



## LASER BEAM WELDING OF PRESS-HARDENED CHROMIUM STEELS WITH MARTENSITIC MICROSTRUCTURE

### Task

After determining that press-hardened chromium steels with a martensitic-austenitic microstructure are principally suitable for welding, Fraunhofer ILT is now continuing the research heading to safeguard weldability. It is focused on similar and dissimilar bonds in overlap joints. Based on the dissimilar bonding of these steels with other ultra-high-strength grades, the institute is pushing forward the development of welded components.

### Method

Taking into account the suitable heat treatment, Fraunhofer has determined the parameters for achieving a homogeneous distribution of strength across the weld. The bond is made by contoured stitching and by abutting face seams. The mechanical properties are determined in quasi-static and dynamic KS2 tests. Fatigue tests are also used to determine how the welded joints behave in operation.

1 Weld seam at the overlap of three materials (1.5528, 1.4034, 1.4678).

2 Abutting-face seam in 1.5528.

### Results

After metallurgical basics were clarified, the first parameter fields for welding and heat treatment were identified, so that a first iteration was initiated by determining the mechanical properties.

Non-die hydroforming trials have shown that the failure limits of welds without heat treatment are still too low to ensure reliable fabrication. Further experiments will serve to improve the mechanical and technological properties.

### Applications

The results of the project can be used directly in vehicle construction for road and rail. Indeed, these industries can fully exploit the potential for lightweight construction resulting from the high strengths. Manufacturers of welding equipment and laser technology can expand their offers for demanding welding tasks in the field of ultra-high-strength steels.

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