Research & Development, 49(6), 831–842. DOI: http://DX.DOI.ORG/10.1682/JRRD.2010.12.0234 Pasquina, P.F., Carvalho, A.J., Murphy, I., Johnson, J.L., Swanson, T.M., Hendershot, B., Corcoran, M., Ritland, B., Miller, M.E. and Isaacson, B. (2017). Case Series of Wounded Warriors Receiving Initial Fit PowerKneeTM Prosthesis. Journal of Prosthetics and Orthotics, 29(2), 88–96 (2017). DOI: 10.1097/JPO.0000000000000123

OUTCOME MEASURES

Outcome measures are used by health care professionals to help determine the user's baseline function and progression throughout rehabilitation and beyond. They are an important tool to utilise to provide credible and reliable justification for treatment and reimbursement.

This table outlines examples of validated outcome measures used in practice to objectively determine function, progress, and treatment efficacy.

Outcome Measures	Use	Reference
Performance Based		
6 Minute Walk Test (6MWT)	General Mobility	Cooper, K.H. (1968). A Means of Assessing Maximal Oxygen Intake Correlation Between Field and Treadmill Testing. Journal of the American Medical Association, 203(3), 201–204. DOI: 10.1001 jama.1968.03140030033008
Amputee Mobility Predictor (AMP)	Amputee Function	Gailey, R.S., Roach, K.E., Brooks Applegate, E., Cho, B., Cunniffe, B., Licht, S., Maguire, M. and Nash, M.S. (2002). The amputee mobility predictor: an instrument to assess determinants of the lower-limb amputee's ability to ambulate, Archives of Physical Medicine and Rehabilitation, 83(5), 613–27. DOI: 10.1053/ampr.2002.32309
Timed Up and Go (TUG)	Falls Risk	Podsiadlo, D. and Richardson, S. (1991). The timed "Up & Go": a test of basic functional mobility for frail elderly persons. Journal of the American Geriatrics Society, 39(2), 142–8. DOI: 10.1111/j.1532-5415.1991.tb01616.x
L-Test	Falls Risk	Deathe, A.B. and Miller, W.C. (2005). The L test of functional mobility: measurement properties of a modified version of the timed "up & go" test designed for people with lower-limb amputations. Physical Therapy, 85(7), 626-35.
Self-Report		
Activities-Specific Balance Confidence Scale (ABC)	Balance, Confidence	Powell, L.E. and Myers, A.M. (1995). The Activities-Specific Balance Confidence (ABC) Scale. The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 50A(1), M28–34. DOI: 10.1093/gerona/50a.1.m28
Prosthesis Evaluation Questionnaire – Mobility Section (PEQ-MS)	Prosthetic Function and Satisfaction	Franchignoni, F., Giordano, A., Ferriero, G., Orlandini, D., Amoresano, A. and Perucca, L. (2007). Measuring mobility in people with lower limb amputation: Rasch analysis of the mobility section of the prosthesis evaluation questionnaire. Journal of Rehabilitation Medicine, 39(2), 138–44. DOI: 10.2340/16501977-0033
Trinity Amputation and Prosthesis Experience Scales – Revised (TAPES-R)	Prosthetic Function and Satisfaction	Gallagher, P. Franchignoni, F., Giordano, A. and MacLachlan, M. (2010). Trinity amputation and prosthesis experience scales: a psychometric assessment using classical test theory and Rasch analysis. American Journal of Physical Medicine and Rehabilitation, 89(6), 487–96. DOI: 10.1097/PHM.0b013e3181dd8cf1

OUTCOME MEASURES

Outcome Measures	Use	Reference
Self-Report		
Locomotor Capabilities Index (LCI)	Prosthetic Use	Grise, M.C., Gauthier-Gagnon, C. and Martineau, G.G. (1993). Prosthetic profile of people with lower extremity amputation: Conception and design of a follow-up questionnaire. Archives of Physical Medicine and Rehabilitation, 74(8), 862-70. DOI: https://doi.org/10.1016/0003-9993(93)90014-2
Oswestry Disability Index	Lower Back Pain	Fairbank, J.C.T. and Pynsent, P.B. (2000). The Oswestry Disability Index. Spine, 25(22), 2940–53.
Western Ontario and McMaster Osteoarthritis Index (WOMAC)	OA in Hip or Knee	McConnell, S., Kolopack, P. and Davis, A.M. (2001). The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC): A Review of Its Utility and Measurement Properties. Arthritis Care and Research, 45(5), 453-61.
Socket Fit Comfort Score (SFCS)	Socket Fit	Hanspal, R.S., Fischer, K. and Nieveen, R. (2003). Prosthetic Socket Fit Comfort Score, Disability Rehabilitation, 25(22), 1278–80. DOI: 10.1080/09638280310001603983
PROSTHETIC LIMB USERS SURVEY – MOBILITY (PLUS-M)	Mobility	Morgan, S.J., Amtmann, D., Abrahamson, D.C., Kajlich, A.J. and Hafner, B.J. (2014). Use of cognitive interviews in the development of the PLUS-M item bank. Quality of Life Research, 23(6), 1767–75. DOI: 10.1007/s11136-013-0618-z

FURTHER INFORMATION

PRODUCT INFORMATION:

POWER KNEE Information: www.ossur.com/en-us/prosthetics/explore-power-knee

POWER KNEE Brochure:
media.ossur.com/image/upload/v1643835503/product-documents/en-us/PN20538/brochure/PN20538_Power_Knee.pdf

POWER KNEE Catalogue Page:
media.ossur.com/image/upload/v1644274231/product-documents/en-us/PN20538/catalogs/PN20538_Power_Knee.pdf

POWER KNEE Instructions for Use: media.ossur.com/image/upload/v1639046690/pi-documents-global/Power_Knee.pdf

POWER FORWARD Webinar by Dr Bob Gaily - Rehabilitation with Power Knee for Guidance on Physical Therapy Best Practices:
www.youtube.com/watch?v=PYSVjycdodI

Who is POWER KNEE for: www.ossur.com/en-us/prosthetics/explore-power-knee/who-is-power-knee-for

TESTIMONIAL:

Whitney Doyle (user) on her experience with the POWER KNEE: www.ossur.com/en-us/about-ossur/newsroom/whitney-doyle-ossur-family

RECOMMENDED TREATMENT PATHWAY AND ESSENTIAL STEPS:

A trial unit may be requested by the treating Prosthetist and set up for the user to test for up to three weeks. Please contact your Össur Prosthetics Clinical Specialist to arrange a trial.

POWER KNEE Fitting Guides are available at www.ossur.com/en-us/prosthetics/explore-power-knee/getting-started-with-power-knee.

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