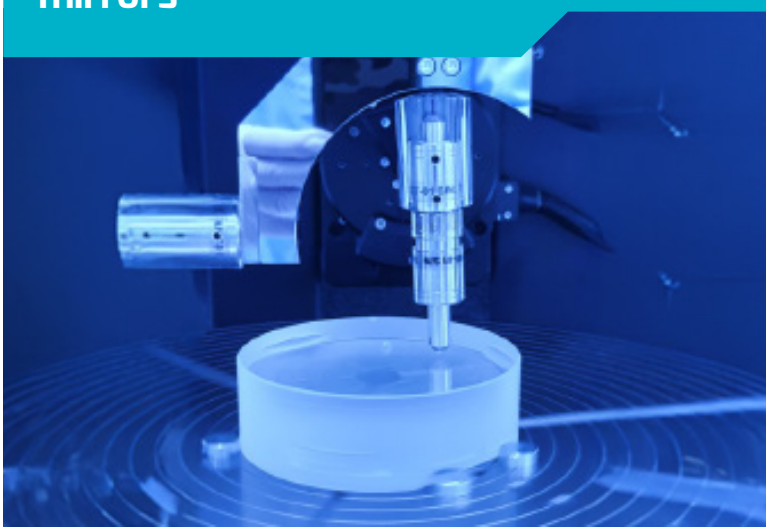
THALES

Building a future we can all trust

SESO® Optics for Semiconductor EUV Equipment

EUV Collector mirrors

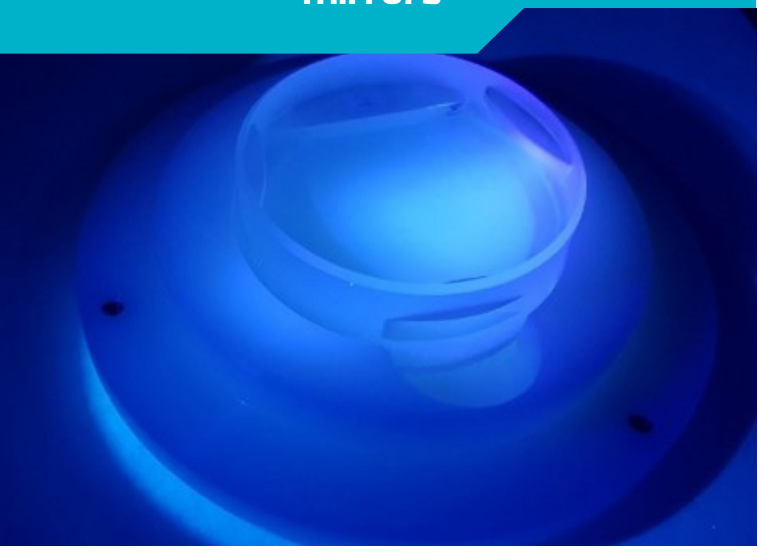


Free-Form Optics – Silica/Silicon

Shape vs sphere: deformation > 1 mm
Up to 500 mm diameter
Slope 2D < 10 µrad

"Thales SESO® Optics team has received repeat orders for EUV optics, proving we achieve the surface roughness required for this critical application"
Feedback from a valued customer (name withheld)

EUV Illuminator mirrors



Ellipsoids – Silica

Shape vs sphere: deformation < 1 mm
Shape errors RMS < 1 nm
Slope errors RMS < 1 µrad

"This new illuminator optic represents a very significant improvement in our latest generation system, substantially improving brightness and yielding a 4x improvement in optical throughput."
Patrick Naulleau (CEO, EUV Tech)

"...Your first AIRES mirror shows a great EUV reflectance. YOU CAN DO IT!!! With 66.5 % (only) 1 % less than our (perfect) Si witness samples. GREAT JOB!!! ..."
Torsten Feigl (CEO, optiXfab)

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EUV Imaging Mirrors

Near Spherical – Silica
Shape errors RMS < 0.5 nm
Slope errors RMS < 1 µrad

Figure (LSRF):
Shape error RMS < 0.5 nm

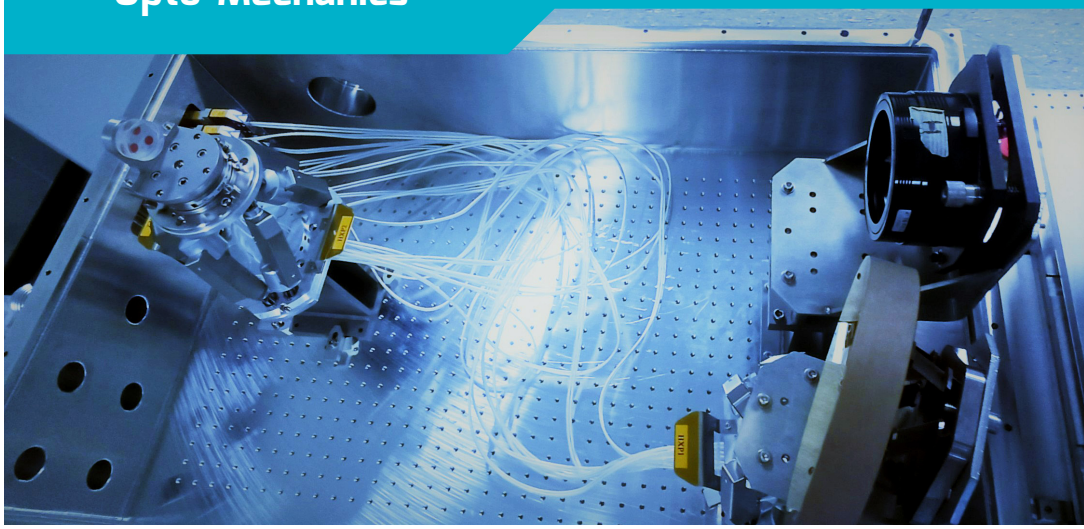
Waviness (MSFR):
Roughness RMS < 0.3 nm

Micro-roughness (HSFR):
Roughness RMS < 0.1 nm

Extremely low roughness < 0.3 nm Over 6 decades spatial frequencies (10 nm – 1 mm)

"LUXEM microscope: tailored figure error optics mark a disruptive advance in illumination function quality and stability, improving throughput in EUV ultrafast nanometrology"
Prof. Giulia Fulvia Mancini (Associate Professor in Physics & Head of the Laboratory for Ultrafast X-ray and Electron Microscopy – LUXEM)

EUV Microscope Opto-Mechanics



Multi-Mirror Assemblies
Motorized alignment
Common Frame Vibration optimized
Gravity sag compensated
Thermally stabilized holder

Ongoing progress towards keeping a total WFE RMS at the nanometer scale during operation.

"Thales SESO® Optics team is one of the best manufacturer in the world of optical assemblies for space. This know-how is certainly an asset for EUV microscopes assembly and alignment."
Bruno Bailly (Technical Authority, Domain Observation, Science & Exploration, Thales Alenia Space)

Thales SESO® Optics team is a world leading supplier of very high precision optics since 1965.