

# FROM DUSK TILL DAWN

## Designing with 3D-printed shape memory polymers



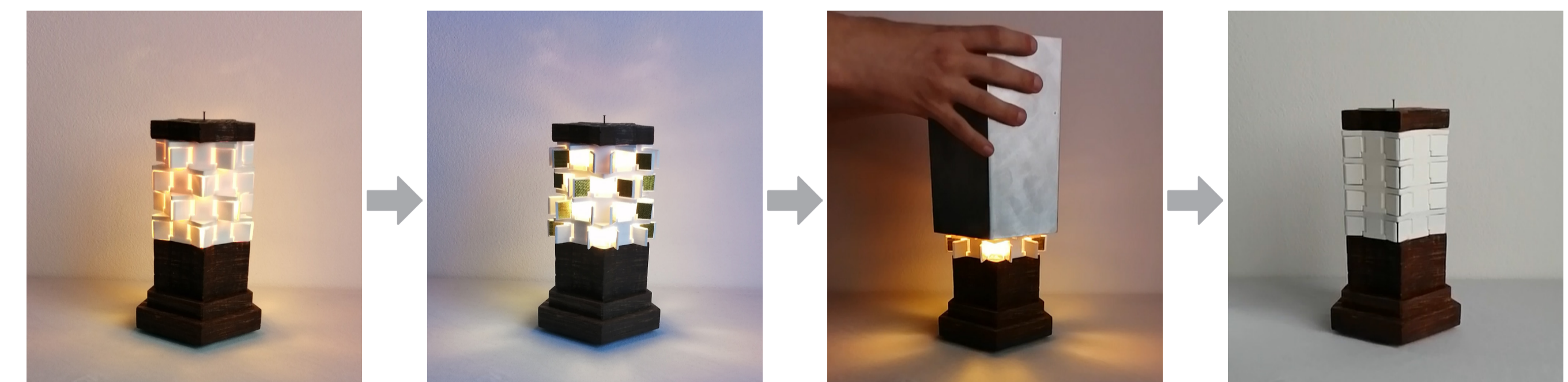
The aim of this project was to get a better understanding of the shape memory behaviour of 3D-printed polymers, with the ultimate goal to apply shape memory polymers (SMP's) in product design. To achieve this, different parameters influencing this behaviour were researched. Based on this research, a demonstrator product and a set of guidelines for 3D-printing shape memory objects were created, which are meant to serve as inspiration and a way to encourage and help designers to use 3D-printed SMP's in their future designs.

### GUIDELINES

Fourteen parameters related to creating 3D-printed shape memory objects were researched. The results were used to create a booklet with guidelines, describing how the investigated parameters influence different aspects of the shape memory behaviour of SMP's. This document serves as a tool for designers to help them successfully create shape memory objects with 3D-printing.

### DEMONSTRATOR

*DAWN*, the shape memory wake-up light, is a concept designed using the knowledge gained in this project, which utilizes the shape memory properties of a 3D-printed polymer. A prototype was made of the concept to serve as a demonstrator to show the capabilities of the SMP. Thin sections in the SMP parts function as hinges, which can be deformed and can recover their printed shape.



When the wake-up light is turned on, the lamp inside starts heating the shape memory polymer rings. Some light is already visible.

Once the shape memory material is heated sufficiently, small hatches start slowly opening, exposing more light, gradually waking up the user.

After awakening, the user aligns the SMP rings and places the cover over the lamp, which closes the hatches again. After this, the lamp is turned off.

Once the lamp has cooled down, the cover can be removed. After turning the rings back to their original orientation, the lamp is ready to be used again.

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Designing 3d-printed deployable structures with  
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Integrated Product Design

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