

PHOTO STENCIL HISTORY

- Founded as a Specialty Screen Manufacturer 1979
- Primary Stencil Supplier to most of the Major OEMs 1980's
- During early 90's introduced many new products to the industry (such as Trapezoidal Apertures, Electropolishing, etc) 1990's
- First and only Stencil vendor to become ISO 9001 certified 1996
- Established support products such as Blades, BGA Tools, etc 1996
- Established Global Manufacturing 1997
- Introduced Wafer Bumping Stencil 1997
- Won Numerous Industry Awards / Recognition 1993-Present
- Acquired AMTX (Electroformed Stencils) from Xerox 1998
- Moved into 75,000-sq ft custom designed building for: State of the Art Manufacturing, R&D, and Corporate Central Support 1999
- Becoming Major Supplier to most large CEM's 2000
- Continued Industry leadership in Stencil Technology 2001
Currently hold 5 patents with new ones pending for
Glue Reservoir Stencil and Step E-FAB Stencil
- Current Locations include: Colorado Springs Headquarters, Raleigh NC, Guadalajara MX, Campinas Brazil, Singapore, Penang Malaysia, and Alliance with DeK for Europe
- More than 100 employees and 600 customers



AVI PRECISION ENGINEERING PTE LTD

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PHOTO STENCIL TECHNOLOGY

PEOPLE

- Applications Engineers
- CAD Technicians
- Chemists
- Customer Service Teams

TECHNICAL SUPPORT

- On Site Print Workshops
- On Site CAD Design
- On Site Stencil Design
- DOEs with Customers

INDUSTRY AWARDS FOR PRODUCT DEVELOPMENT

- 1993 Vision Award (SMI) "Trapezoidal Stencil Aperture"
- 1995 Kiver Award (NEPCON) "Electroformed Stencil"
- 1995 Vision Award (SMI) "Additive Stencil Technology"
- 1996 Vision Award (SMI) E-Fab "Squeegee Blade"
- 1997 Kiver Award (NEPCON) "Wafer Bumping Stencil"
- 1997 Vision Award (SMI) "Duraglide Squeegee Blade"
- 1998 Excellence in EP&P Award (NEPCON)
"BGA Reballing Tool"

NEW PRODUCT HISTORY

Thick Film Screens □	1980 □	Acquired AMTX from Xerox□	1998
Chem-Etch Stencils □	1987□	Metal Mask Screens□	1998
In-House Photoplotting□	1990□	E-FAB Stencils□	1999
*Electropolished Apertures□	1992□	Inspection Templates□	2000
*Trapezoidal Apertures□	1993□	E-FAB for Flip Chip□	2000
Laser-cut Stencils□	1994□	E-FAB for Wafer Bumping□	2000
*Hybrid (Laser & Chem) Stencils□	1994□	Pallets□	2001
*Nickel Plated Apertures□	1995□	Glue Reservoir Stencils□	2001
*Duraglide Squeegee Blades□	1997□	*Step E-FAB Stencils□	2002
*BGA Ball Placement Tools□	1997□	*3-D E-FAB Stencils□	2002
*Wafer Bumping Stencils□	1997		

TECHNICAL PAPERS

- SMT June 96 "Stencil Design for advanced Packages"
- SMI Oct 97 "Achieving Dramatic Reductions in SMT Defects"
- NEPCON Feb 98 "Special Coatings for Stencil Applications"
- Globaltronics Sept 98 "Stencil Design for Wafer Bumping"
- Circuit Assembly Oct 99 "Stencil Design Guidelines"
- AMTX Report 99 "Comparative Study.. Ultra Fine Pitch Printing"
- SMT Intl Oct 99 "Stencil Design for Through-hole SMT"
- SMT Jan 00 "Adhesive Deposition"
- US TECH Feb 01 "Speed Printing High Viscosity Materials"
- Circuit Assembly Mar 01 "Stencil Technology and Design Guidelines for Print Performance"
- SMTAI Oct 01 "Stencil Print Performance"
- APEX Jan 02 "Metal Stencils for Adhesive Printing"

PHOTO STENCIL PATENTS

- Method of preparing and using a screen printing stencil having raised edges
Patent 5,359,928 Nov. 1 1994
- Method of preparing a screen printing stencil
Patent 5,478,699 Dec. 26 1995
- Electroformed squeegee blade for surface mount screen printing
Patent 5,746,127 May 5 1998
- Method of forming fiducials, and stencils containing fiducials
Patent 5,727,461 March 17 1998
- Metal squeegee blade with Titanium Nitride coating
Patent 5,947,021 September 7, 1999
- Reservoir stencil with relief areas
Patent Pending



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L-FAB (LASER-CUT STENCILS)

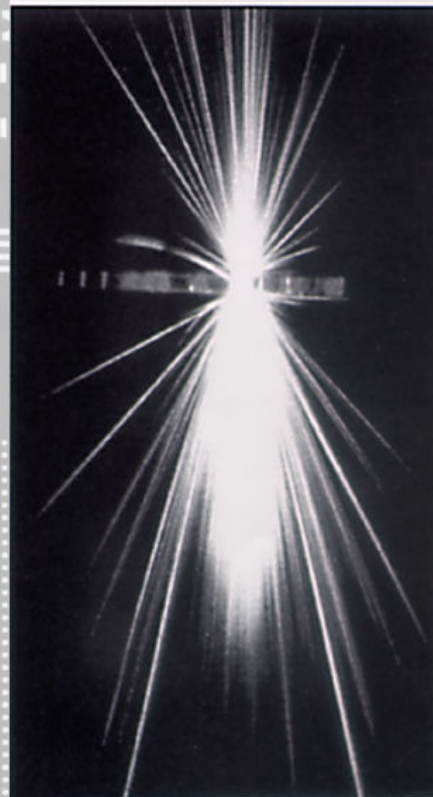
L-FAB is the technology for your applications containing fine pitch components (0.020" and below). Photo Stencil provides laser cut apertures with a standard size tolerance of $\pm 0.00025"$. Post processing a laser cut stencil will improve aperture wall quality yielding higher percentages of paste release. Post processing may impact aperture size tolerances, but the finished product will typically outperform a laser cut stencil without it.

Nickel plating is another post laser-cut option for creating even smoother aperture walls and is recommended for 16mil pitch and below and for micro BGA applications.

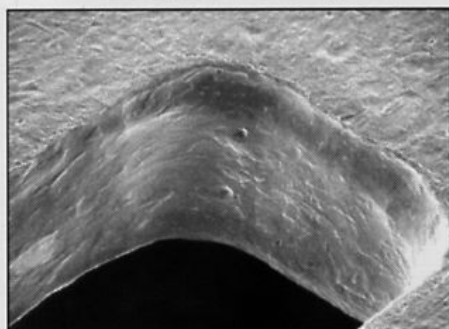
Photo Stencil offers laser cut stencils in a variety of materials. Different full hard stainless steels can be selected to provide specific print performance and paste release characteristics. Or you may choose our Alloy 42 for those higher print performance requirements where print quality required exceeds that available from full hard stainless steel.

Our new DuraAlloy foil meets exacting engineering standards and sets new standards for print performance with laser cut stencil technology. With its proprietary laser and post processing methods, this stencil can deliver print performance second only to E-FAB® technology.

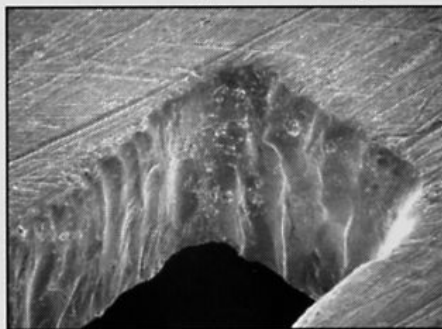
Laser-Cut Stencil



Electropolished Alloy 42



Non Electropolished Alloy 42



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H-FAB (LASER-CUT & CHEM-ETCH STENCILS)

The Hybrid Stencil (H-FAB) combines Laser-Cut and Chem-Etch technologies in a single stencil. This technology is for applications having a small number of fine pitch apertures (500 to 1500) and a large number of total apertures (6,000 to 12,000).

The fine pitch apertures (typically 20 mil pitch QFP's or smaller as well as BGA's of 30 mil pitch or less) are Laser-Cut to ensure dimensional accuracy and aperture wall quality providing excellent print performance. The remaining apertures (25 mil pitch and above) are chemically etched providing more than adequate print performance for these larger apertures.

H-FAB Stencils are available using Alloy 42 metal. Step Stencils and Relief Stencils are available for all Hybrid Stencils. Photo Stencil's proprietary registration process yields excellent registration between the chemically-etched and the laser-cut apertures.

Post processing of the H-FAB Stencil will improve aperture quality of both the Laser-cut and the chemically-etched apertures. Nickel plating is also available for H-FAB Stencils and is recommended for 16 mil pitch and below and for uBGA applications.

Hybrid Stencils are an effective value alternative for stencils having less than 15% fine pitch apertures compared to the total number of apertures.



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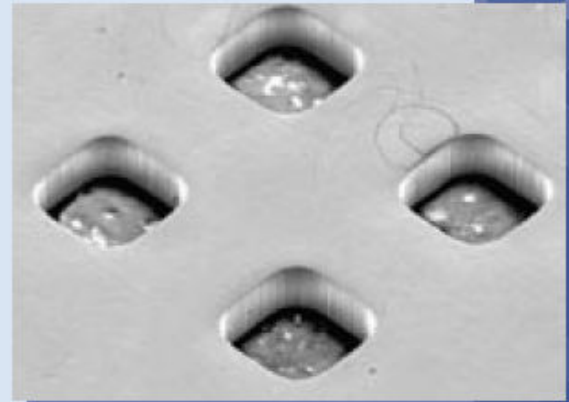
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AMTX E-Fab[®]

Electroformed Stencil

AMTX E-FAB[®] Electroformed Stencils have set the standard for the SMT industry with superior printing characteristics and lower defect rates.

The AMTX E-FAB Electroformed Stencil is used extensively for (20 mil to 12 mil pitch) SMT applications. It is also used for μ BGA's, Flip Chip, and Wafer Bumping (12 mil to 6 mil pitch). Photo Stencil is the exclusive manufacturer of the patented AMTX E-FAB stencil (including all improvements since 1998).



μ BGA Apertures

Advantages

Smooth, Trapezoidal Sidewalls: Maximizes solder paste release.

Unsurpassed Tensile Strength and Hardness: Increases stencil life.

Nickel Surface Properties: Low-surface energy enhances solder paste release.

Thickness: Available in 1 to 12 mil thicknesses with 0.1 mil increments.

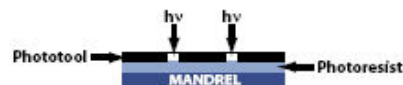
Precise Aperture Sizes: Post-processing size compensation not required.

Higher Process Yields: Superior printing characteristics and lower defect rates guarantee high process yields.

THE ELECTROFORMING PROCESS

Unlike subtractive etching or laser-cutting processes, E-Fab Stencils are grown atom by atom around the aperture pattern created by a photoresist film deposited on a conductive surface.

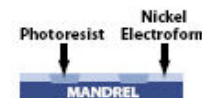
1) The coating is polymerized by light exposure through a photo mask of the board pattern.



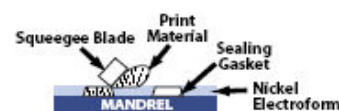
2) After developing, a negative image is created on the mandrel where only the apertures on the stencil remain covered by the photoresist.



3) The stencil is then grown by nickel electroforming. The remaining photoresist is removed from the apertures and the foil is separated from the mandrel.



4) The stencil is then framed so that as the print material is spread across the stencil, the patented sealing gasket helps to minimize print material bleeding, and the tapered side walls maximize material release from the stencil.



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E-FAB® (ELECTROFORMED STENCILS)

E-FAB® electroformed stencils have set the standard for the SMT industry with superior aperture size consistency, geometry capability, printing characteristics and lower defect rates.

The E-FAB® stencil is used extensively for (20 mil to 12 mil pitch) SMT applications. It is also used for uBGA's, Flip Chip, and Wafer Bumping (12 mil down 6 mil pitch). Photo Stencil has acquired the exclusive manufacturing and marketing rights to the Xerox patented E-FAB stencil (and all its improvements over the years) when you buy from AMTX/Photo Stencil.

- **Smooth, trapezoidal sidewalls** - maximize solder paste release
- **Unsurpassed tensile strength and hardness** - increased stencil life
- **Nickel surface properties** - low surface energy enhances solder paste release
- **Available in thicknesses** - 1 mil to 12 mil in 0.1 mil increments
- **Precise aperture sizes** - Post Processing size compensation not required

The Electroforming Process.

Unlike subtractive etching or laser cutting processes, E-FAB Stencils are grown atom by atom around the aperture pattern created by a photoresist film deposited on a conductive surface.

1. The coating is polymerized by light exposure through a photo mask of the board pattern.



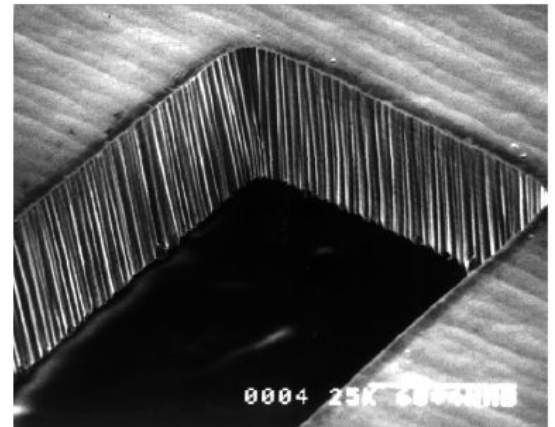
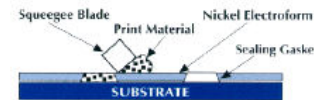
2. After developing, a negative image is created on the mandrel where only the apertures on the stencil remain covered by the photoresist.



3. The stencil is then grown by nickel electroforming. The remaining photoresist is removed from the apertures and the foil is separated from the mandrel.



4. The stencil is then framed so that as the print material is spread across the stencil, the patented sealing gasket* helps to minimize print material bleeding, and the tapered side walls maximize material release from the stencil.



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The Electroforming Process

Unlike subtractive etching or laser cutting processes, E-FAB® products are grown atom by atom around the aperture pattern created by a photoresist film deposited on a conductive surface.

Advantages of Electroforming

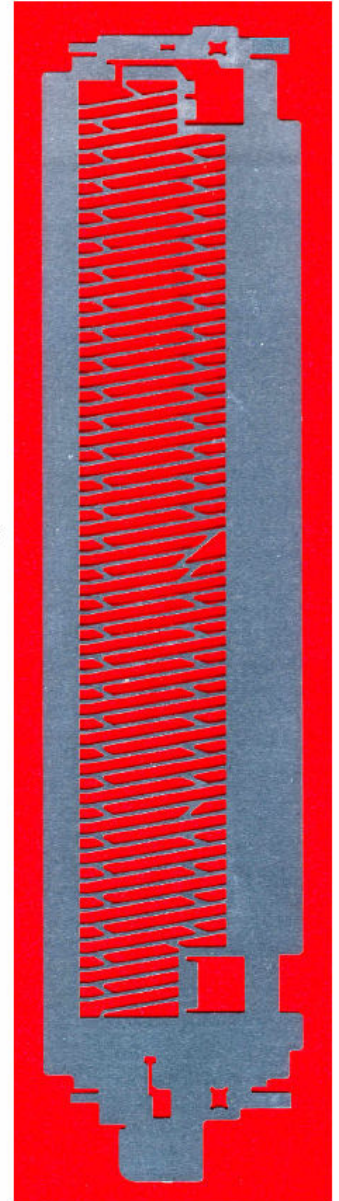
- Short Delivery Time
- Low Tooling Costs
- Flexible Metal Properties
- Thin, Fragile, Small, and Complicated Design Parts Can Be Produced at Tight Tolerances
- Quick Turnaround
- Relatively Flat and Burr Free Parts
- Design Alterations at Low Costs

Category of Electroformed Products

- Tools, Molds, and Dies
 - molds
 - diamond cutting
 - foundry patterns
 - stampers
 - press tools
 - dies
 - abrasive tools
- Mesh Products
 - textile printing screens
 - deposition masks
 - micro filters
 - electric razor screens
 - continuous porous substrate
 - electronic stencils and screens
 - sieves
 - wire cloth
- Other Products
 - 1.5--12 mil nickel foil
 - photosensitive drums in office equipment
 - wave guides
 - micro gears
 - micro artificial organs
 - heat sinks
 - micro springs
 - shuttle blades
 - decorative items
 - ink jet nozzles
 - micro relays

Markets

- Automotive
- Electronic Packaging
- Chemical Processing Industry
- Aerospace
- Textile Industry
- Consumer Products
- Plastics Manufacturing
- Entertainment
- Medical
- optical parts
- bellows
- fuel directors
- micro sprockets
- lead frames
- encoder discs
- micro rotors & shuttles
- name plates
- flow sensors
- micro valves
- micro resonators



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