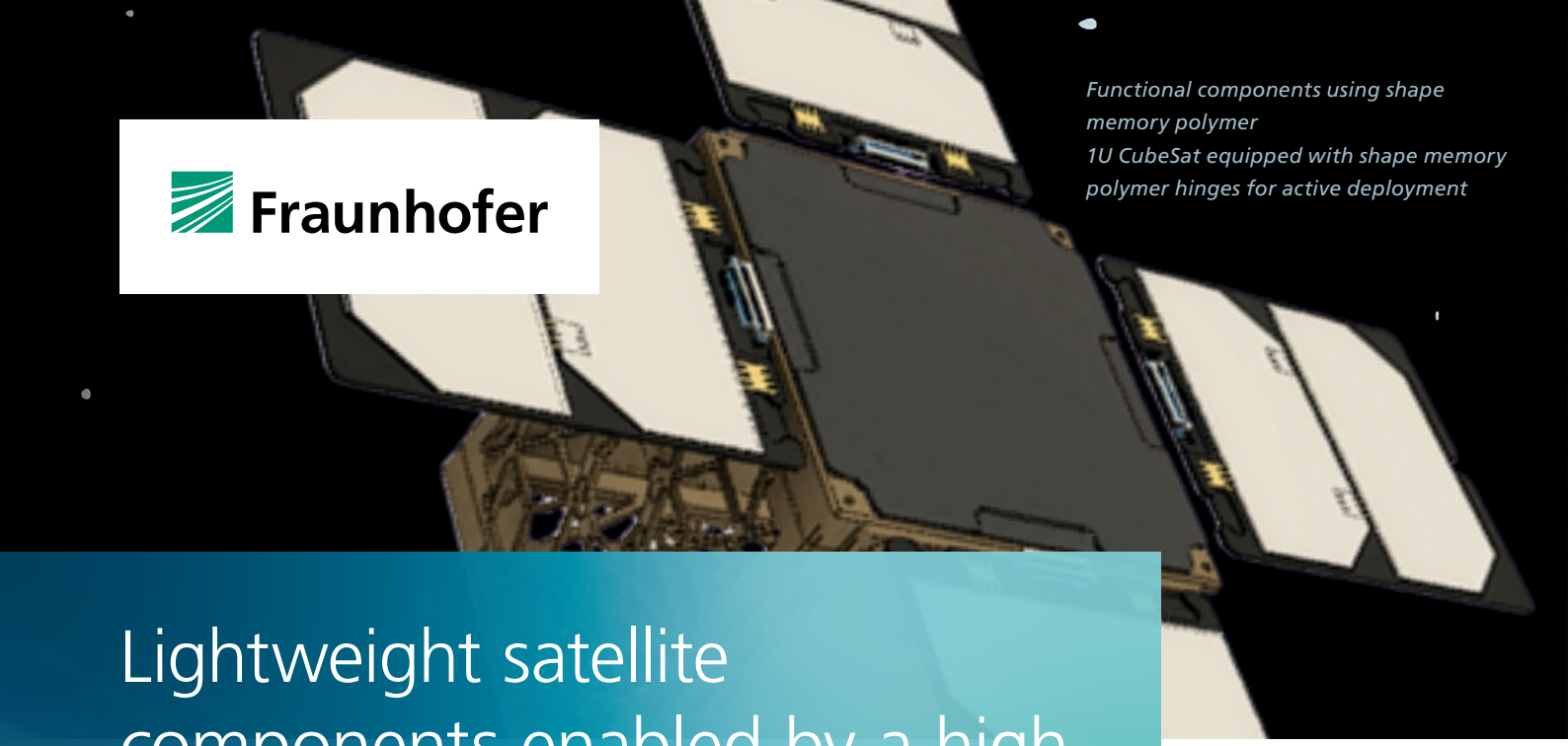


Functional components using shape memory polymer
1U CubeSat equipped with shape memory polymer hinges for active deployment

Fraunhofer

Lightweight satellite components enabled by a high-temperature switching shape memory polymer

The rapid growth of the NewSpace sector is driving demand for lightweight, functional satellite components. Reducing their mass while maintaining functionality and eliminating parts of the underlying electro-mechanical systems creates valuable capacity for additional mission-critical payloads.

Shape memory polymers (SMPs) are smart materials that can retain a temporary shape after programming and recover their original shape upon heating.

Fraunhofer IAP is collaborating with German Orbital Systems (GOS), Orion Additive Manufacturing, and Fraunhofer IZM within the Pro FIT funding
program. Fraunhofer IAP developed an application-specific SMP with a switching temperature of approximately 120 °C and qualified it for additive manufacturing.

In collaboration with GOS, the team utilized the SMP to produce 3D-printed solar-panel hinges, employing two heating wire configurations: an integrated internal design and a circumferentially wrapped one. The weight of each hinge including the wires is about 1.5 g. Resistive heating activates the shape memory whereupon the SMP changes shape and aligns thsse solar panels so that they reach their target position.

These lightweight, additively manufactured hinges combine structural and deployment functions, reducing reliance on conventional electromechanical systems and enabling more efficient satellite designs.

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exhibit overview