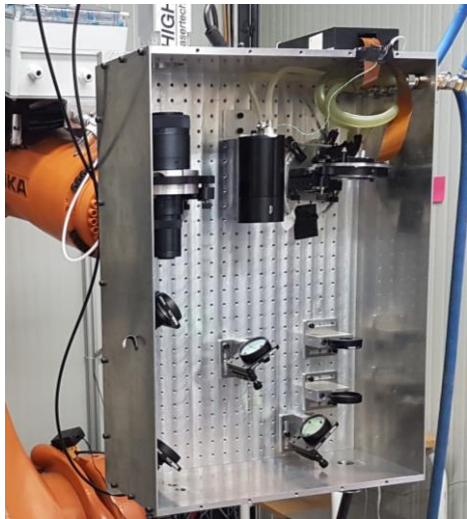
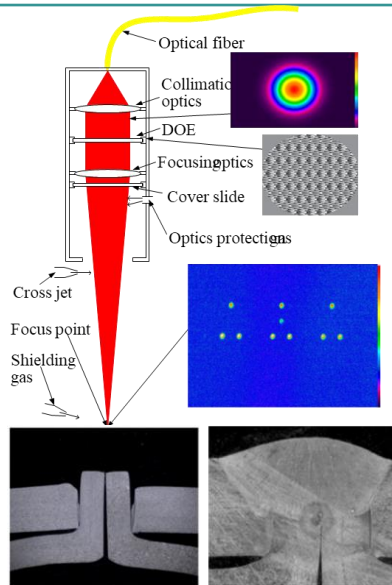


Laser Processing with Tailored Beams

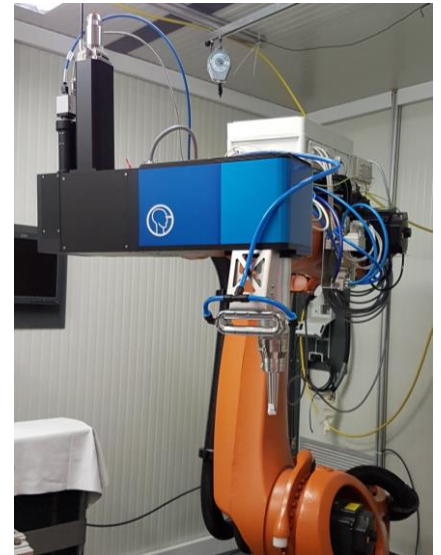
- Several Features Combined into One Laser Beam for Industrial Processing to Improve Quality and Productivity



Test facility to determine the tailored beam before manufacturing a diffractive optical element (DOE).



Principle of a DOE for welding 3 grooves in one pass.



Industrial setup for remote processing where a DOE can be incorporated.

Value Proposition/USP

By tailoring a laser beam, it is possible to add a number of features to a single laser beam and thereby perform multiple functions in one pass. These features are; pre-processing, e.g. dirt removal, pre-heating and pre-melting, processing with dedicated features such as melt and penetration control and finally post-processing, for example applying post-heating. Overall, this can lead to advantages such as more robust and faster processing, reduced energy consumption and fewer processes to complete the part.

Business Opportunity/Objective/Commercial Perspectives

The technology can be used for sheet metal processing in the manufacturing industry. The following results are achieved: • Multiple keyhole laser welding of four sheets for an industrial application. • Laser welding of zinc-polluted parts that without a tailored laser beam would create quality-damaging blowouts. • Method to control laser weld bead geometries with respect to depth and width. • Laser cutting of painted sheet metal, without burn marks and damage on the paint edges.

Future possibilities are: • Laser welding of dissimilar materials e.g. copper with other materials. • Welding in polymers with increased speed and quality. • Affect the metallurgical properties by controlling the cooling rates with inline pre- or post-heating. • Hole drilling by distributed energy patterns. • Parallel processing with multiple spots for various processes, like cutting, marking, drilling, ablation etc.

Technology Description/Technology Summary

The developed technology enables us to generate tailored beam shapes and test their behavior on industrial parts by a programmable beam shaping generator. When a desired beam shape is found a Diffractive Optical Element (DOE) can be manufactured and put into an industrial production for processing of industrial parts. By applying a tailored beam it is possible to guide to laser beam to interact with a part in a desired way controlling heat input on surface, flow in the melt and thereby increase the quality and productivity. The flexible setup in our laboratories allows for quick examination of beam profiles, but is too delicate to install in an industrial setup. For industrial setups we have already tested DOE's, and found them as a good choice for industrial setups with their fixed beam pattern and high robustness.

Development Phase/Current State

All the individual components and technologies in the system are tested and a number of proof of concept are made on industrial cases. The system is in TRL 5. The work and tests to bring the system to a higher TRL level are well defined.

The inventors (among others)

Morten Kristiansen
morten@mp.aau.dk
Klaus Schütt Hansen
ksh@ipu.dk

Contact Information

Morten Kristiansen
Associate Professor
+45 99 40 89 38
morten@mp.aau.dk

Seeking

- Funding/Investors to develop and bring our technology to market
- Research interested end users