

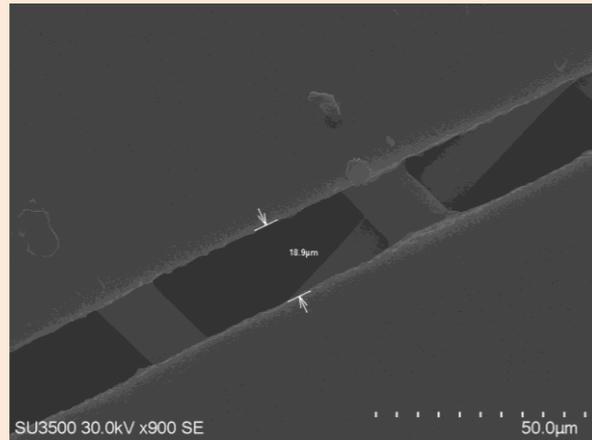
# FINELINE – Variables and challenges

## Stencil making

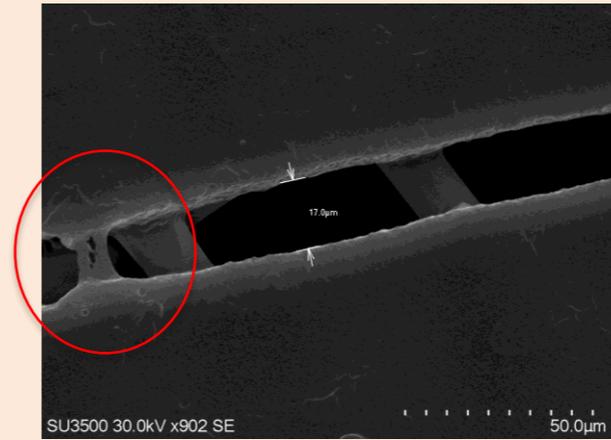
- Stencil making of fineline stencils cannot be compared to the stencil making of conventional screenprinting
  - Lots of different variables affect the workflow of fineline stencil
  - Following charts show these variables and how they can affect the whole process

Variables	Benefits	Disadvantages	How to use	Application	Also important to know...
<b>Standard mesh</b>	Cheaper  Everywhere available	Possibly more reflections → worse resolution	Handling is comparable to black mesh  Depending on mesh count it should be handled with care	Trampoline or direct	<p>Test showed: if the EOM gets higher and/or the resolution finer, the black mesh has better abilities to compensate overexposing and achieves higher resolution than standard mesh</p> <p>Before coating: Chemical preparation (better embedding of emulsion)</p>
<b>Black mesh</b>	Less reflection → easier to achieve high resolution	More expensive  Not always/everywhere available	Handling is comparable to standard mesh  Depending on mesh count it should be handled with care	Rather trampoline than direct (more economical)	

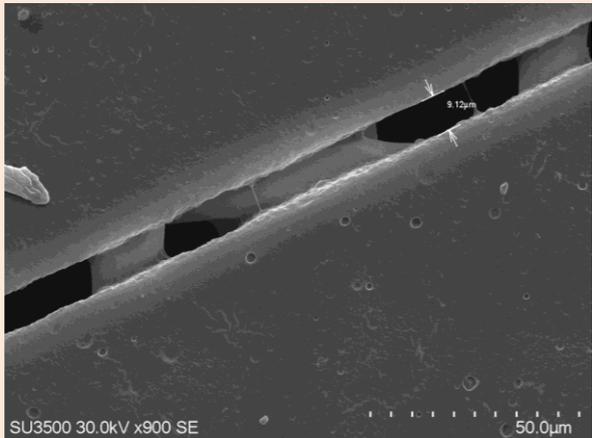
**Black mesh 430-13 - 20 micron**



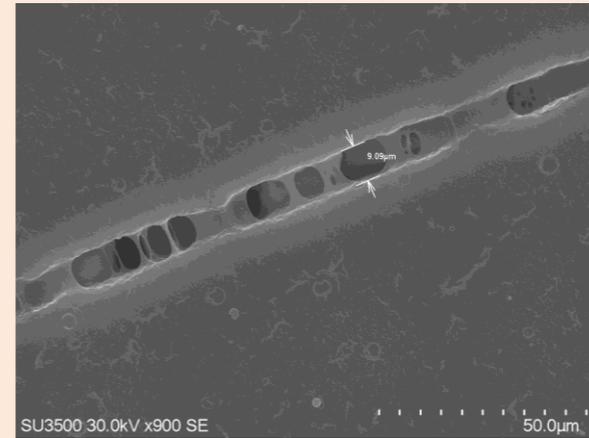
**Standard mesh 430-13 - 20 micron**



**Black mesh 500-16 - 15 micron**



**Standard mesh 500-16 - 15 micron**



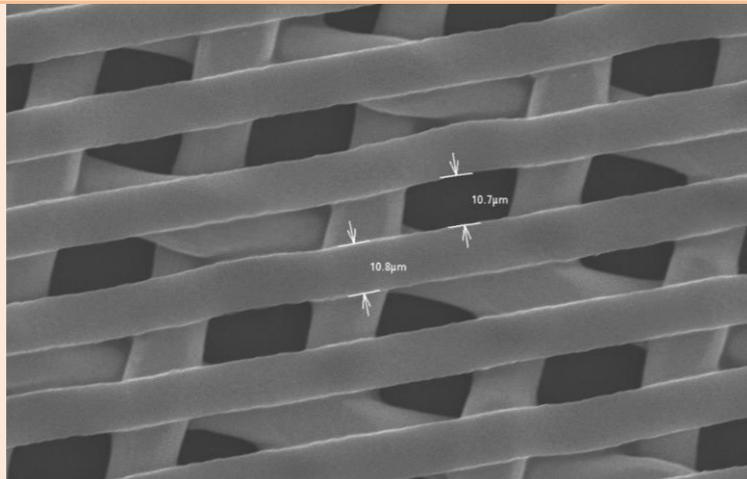
Variables	Benefits	Disadvantages	How to use	Application	Also important to know...
<b>AZOCOL® Z 177 FL</b>	Very fine particle distribution  highest possible resolution (20 micron and less)	Has little „problems“ with higher EOM regarding resolution	EOM: $\leq 10 \mu\text{m}$	Printed electronics  (very) fine lines  lower EOM	Before producing:  Coating and exposure tests have to be done. For this the same mesh (only stainless steel mesh should be used) and layout (with sufficient resolution) like in mass production should be used.
<b>AZOCOL® Z 173/1 FL-H</b>	Achieves also high resolution with higher EOM (> 10 micron)	Slightly coarser particle distribution	Possible EOM: $\geq 10 \mu\text{m}$	Solar industry  (very) fine lines  higher EOM	

# Emulsion



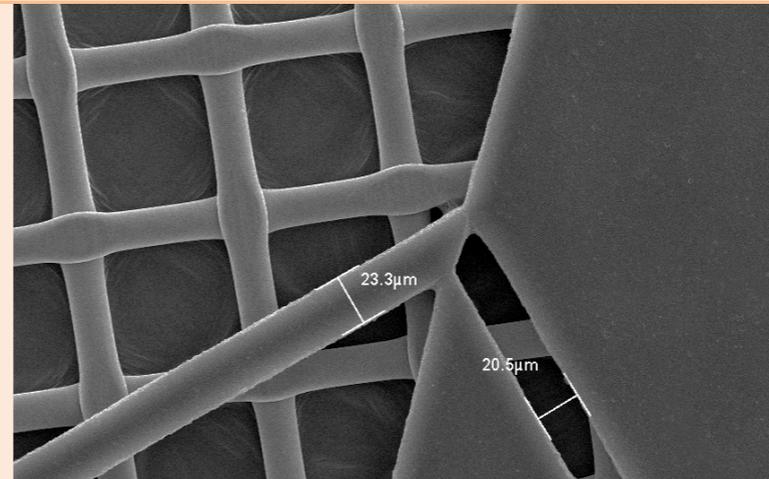
## AZOCOL® Z 177 FL:

3 micron EOM; 10 micron line/space



## AZOCOL® Z 173/1 FL-H

19 micron EOM; 20 micron line negative and positive

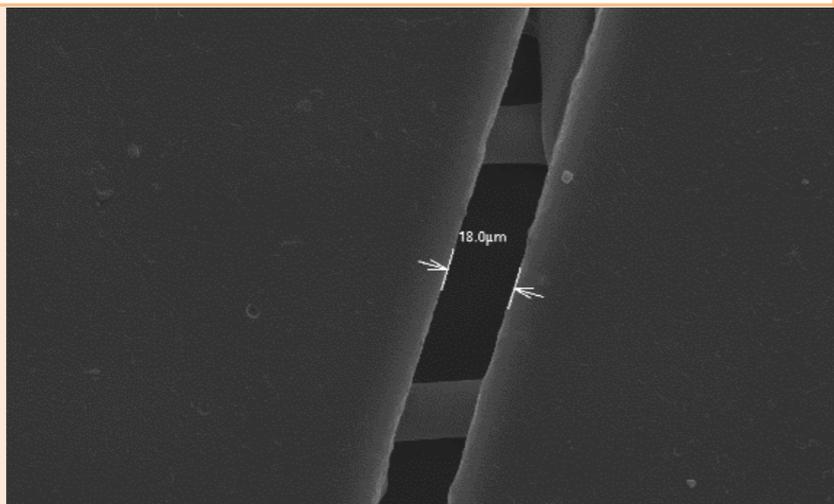


# Photo tooling

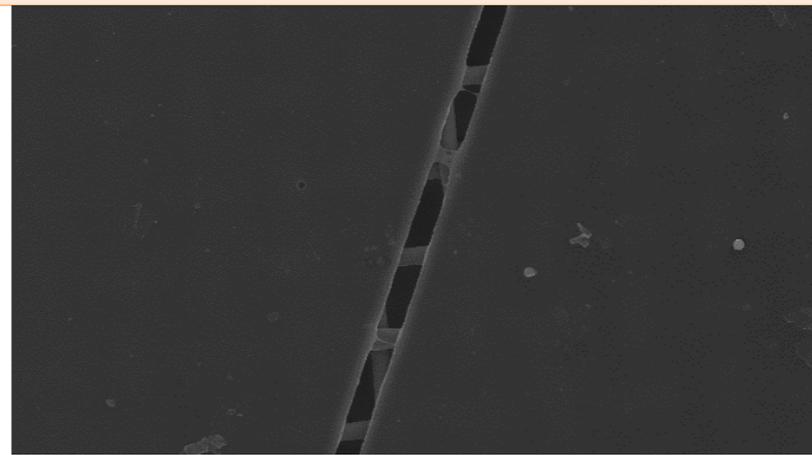
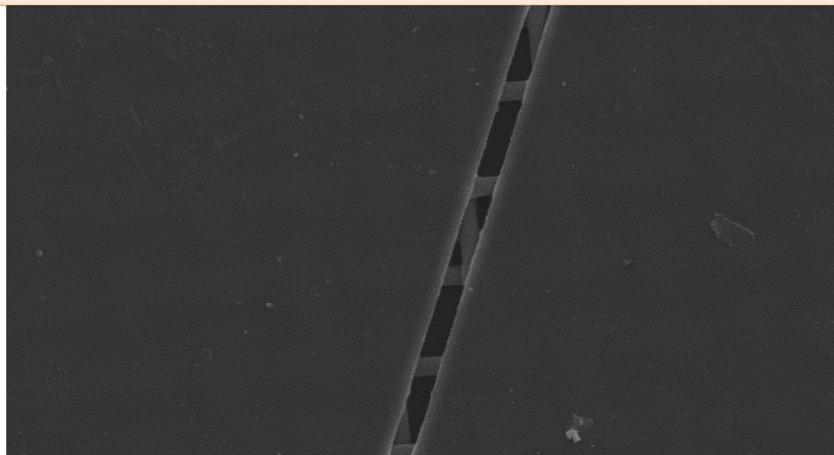
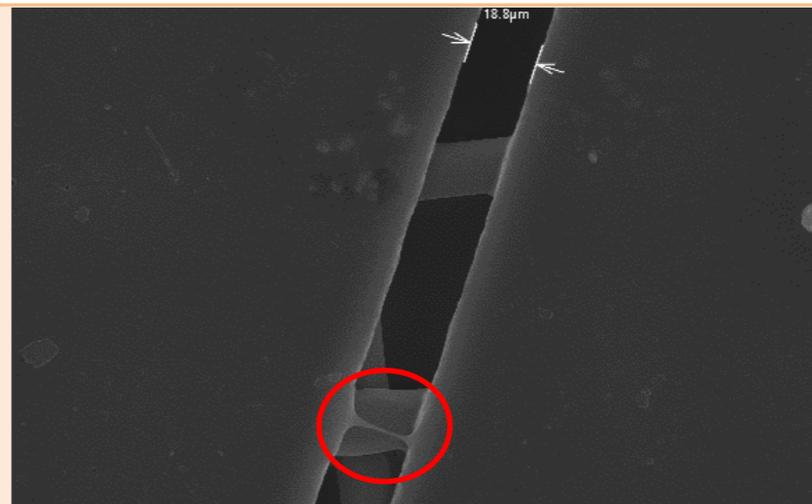


Variables	Benefits	Disadvantages	How to use	Application	Also important to know
<b>Glass master with 200.000 dpi</b>	Perfect quality  Not sensitive for environmental influences	Expensive  Fragile	Handle with care  Mask around to avoid cracks in the glass or damaged mesh	Prototypes  Special projects/ requirements	For lines below 100 micron, the template should have at least 16.000 dpi, the finer the lines the higher the resolution should be → If resolution is as high as possible, this parameter can be excluded if something in the process goes wrong  Pre-testing with same layout like in the following mass production
<b>Film template with 64.000 dpi (or less)</b>	Cheaper  Offered by lots of repro studios	Worse quality  Sensitive for humidity and temperature changes  Can be contaminated by resins of emulsion's surface  Limited resolution	Room with same temperature and humidity over the whole time	Mass production	

Glass master with 200.000 dpi



Film template with 64.000 dpi



# Exposure system

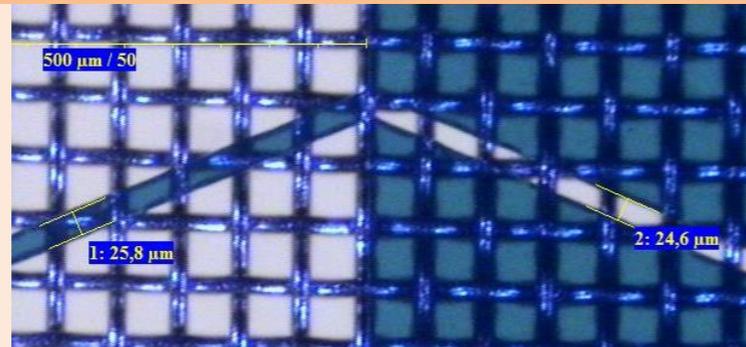


Variables	Benefits	Disadvantages	How to use	Application	Also important to know
<b>Without fresnel</b>	Cheaper Everywhere available	Good quality just by exposing directly in the center	Exposing in the center	Single exposure	The bulb has to be exchanged periodically → Depending on how extremely the unit is used: every 1 to 3 months
<b>With fresnel</b>	Even UV light over whole exposure area	More expensive Just a few manufacturers offer this kind of system	Exposing is possible on the whole area	Multi exposing large formats	

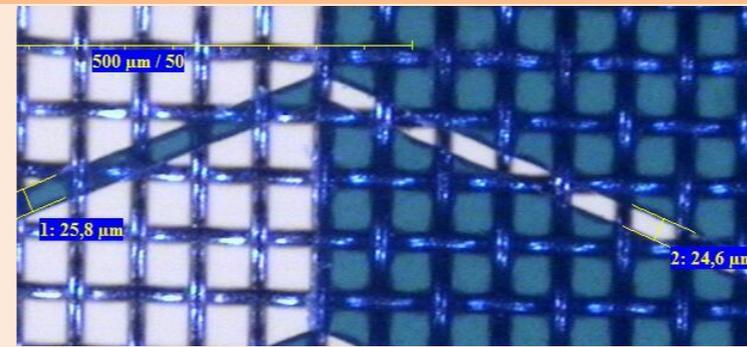
# Exposure system



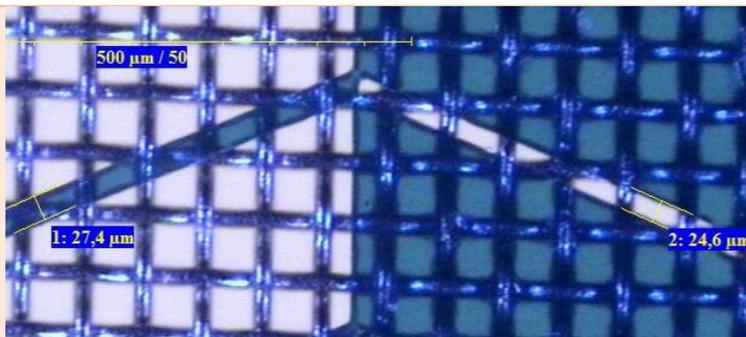
With Fresnel - center



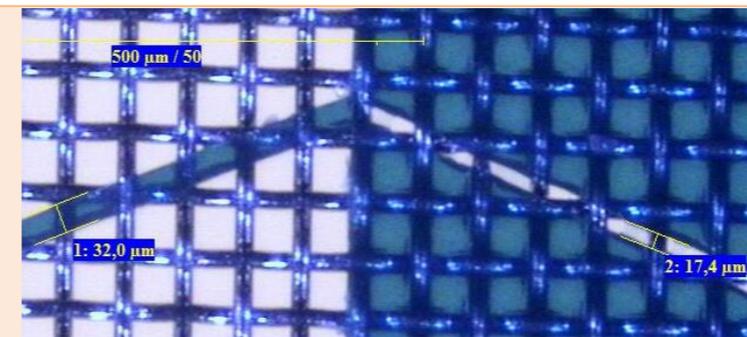
Without Fresnel - center



With Fresnel - bottom left



Without Fresnel - bottom left



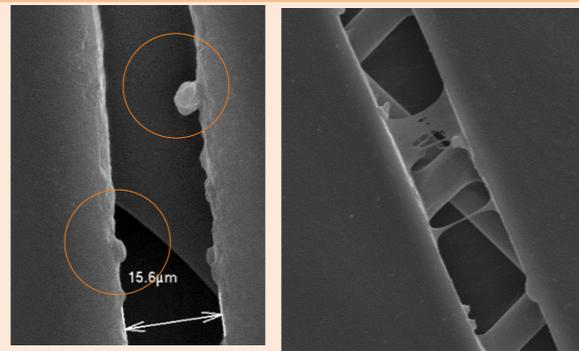
# Other challenges



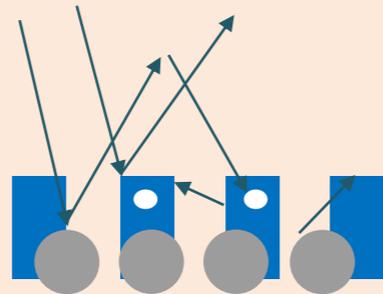
Challenges	Description of difficulty	Tips to avoid/improve
<b>Reflections</b>	<p>Droplets → low impact on printing process</p> <p>Bridges → depending on their size → medium to higher impact on printing process</p> <p>Triangles → higher impact on printing process</p>	<p>sandblasted/black mesh</p> <p>use of different emulsion</p>
<b>EOM vs. resolution</b>	<p>If the EOM is too high, resolution cannot be achieved</p>	<p>Less EOM</p> <p>different emulsion</p>
<b>Relation of line and space in film template</b>	<p>Space = Line → <b>less</b> surfaces (pigments, resins,... → <b>less</b> reflections → <b>better</b> resolution</p> <p>Space &gt; line → <b>more</b> surfaces (pigments, resins,... → <b>more</b> reflections → <b>worse</b> resolution</p>	<p>Different emulsion, which can minimize difficulty</p> <p><b>Always use the same layout for pre exposure tests as for mass production → no bad surprises in mass production</b></p>

# Other challenges in fineline stencil making

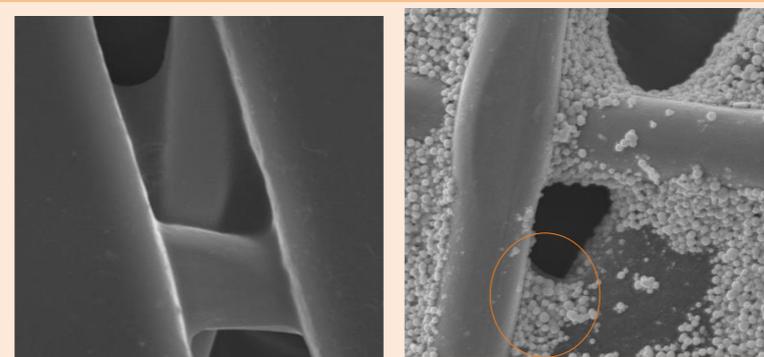
## Droplets and Bridges



**Space = Line** → less reflection problems



## Triangles and impact in printing process



**Space > Line** → more reflection problems

