

# suss report

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# 60

**Years of Engineering Spirit**

SUSS MicroTec is looking back on sixty years of production of high-quality equipment

**suss** MicroTec



## In the Spotlight

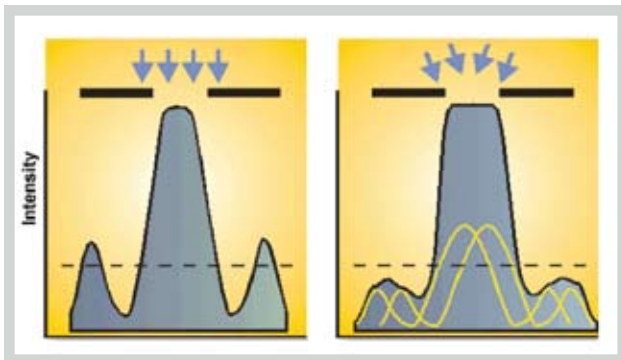
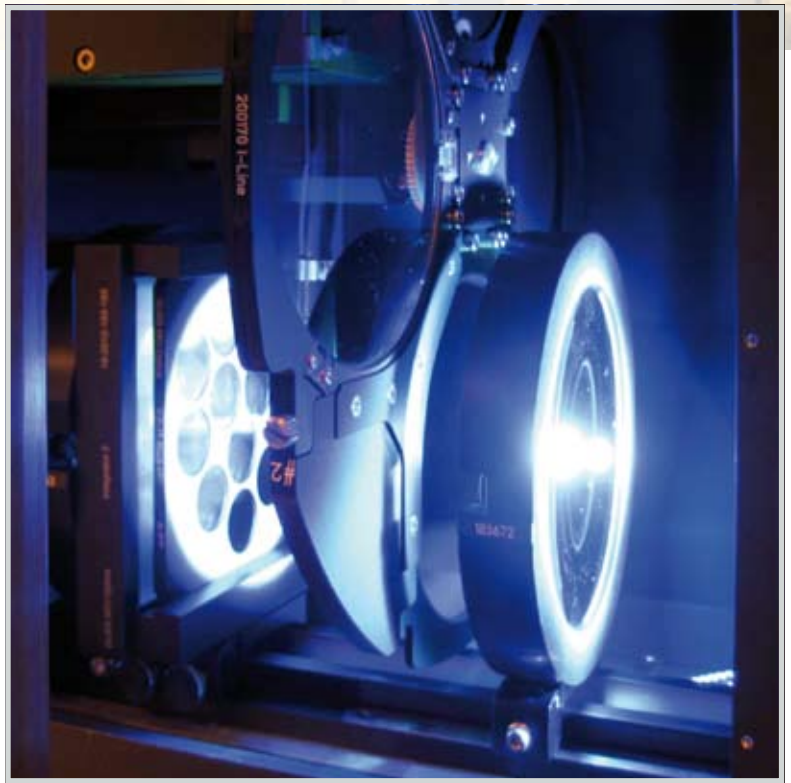
# MO Exposure Optics: Customized Illumination for Process Window Optimization and Yield Improvement. Exclusively for SUSS MicroTec Mask Aligners



Reinhard Völkel

Since the very beginning of Semiconductor Industry in the early 60s, Karl Süss' Mask Aligners have been the workhorse of success and the backbone of the prospering SUSS group. Founded 1949, the SUSS group has sold more than 4'000 Mask Aligners. As the semiconductor industry as a whole, Mask Aligners have changed much over the years: Evolution from manual 2" contact printers to the fully automatic LithoPack 300 cluster.

One thing that never changed significantly in all these years was the Mask Aligner optics. Contact- and Proximity Lithography suffer from diffraction effects (side-lobes) and the SUSS concept of a "Diffraction Reduction" illumination (Fig. 1, right) successfully suppressed these side-lobes – better than all our com-



petitors could ever do. SUSS has developed a variety of different illumination settings to better serve specific customers' needs and different tasks. Which one is the best? Sometimes a difficult choice and a change of the optics is cumbersome and expensive. Previous generations of SUSS Mask Aligners were equipped with A-Optics or D-Optics. Today, HR-Optics (high resolution)

### MO Exposure Optics in MA200Compact

is the first choice for contact- and proximity lithography with small exposure gaps; LGO-Optics (large gap) is for thick resist processes and 3D Lithography.

SUSS MicroTec now introduces the next generation of Mask Aligner Optics, the MO Exposure Optics! This new illumination concept is based



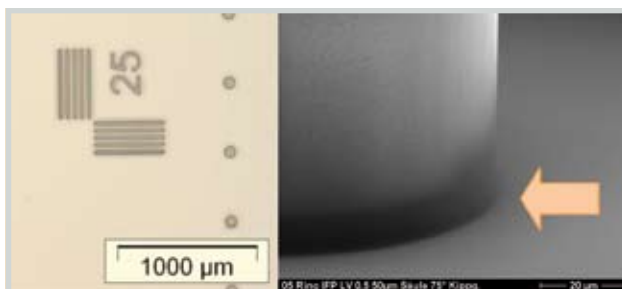
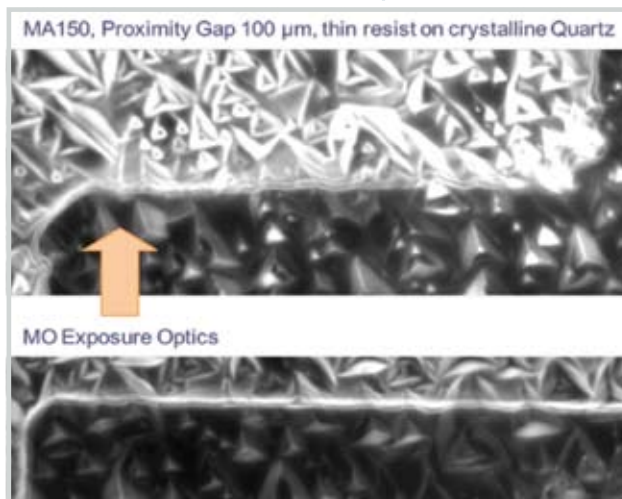
**Figure 2:**  
The MO Exposure Optics Kit consists of a basic library of Illumination Filter Plates (IFP) and allows a simple upgrade of all SUSS Mask Aligner lamphouses.

on Micro-Optical Integrators made of high-quality microlens arrays and an exchangeable Illumination Filter Plate (IFP). MO Exposure Optics provides excellent uniformity (around  $\pm 2\%$ ) with no lamp readjustment over full lifetime, improved telecentricity and customized illumination, the free choice of illumination settings to further optimize the process window and yield in contact and proximity lithography. MO Exposure Optics fits well in all existing SUSS Mask Aligner illumination systems. Changing to MO Exposure Optics is a simple Plug & Play operation. MO Exposure Optics is delivered with HR (high-resolution) and LGO (large gap) illumination settings.

By a simple change of Illumination Filter Plates (IFP) the user can choose his preferred diffraction reduction to improve depth of focus (DOF) and exposure latitude. MO Exposure Optics is providing a precise angular spectrum of the illumination light and also allows Optical Proximity Correction (OPC) in Mask Aligners.

MO Exposure Optics is patented and was developed exclusively for SUSS MicroTec Mask Aligners by SUSS MicroOptics, the leading supplier for high-quality optics solutions in illumination, laser beam shaping, metrology, medical and vision systems.

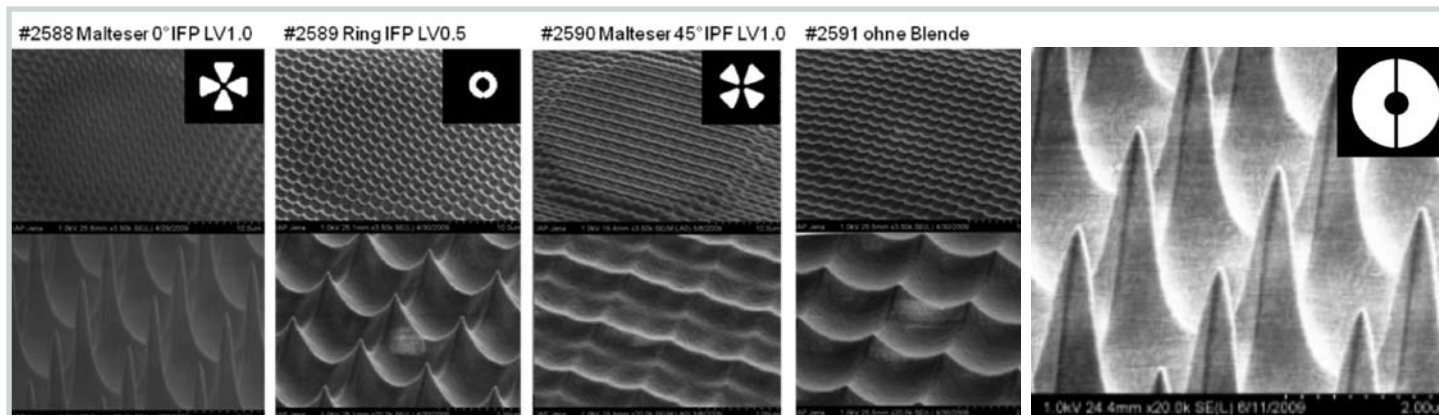
**Figure 4:**  
MA25, Improvement of CD (Micro Crystal, SiO<sub>2</sub> Tuning Forks)



MO Exposure Optics is available exclusively on SUSS MicroTec Mask Aligners. Retrofits allowing the easy and fast upgrade of older generations of SUSS MicroTec Mask Aligners are available.

**Figure 5:**  
MA56, Improvement of Footing & Sidewalls Thick SU8  
SU8: 300µm thick, soft contact, resolution 25µm (Courtesy of MRT Microresist Technology Berlin)

**Figure 6 :**  
MA6, Grey-Level Mask and Proximity Printing Full wafer micro- and nano-structuring (Examples: 10µm proximity gap, different IFP-Filters) (Courtesy by Fraunhofer IOF, Jena)



**Figure 3:** Library of Illumination Filter Plates (IFP) for MO Exposure Optics