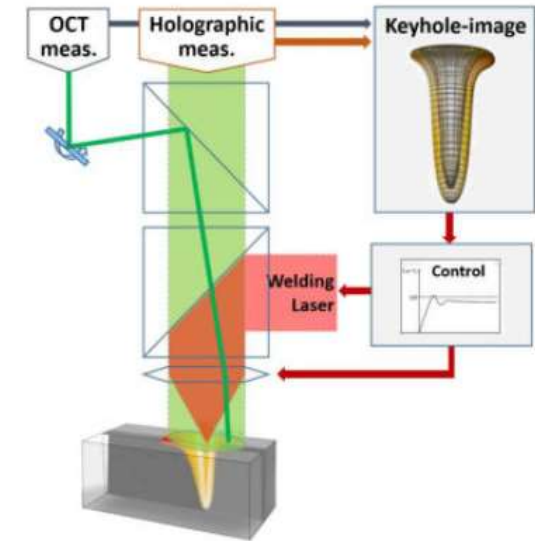


High-speed holographic interferometry for keyhole evaluation in laser material processing (KEEN)

Motivation Laser material processing is increasingly important in industrial manufacturing due to its precision and efficiency. In deep penetration welding, a vapor capillary ("keyhole") forms and moves along the weld path. Its stability directly affects weld quality. However, materials like aluminum castings and copper alloys often cause keyhole fluctuations due to volatile elements, making real-time monitoring essential.

Building on previous work, we plan to combine digital holography and AI-based data analysis for real-time 3D imaging. This is a transfer project together with the Fraunhofer IWS and the industry partners Lessmüller Lasertechnik GmbH and ZF Group.



Keywords digital holography, deep learning, image processing



- Tasks (software)**
- Implementation of neural network based reconstruction and classification
 - Developing a method to model reconstruction uncertainty and quantify confidence
 - Model optimization, result evaluation and documentation

- Tasks (hands on)**
- Characterization and optimisation of lab setup



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