

# **Study and development of articulated transtibial prostheses with adaptable compliance and push-off properties**

**Rino Versluys**

Individuals that walk without pathologies can perform the daily life tasks quite easily. Unfortunately, there are many others. Clinical gait analysis revealed that transtibial (or below-knee) amputees walk differently from able-bodied subjects. They compensate for the loss of a limb by altering their gait pattern, increasing the muscular demand on the residual joints. This causes gait asymmetries, increased metabolic energy expenditure and medical pathologies in the long run. Energy-storing-and-returning (ESR) prostheses provide amputees with a push-off sensation in the late stance phase. Although they are preferred over conventional prostheses by most amputees, they do not establish human-like ankle behavior and are not capable of reducing the increased metabolic energy cost measured in amputees.

The research work presented in this text is concerned with the development of two transtibial prostheses that establish able-bodied ankle kinematics and provide the user with a push-off sensation during walking. The difference between both devices lies in the way they generate that push-off sensation. One prosthesis uses pleated pneumatic artificial muscles configured in an antagonistic set-up, the other is passive and uses mechanical springs. Both prostheses were tested on transtibial amputees.