

## The Maskless Aligner – A Success Story

Maskless Lithography, also known as Direct Writing, has been around for many decades. For a long time however, the main and only purpose of this technology was the patterning of photomasks for all kind of applications in Research and Development (R&D) as well as industry.

The introduction of the Heidelberg Instruments MLA (Maskless Aligner) series in 2015 was a game changer for UV lithography in the field of R&D.

Maskless Lithography has several major advantages over other techniques: For example, the cycle time for new micro applications decreases from several days to less than an hour. In addition, unique features such as dynamic pattern adaption, real-time autofocus or Grayscale lithography provide more freedom in the creation of microstructures. Finally, submicron resolution combined with high alignment accuracy allows shifting applications from time consuming and expensive e-beam lithography towards maskless UV lithography.

Today it is hard to imagine Research & Development in Micro- and Nanofabrication applications taking place without the use of Maskless Lithography.

A Maskless Aligner specifically designed for volume production was then developed, with the aim of making the advantages of Maskless Lithography available also to the industrial market. The Heidelberg Instruments MLA 300 was introduced at the end of 2019 and fulfils production requirements such as complete automation and high throughput as well as flexibility and highest precision. Applications include areas such as wafer level packaging and the production of microchips, sensors, sensor ICs, MEMS, and microfluidic systems.

This presentation will give an overview of the history of the Maskless Aligner - describing the milestones from concept creation up to the initial market introduction, the continuing further development of the system series over the following years and an outlook to the future.