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Development and Test of Force-Locked Connecting Elements for Shape Memory Alloy Wires

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Abstract

For transferring an actuating-force and for using a shape memory alloy as an actuator, it is necessary to connect the SMA-wire with its fixing-place. Until now, such a connection is realized by material bonded connections, like laser welding, or friction-locked connections, like bolted connections. Laser welding has the disadvantage that the properties of the shape memory alloy actuator can be badly influenced through the formation of a weld zone. Besides, this procedure is complex and costly. A bolted connection has problems with the durability at cyclic operations and uses more available space.

In the context of this work an alternative connection method, the crimp connection, is analyzed. With a crimp connection, end sleeves of cooper or aluminum are joined force-locked with the actuator wire. Advantages of the crimp connection are the small overall size and the simple and cost-efficient assembling. With this connection method industrial standards can be fulfilled.

In the present study, crimp connections under change of various parameters were functionally characterized through pull-out tests. The changed parameters are the crimp force, the material of the crimp, the geometry, the surface treatment and the ambient temperature. On the basis of the results of the functional characterization, the connection quality is appraisable and it is possible to select an optimal crimp technique for industrial applications.