SUSS MJB4

Manual Aligner

For Research, Development and Operator Assisted Production

October, 2009

Overview – Product Portfolio Aligner

MJB4

MA/BA 8

MA/BA 6

MA200Compact

MA150e

MA300Plus

LithoFab200

LithoPack300

Manual / Basic (2” – 4”)

Manual & Pre-Production (6” – 8”)

Automated (2”-200mm)

Fab Automation (300mm)

Litho Cluster (200/300mm)

SÜSS MicroTec

Overview – Product Portfolio DSM (Metrology)

DSM8

Manual

(2” – 200mm)

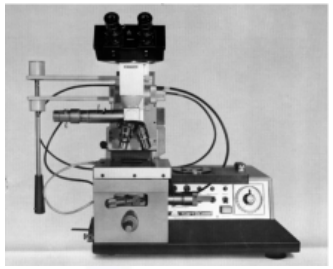
DSM200

Automated

(2”-200mm)

SUSS Manual Aligner “MJB History”

1969



Technological Improvements:

- Up to 3” wafer/substrates
- <resolution
- µm alignment
- Uniformity 5%
- IR Alignment
- Up to 350W

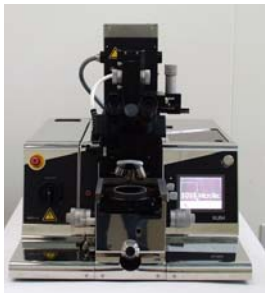
1983 1990

MJB3

Technological Improvements:

- Up to 3” wafer/substrates
- Hard and soft contact, vacuum contact and proximity exposure
- Bond Alignment
- EISS Vision System
- AL300
- Constant Intensity
- Parameter storage
- Motorized stages

2003



MJB4

Technological Improvements:

- Up to 4” wafer/substrates
- Combi optics for UV250/300/400
- Resolution down to 0,5µm
- UV-Nanoimprint Lithography tool kit
- Easy to use user interface with touch panel

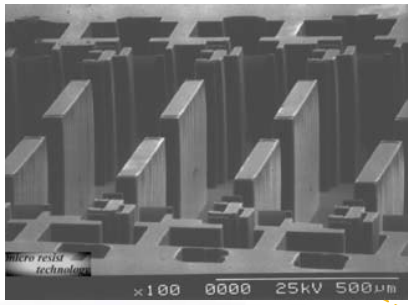
More than 2000 systems installed since 1969

GEN 1 → GEN 2 → GEN 3

SÜSS MicroTec

The Innovative World of SUSS Mask Aligners...

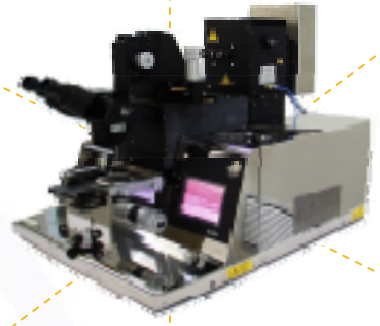
SU-8 Micro Parts



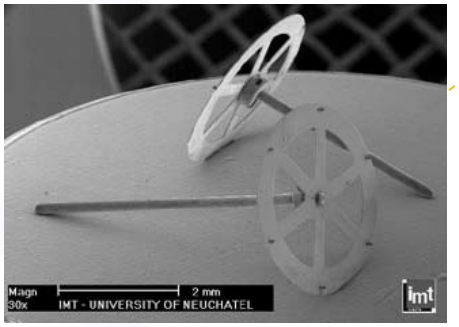
Courtesy: mrt, Berlin

R&D

Education

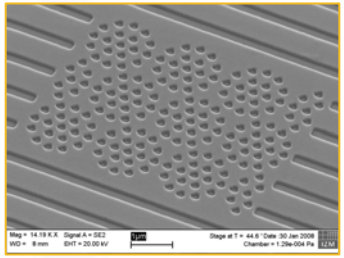


MEMS



Courtesy: IMT, University of Neuchatel

UV Nano Imprint



LED

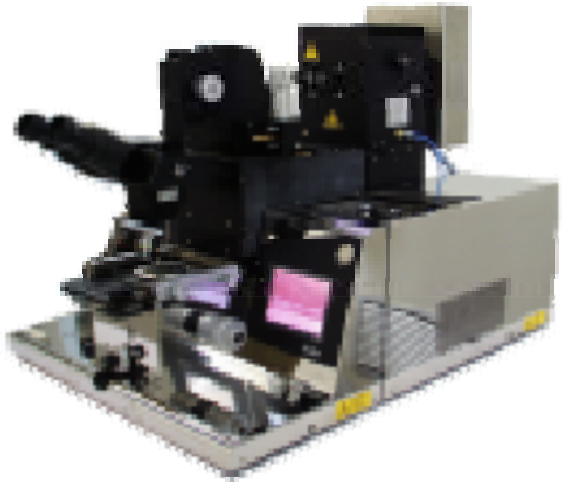
SÜSS MicroTec

MJB4

Designed for Research and Operator Assisted Production

Featuring:

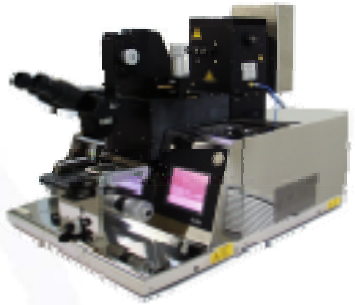
- Perfect low-cost solution for:
  - High Accuracy
  - Good Optical performance
  - latest processes (e.g. UV-NIL)
- Addressed Markets:
  - MEMS
  - Telecommunications
  - Compound Semiconductors
  - Nano Imprint Lithography
- Manual tool; easy to operate
- Allows the utilization of tooling from the previous MJB3 (with adaption kit)



MJB4 – Benefits

Easy, intuitive touch screen operation

Quick and easy changeover between wafer sizes



Precise and robust mechanical design

Minimum operator training

MJB4 – Technical Characteristics

Material

- From pieces up to 100mm round and square substrates

Exposure modes

- Contact: soft, hard, vacuum, soft vacuum
- Proximity up to 50µm gap

Optics

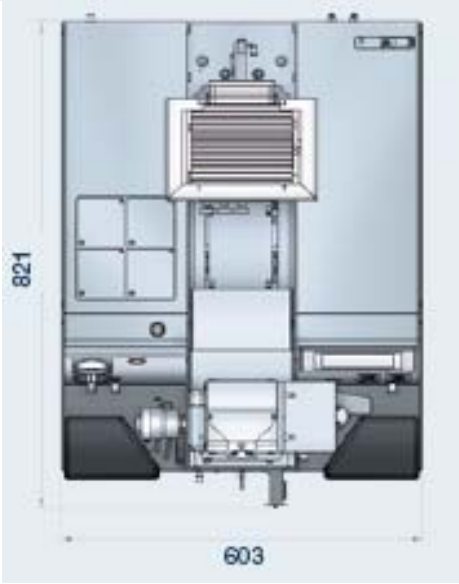
- UV250, UV300, UV400 and broadband optics
- Intensity Uniformity ± 3% on 100mm
- Constant power or constant intensity
- Lamp sizes: 200W, 350W, 500W (for UV250)
- Resolution down to 0,5 µm L/S (vacuum contact, UV250)

Alignment

- TSA alignment accuracy: 1µm*
- Transmitted IR Alignment accuracy: < 5µm (<2µm under special process conditions)*
- Single or splitfield microscope with/w/o CCD camera

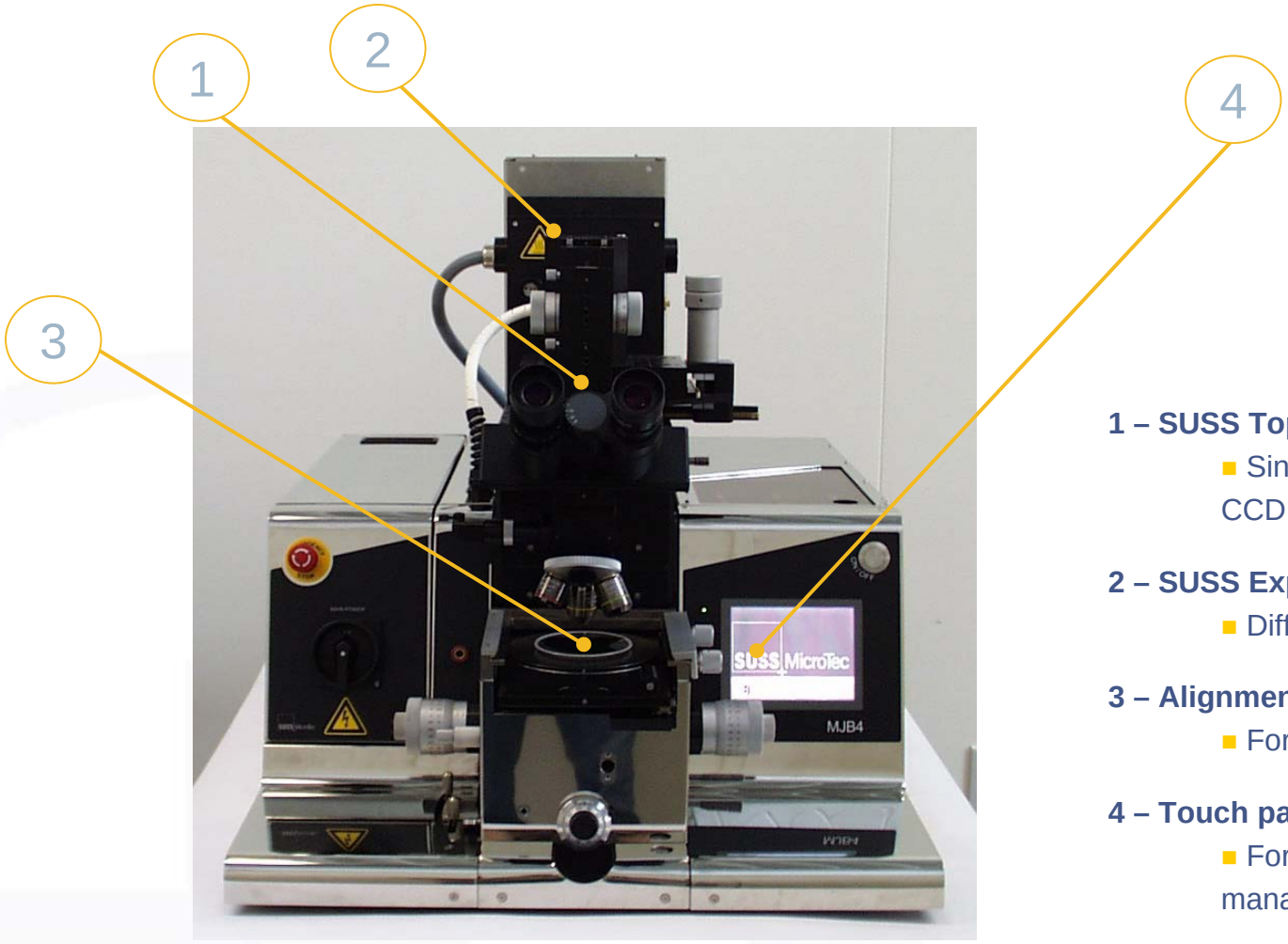
Touch screen

Small Footprint: 0,5m²



** Performed with SUSS recommended alignment targets and materials*

MJB4 – Equipment Overview



1 – SUSS Top Side Microscope

- Single or Splitfield with eye-pieces. CCD Camera available

2 – SUSS Exposure Optics

- Diffraction reducing exposure optics

3 – Alignment Stage

- For TSA and IR alignment

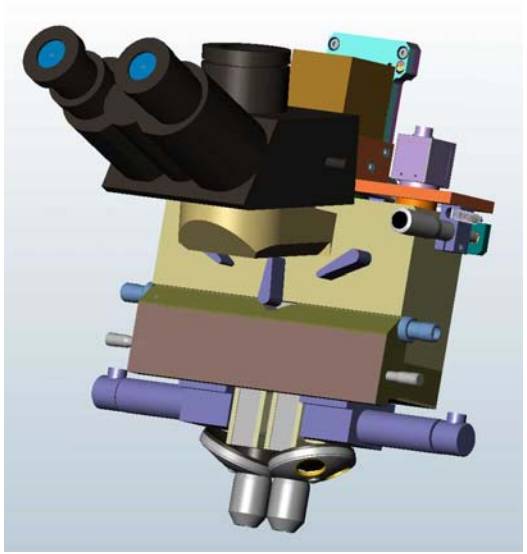
4 – Touch panel

- For system control and recipe management

MJB4 – SUSS M604 Microscope

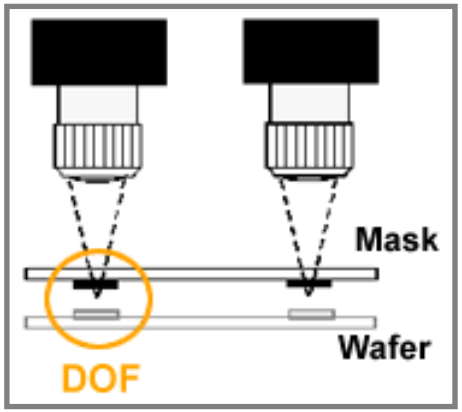
+ SUSS M604 Splitfield Microscope

- Configurable with CCD camera -



Overview

- Simultaneous viewing of mask and wafer
- Target search and alignment with low or medium magnification
- Alignment check with high magnification
- IR camera option
- Bright field, dark field and interference contrast illumination available



Specifications

- 2.5x, 5x, 10x and 20x objectives, Turret for 3 objectives
- Alignment accuracy 1µm and better
- Maximum objective distance 100mm
- Travel range Y: +30/-50 mm X: +/- 40mm Theta: 4°

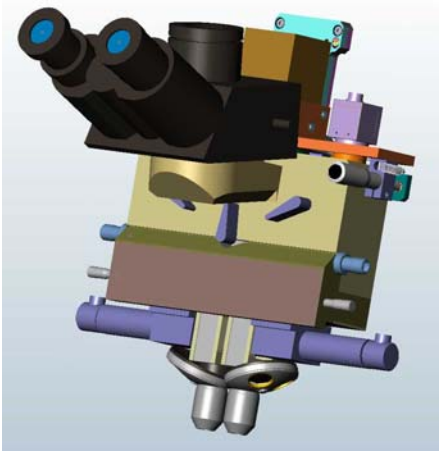
Benefit:

+ The SUSS M604 with eyepieces allows alignment with larger depth of focus, larger field of view and provides a colored and 3D like image

MJB4 – SUSS M604 and M500 Microscope

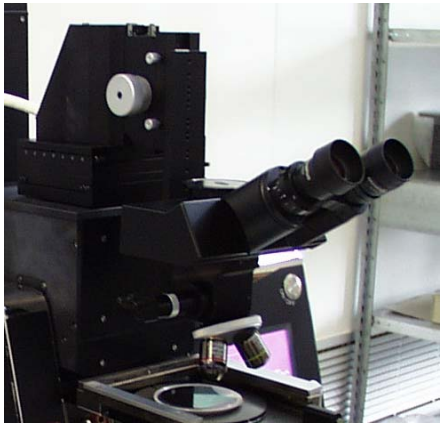
+ SUSS M604 Splitfield Microscope

Objectives	2.5x	5x	10x	20x
Resolution [µm]	4,2	2,2	1,1	0,9
DOF eye-piece / video [µm]	195	51	13	4,5
FOV eye-piece [mm]*	4,65	2,33	1,16	0,58
Magnification direct view*	47x	93x	186x	372x



+ SUSS M500 Singlefield Microscope

Objectives	2.5x	5x	10x	20x
Resolution [µm]	4,2	2,2	1,1	0,9
DOF eye-piece / video [µm]	518	132	33	10
FOV eye-piece [mm]*	8,8	4,4	2,2	1,1
Magnification direct view*	25x	50x	100x	200x

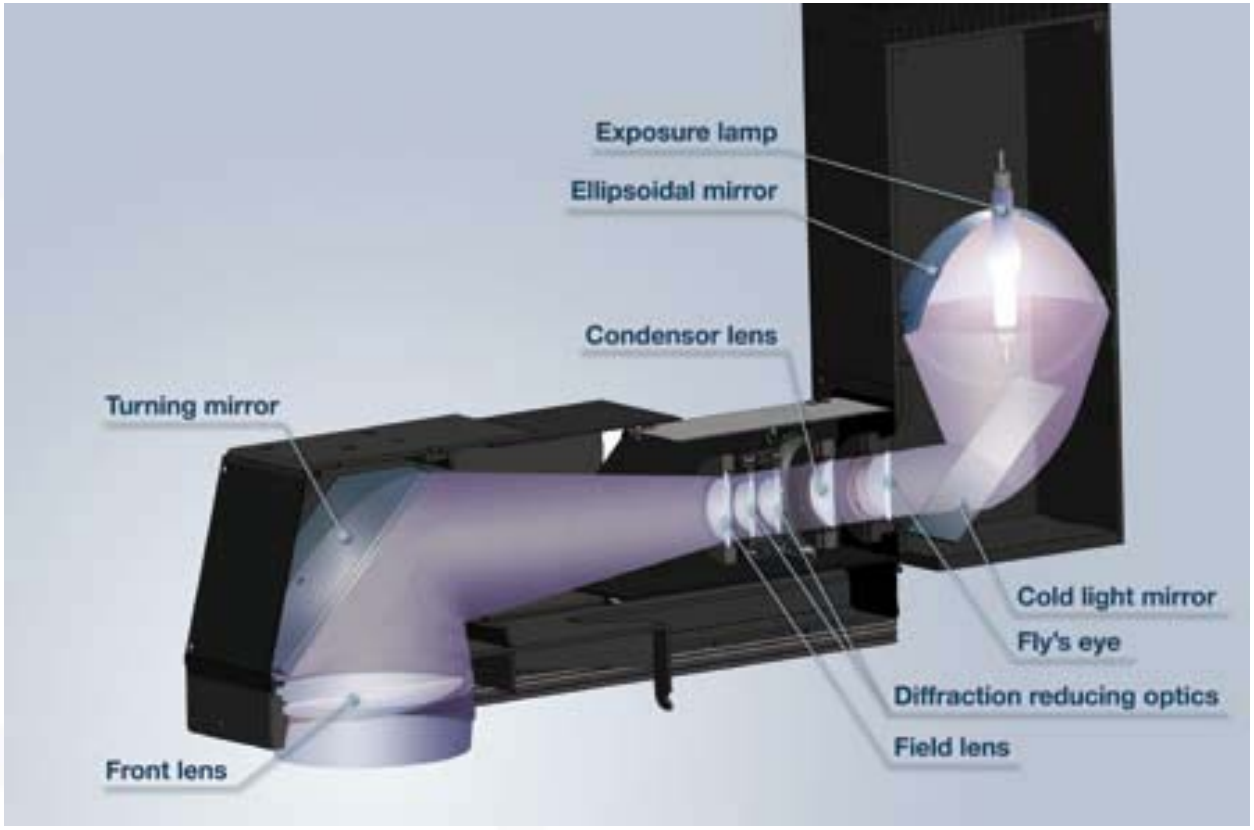


*10X eye-piece

** ½“ CCD camera/17“ monitor

MJB4 – Exposure Optics

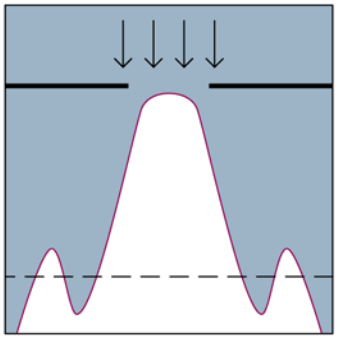
- SUSS Exposure Optics:
  - UV250/UV300/UV400 and broadband



MJB4 – Exposure System

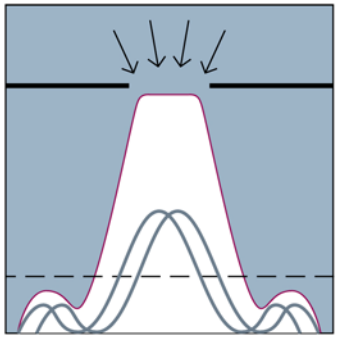
+ SUSS Diffraction Reducing Exposure Optics:

Conventional

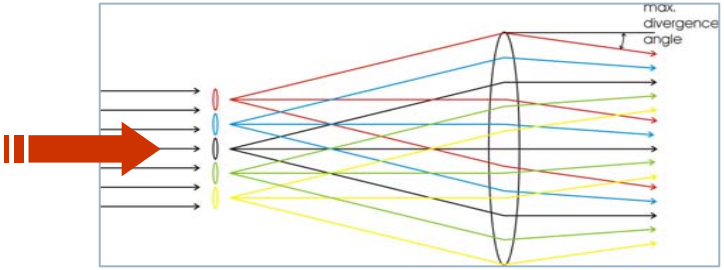


Strong diffraction effects
from parallel illumination

SUSS Optics



SUSS diffraction
reducing optics



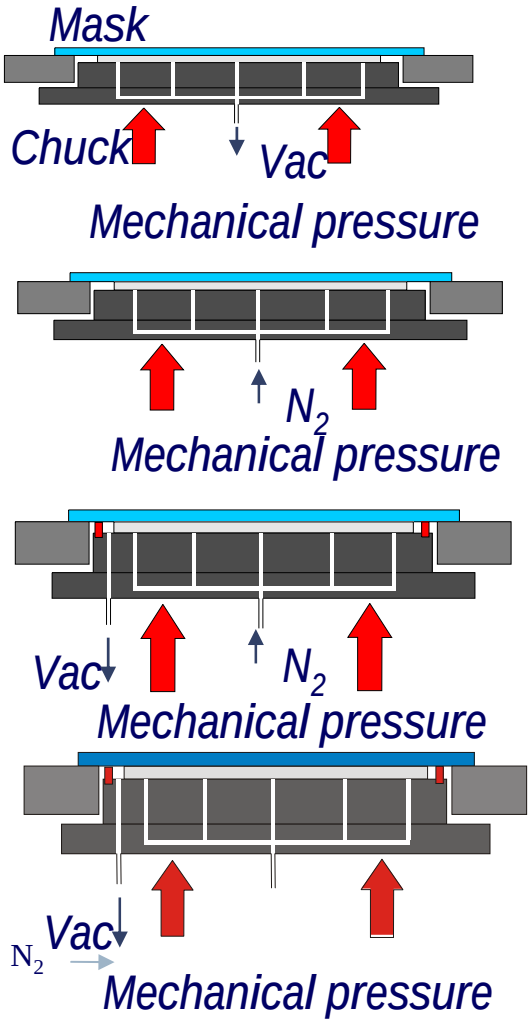
Benefits:

+ SUSS diffraction reducing optics provide optimum L/S resolution in proximity printing and contact exposure mode
+ Dedicated optics solution offers the best technical solution to specific application requirements
+ Easy and fast optics exchange to save time and to ensure high uptime couple with high process flexibility

MJB4 – Exposure Modes

SUSS Contact Exposure Modes:

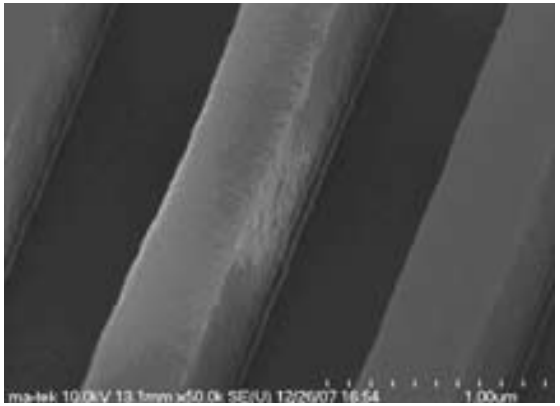
- Soft contact
  (adjustable mechanical pressure)
- Hard contact
  (additional nitrogen pressure)
- Vacuum contact (sub-micron printing!)
  (evacuation of exposure gap and additional nitrogen pressure)
- Soft vacuum (vacuum contact with additional nitrogen pressure)



MJB4 – SUSS L/S Resolution Limits

Resolution Limits:

Optics Type:	UV400	UV300	UV250
Vacuum Contact	<0,8µm	<0,6µm	<0,5µm
Hard Contact	1,0µm	<1,0µm	-
Soft Contact	2,0µm	<2,0µm	-
Proximity [20µm]	>3,0µm	-	-



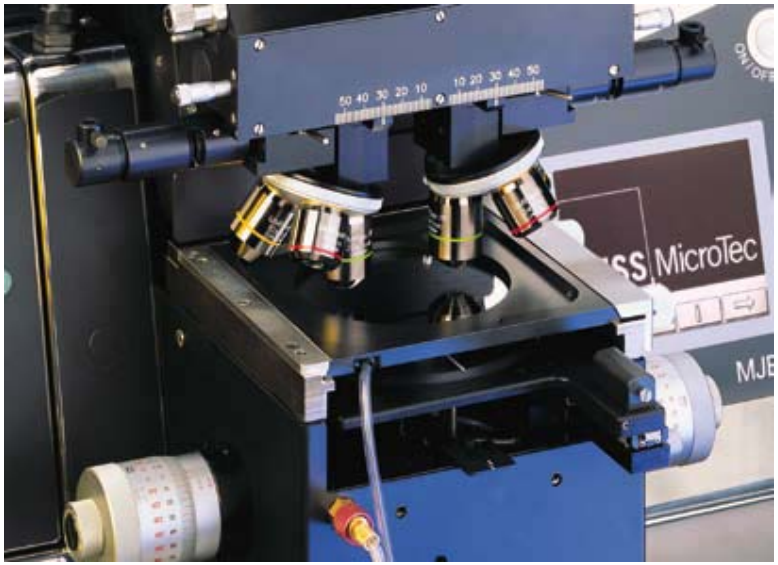
(0,6µm L/S resolution in 0,8µm thick resist

Line, Space resolution achieved in 1 µm thick resist AZ 4110 (UV400, UV300) and UV6 (UV250) respectively. Achievable resolution depends on wafer size, wafer flatness, resist type, clean room condition and therefore, might vary for different processes.

MJB4 – Wafer Thickness Compensation and Leveling

+ SUSS Wafer Thickness Compensation and Leveling

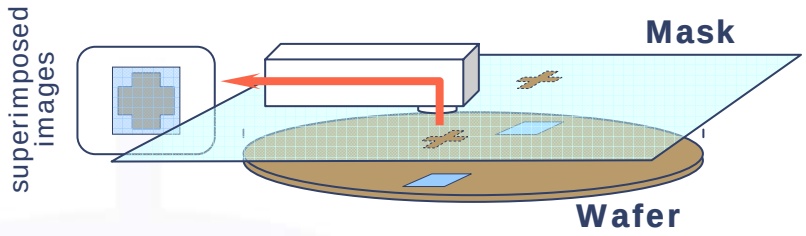
Leveling of mask and wafer as well as thickness compensation are essential for good printing results.



Benefits

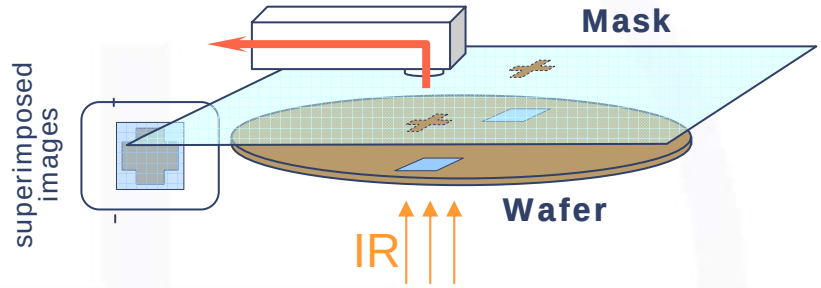
- + Low force for mask and wafer protection
- + High sensitivity for precise leveling
- + Clamping principle eliminates shift
- + Robustness and simplicity ensures high uptime and ease of maintenance

MJB4 – Alignment Methods



+ Top Side Alignment (TSA)

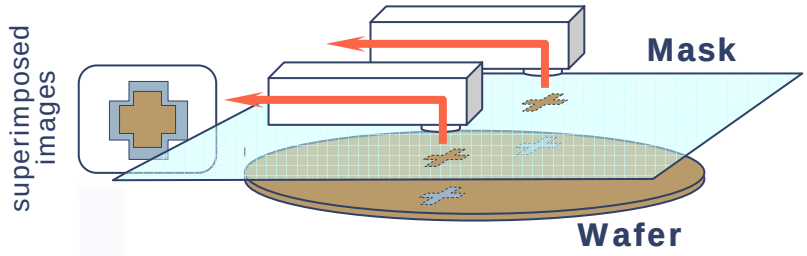
- Mask to wafer alignment with mask clear field (transparent area)

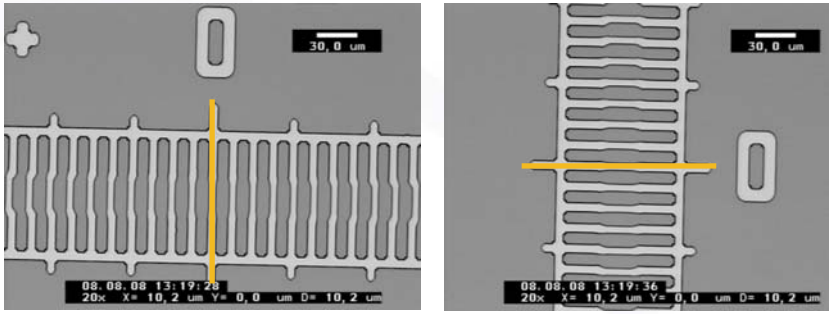


+ Infrared Alignment (IR)

- Alignment of with Infrared illumination (incident or transmitted)

MAJB4 – Top Side Alignment

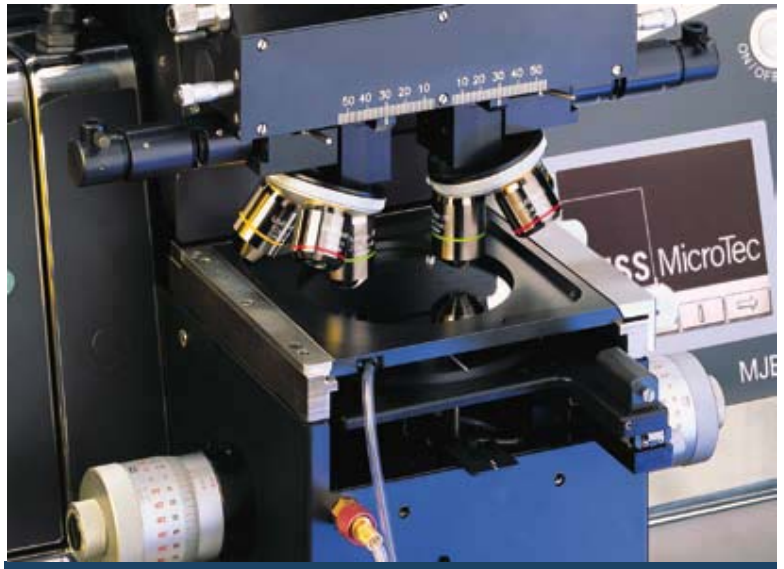




Print results of a top side alignment test, used for alignment verification

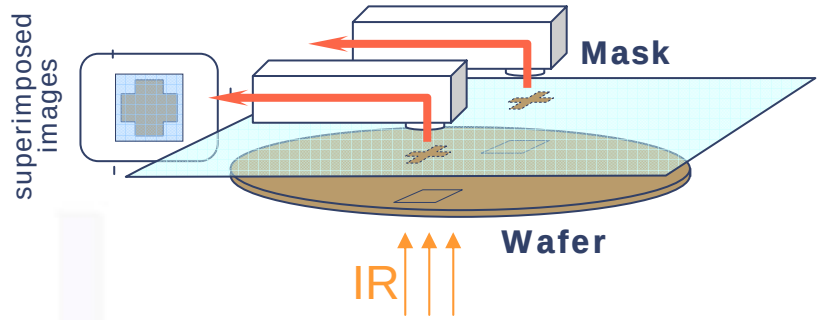
SUSS Performance:

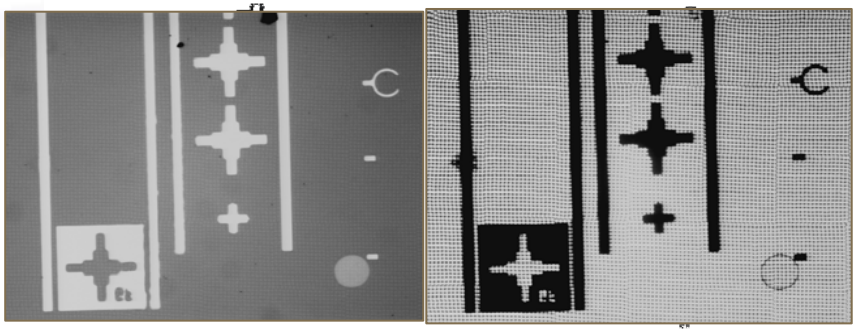
+ +/- 1µm Alignment Accuracy with SUSS recommended targets



ALIGNMENT STAGE	
MA Movement Range	X: ± 5 mm Y: ± 5 mm Theta: ± 5°
Mechanical Resolution	X, Y: 0.1 µm Theta: 4 x 10^{-5}°
TOPSIDE MICROSCOPE (TSA)	
Movement Range	X: ± 40 mm Y: + 30, – 50 mm Theta: ± 4°

MJB4 – Infrared Alignment (IR)



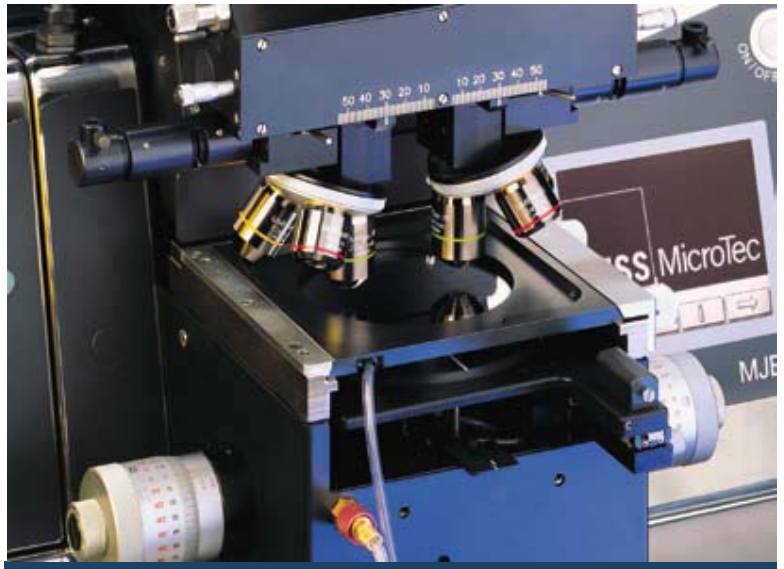


Example: Incident IR alignment

Example: Transmitted IR alignment

SUSS Performance:

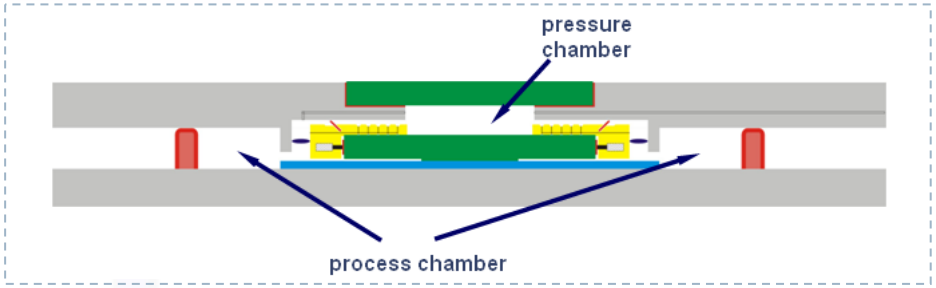
- \+ +/- 2µm depending on material type, thickness, surface quality
- \+ For IR transparent materials: GaAs, InP, Si, etc
- \+ Applicable to materials transparent to wavelengths from 400 to 1200nm (special cameras for longer wavelength available)
- \+ Manual light source positioning
- \+ One (M500) or two (M604) video cameras



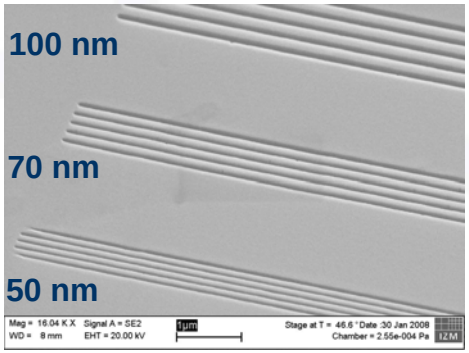
ALIGNMENT STAGE	
MA Movement Range	X: ± 5 mm Y: ± 5 mm Theta: ± 5°
Mechanical Resolution	X, Y: 0.1 µm Theta: 4 x 10^{-5}°
TOPSIDE MICROSCOPE (TSA)	
Movement Range	X: ± 40 mm Y: + 30, – 50 mm Theta: ± 4°

Note: Transmitted IR alignment requires openings in the exposure chuck

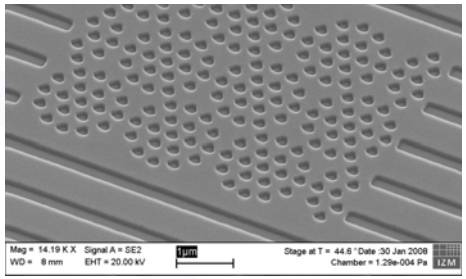
MJB4 – UV-NIL (UV Nanoimprint)



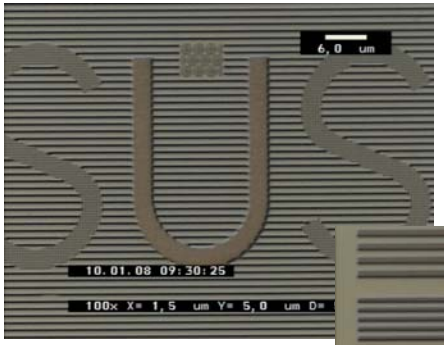
Schematic drawing of SUSS UV NIL tool set

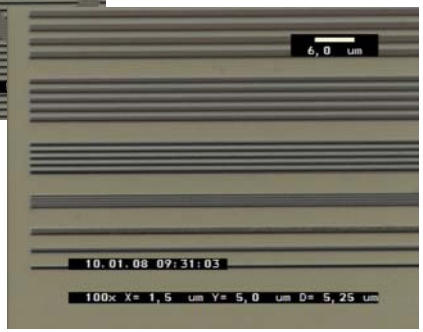


Imprinted lines and spaces in Amonil MMS4



Imprinted array of 160nm holes in concentric rings



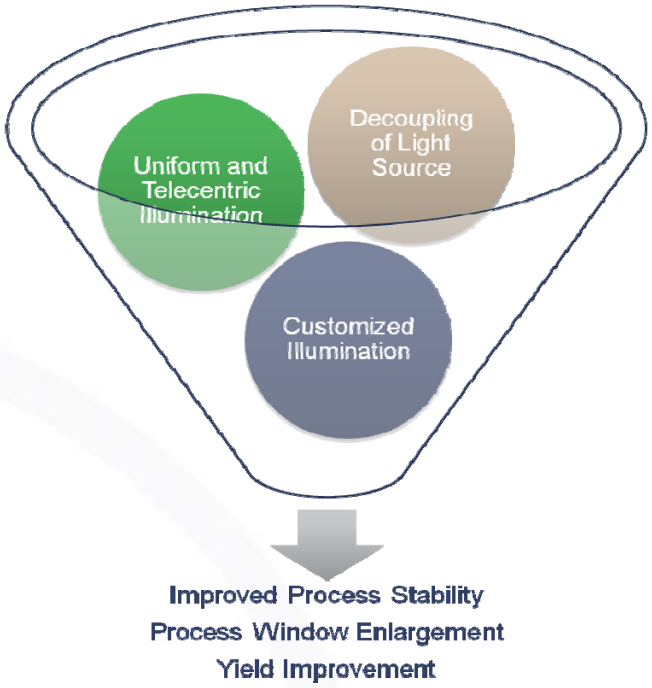


UV Nano Imprint of SUSS test structure

Featuring:

- \+ Supports quartz glass stamp: 65 x 65 x 6.35 mm (standard defined by Molecular Imprint Corp.)
- \+ Imprint area: 10mm square
- \+ Substrate size: 2” Wafers
- \+ Exposure area 35 x 35mm
- \+ Inert-Gas purge (e.g. He) optional
- \+ Resolution sub 50nm (depending on stamp quality)

MJB4 – Micro Optics (MO)



MO Optics toolkit

Benefits

- \+ Improved light uniformity (2,5%)
- \+ Decoupling of light source (no adjustment at lamp change)
- \+ SUSS High Resolution and Large Gap optical setups in one exposure optic
- \+ Flexible illumination settings via quick and easy IFP exchange

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October, 2009