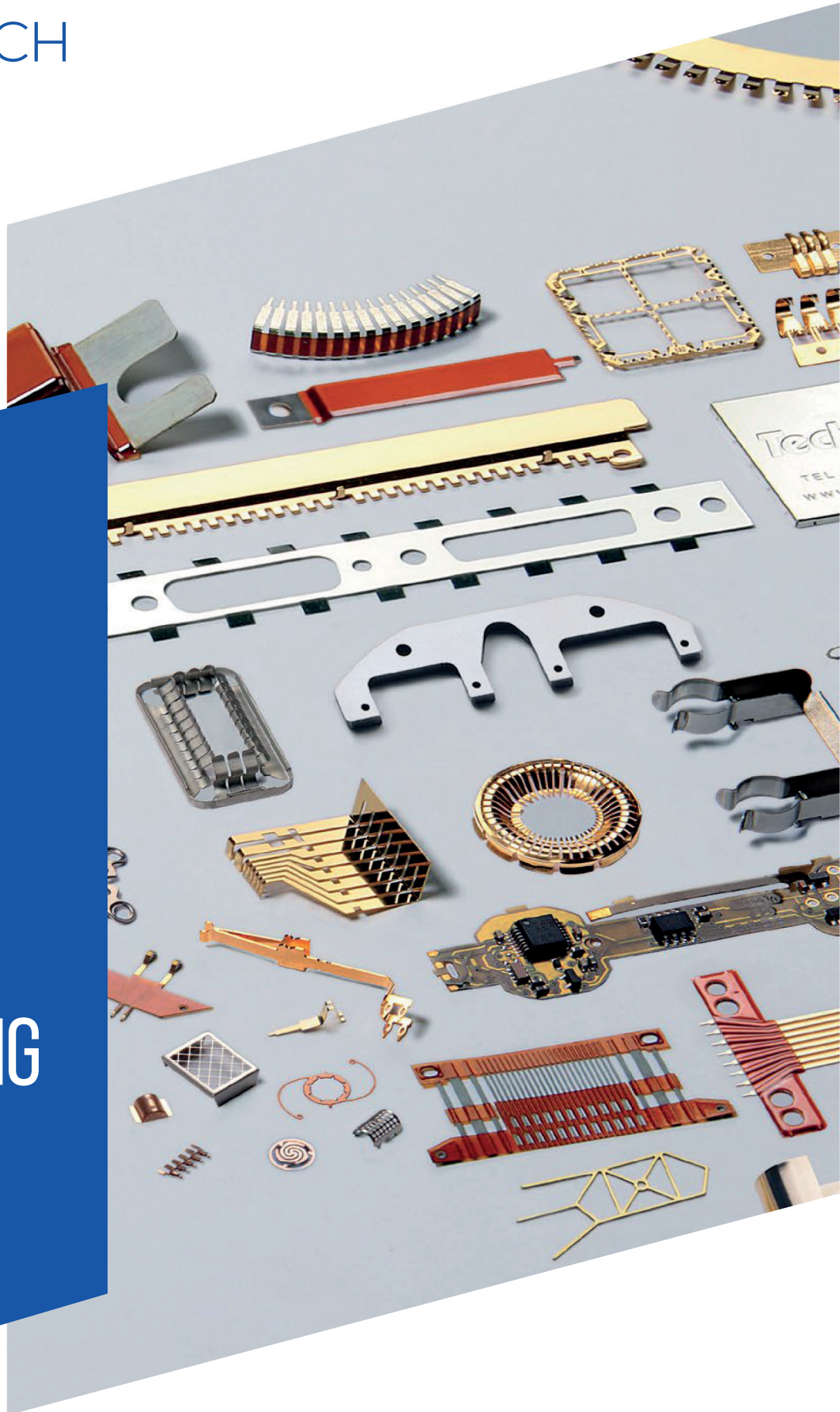




# ENGINEERING THIN METALS FOR MEDICAL THROUGH PHOTOETCHING



# PHOTOETCHING

**Tech Etch** specializes in the manufacture of light gauge metal parts. The photoetching process allows us to produce intricate metal components with close tolerances that are impossible to duplicate by other production methods. **Tech Etch** is setting industry standards for the manufacture of encoders, masks, filters, lead frames, flat springs, strain gauges, laminations, chip carriers, step covers, heat sinks, shields, shutter blades, electron grids, fluidic circuit plates, reticles, drive bands, and shims. *Optimize your design with precision photoetching.*

## | MATERIALS |

Tech Etch photoetches many metals such as Copper Alloys, Beryllium Copper, Stainless Steels, Aluminum, Nickel and Nickel Alloys, Silver, and Spring Steels. Specialty materials such as Elgiloy, Niobium, Nitinol, Titanium, Tungsten, and Molybdenum can also be etched with intricate detail, as well as polyimide film. Manufactured parts range in thickness from .0005" to the maximum thickness that remains consistent with the dimensions and tolerances listed below.

## | DIMENSIONS AND TOLERANCES |

Practical limitations for dimensions of slots, spaces and holes (as shown in Figure 2) are determined by the metal's thickness. These limitations are expressed in the following guidelines. Tables 3 and 4 give photoetching dimension tolerances. Consult the factory for dimensions that exceed these guidelines.

**Fingers and Slots** The minimum feature for a web or finger (ref. Fig. 2) is equal to material thickness. The minimum feature for holes or slots is equal to 1.1 times material thickness, .003" min. (e.g. min. feature on .002" thk. material is .003", min. feature on .003" thk. material is .0033".)

**Relationship of Hole Diameter to Metal Thickness** Generally, the diameter of a hole cannot be less than the metal thickness. This relationship, however, varies as the metal thickness changes. A more exact relationship is illustrated in Table 1.

**Table 1** Holes or slots

METAL THICKNESS (T)	DIAMETER OR WIDTH
.001"-.005"	1.1 Times Metal Thickness (.003" Min.)
.005" or Over	Min. of 1.1 Times Metal Thickness

**Table 2** Web or Finger

SPACES BETWEEN HOLES (W)	At Least Metal Thickness
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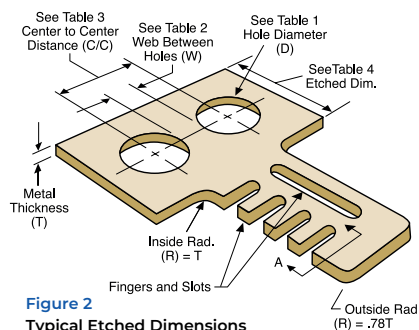
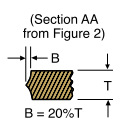
**Table 3** Center to Center Tolerances

CC/ DIMENSIONS (INCHES)	DIAMETER OR WIDTH
1.0" or Less	±.0005"
1.0" - 3.0"	±.0010"
3.0" - 6.0"	±.0020"
6.0" - 10.0"	±.0030"

**Table 4** Etched dimension tolerances

THICKNESS (T)	(INCHES)
.001"	.002"
Empirical	±.0010"
.005"	.010"
±.0010"	±.0015"
.015"	.020"
±.0020"	±.0030"
.040"	
±.0050"	

**Figure 1**  
Typical Etched Edge



**Figure 2**  
Typical Etched Dimensions



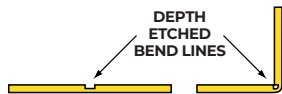


# FORMING

**Tech Etch** manufactures formed parts by combining photoetching, used for blanking, with inexpensive or universal tooling, used for forming. Select the etch and form manufacturing process for quick turn and low tooling cost. This method produces burr-free parts in intricate and complex designs and shapes. It also makes it possible to prove your design in preproduction quantities without having to commit to expensive, progressive die tooling. The following guidelines show practical methods to assure proper function and the best cost.

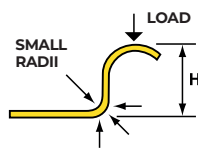
## | HAND FORMING |

For bends that do not require structural strength and where a sharp internal radius is desired, such as board-level shielding applications, depth etched bend lines may be used for hand forming. The lines are produced by etching a groove along the bend line of the part. By eliminating the need for forming tools, the cost is lowered.

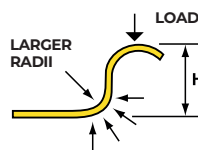


## | BEND RADII |

In the forming process, care is taken to design the proper bend radii, since larger radii can withstand a larger deflection without failure. **Example B** is designed to take a larger deflection ( $\Delta H$ ) than **Example A**.



**A** HIGH STRESS CONCENTRATION



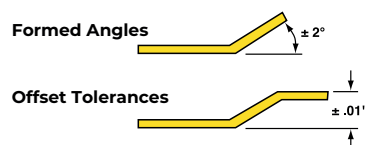
**B** STRESS SPREAD OUT OVER LARGER AREA

## | HEAT TREATMENT |

Tech Etch can heat-treat many materials, including Beryllium Copper, to achieve close dimensional control. Heat treatment enhances spring qualities by permitting greater deflection without compression set and without increasing the material's stiffness.

## | TOLERANCES |

Preferred forming tolerances are as shown. (Consult factory if tighter tolerances are desired.) Temper selected for a given bend radius depends on material thickness and the position of the bend with respect to grain direction. **Table 5** shows suggested minimum bend radii.



**Table 5**

Minimum Bend Radius	MATERIAL	ALLOY	TEMPER	MINIMUM RADIUS FORMABILITY 90°		
				GRAIN DIRECTION		
				ACROSS	45°	WITH
	BeCu	C172	A	SB	SB	SB
	BeCu	C172	1/4 H	SB	SB	SB
	BeCu	C172	1/2 H	0.5 x T	0.7 x T	1.1 x T
	BeCu	C172	H	1.0 x T	2.0 x T	2.2 x T
	BRASS	C260	A	SB	SB	SB
	BRASS	C260	1/2 H	SB	SB	SB
	BRASS	C260	H	0.7 x T	1.3 x T	1.6 x T
	BRASS	C260	S	1.0 x T	1.8 x T	3.7 x T
	STAINLESS STEEL	301/302	1/4 H	1.0 x T	1.0 x T	1.0 x T
	STAINLESS STEEL	301/302	1/2 H	1.0 x T	2.0 x T	2.0 x T
	STAINLESS STEEL	301/302	H	2.0 x T	4.0 x T	4.0 x T

Consult factory if tighter radius is desired.



## STANDARD & CUSTOM BOARD LEVEL SHIELDIN

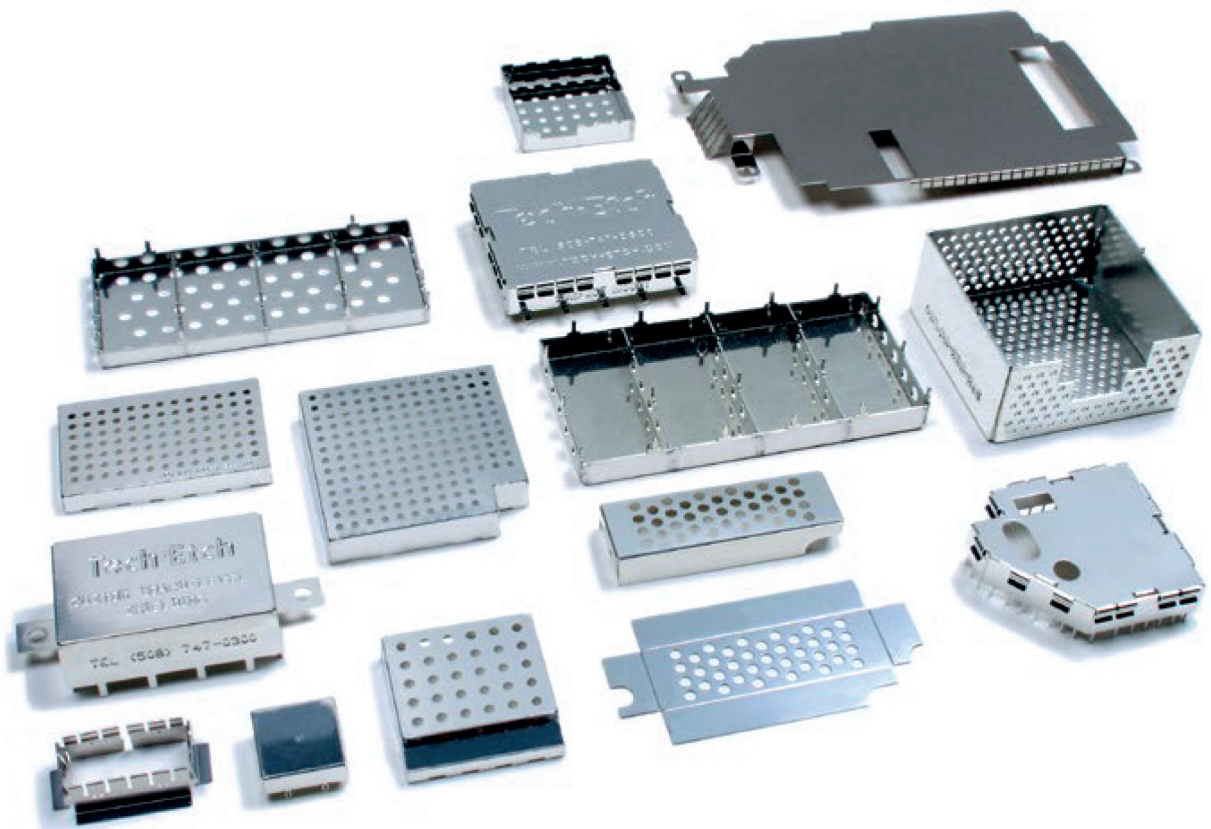
Standard and custom designs are manufactured using a photo chemical etching process making it possible to offer custom single piece and standard two-piece designs with no tooling charges.

***Interactive PDF Sales Drawings are available for download on the website to simplify the design process for 1-piece and 2-piece standard board level shields.***

The photoetching process improves design flexibility, shortens lead times, and eliminates hard tooling costs. Prototypes are available in five days. Fences, covers and mounting pins can be designed in any configuration, as can through holes, slots and internal dividers. Depth-etch bend lines facilitate hand forming, and soldered or resistance welded seams are available.

Board level shielding is typically etched from .007" - .020" tin plated brass, nickel silver, copper or cold rolled steel. Board level shielding can also be manufactured out of beryllium copper, if extra strength is desired. Other materials, thicknesses and finishes are also available.

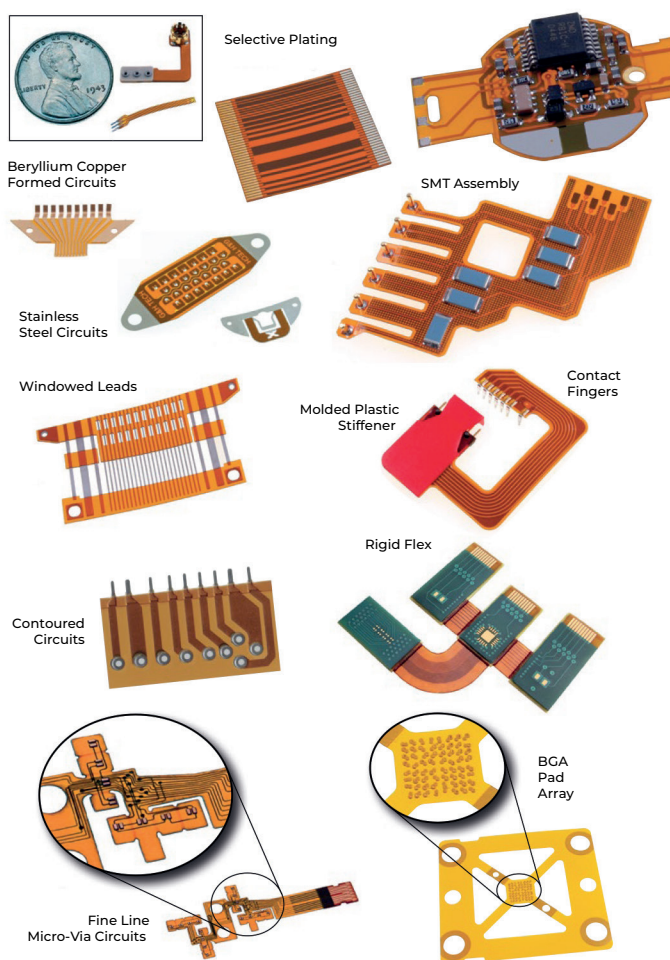
For additional information contact one of our application engineers at 508-747-0300 or visit [www.techetch.com/shield](http://www.techetch.com/shield)





# FLEXIBLE CIRCUIT AND RIGID FLEX MANUFACTURING

**Tech Etch** specializes in manufacturing high reliability flexible circuits using both adhesive based and adhesiveless raw materials. By using an additive process, copper features and spaces as small as .0015" can be produced in production volumes.



## | PLATED THROUGH VIAS |

This capability provides hole sizes down to .001" dia. for microvia and blind via multilayer circuits. Tech Etch offers through, blind and buried vias in multilayer flex circuits.

## | ASSEMBLY |

**Tech Etch** is equipped for both through hole and SMT assembly of components on flex circuits. Package sizes down to 0201 and .4mm pitch can be accommodated using our state-of-the-art SMT equipment. Precision Single Point and Bar bonding assembly capabilities are also offered.

## | CONTACT FINGERS |

**Tech Etch** can provide fingers assembled to the circuit conductors for use as contacts, terminals or pins. Material thickness is generally .010" and can be beryllium copper. Pitch can be as low as .050" and fingers can be formed for 90° assembly applications.

## | CONTOURED CIRCUITS |

**Tech Etch** can provide circuits with integral fingers for solder attachment to PCB's. Starting with copper .010" thick, the trace areas are etched down, or contoured to approximately .003" thick. Portions of the circuit, which benefit from heavier copper, are masked and not etched down. **The benefits are:**

- Integral connector contact pins - cost saving and simplified interconnect schemes in assemblies.
- Raised solder pads above the cover layer - more reliable solder connections.
- Particularly useful for high current carrying applications.

## | POLYIMIDE ETCHING |

By using Tech Etch's proprietary polyimide etch process, single layer circuits can be supplied with single or both side access, windowing, and cantilevered leads. Multilayer circuits can be made with direct access to any layer from either side.

## | LASER PROCESSING |

Tech Etch's laser processing capability supports precision drilling and ablating of polyimide laminates. Laser processing has the ability to control the circuit outline to a very tight tolerance without the cost and long lead time associated with precision hard tooling.

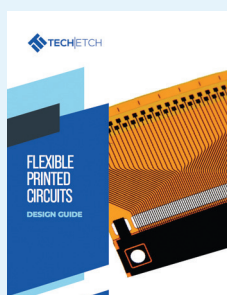
## | STIFFENERS |

Packaging techniques often make it necessary to mount components directly on the circuit. Typically, polyimide or epoxy-glass is laminated in place to provide additional support.

## FLEXIBLE PRINTED CIRCUIT DESIGN GUIDE

*Contains detailed application information on:*

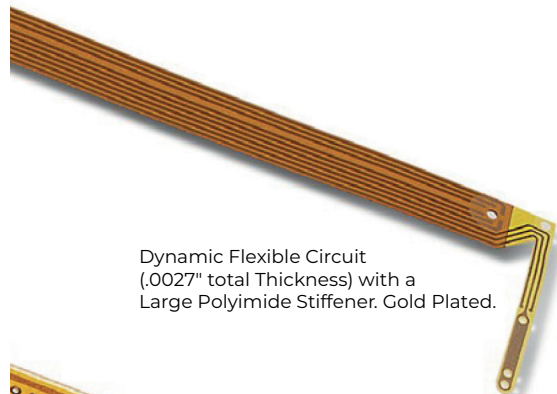
- MULTILAYER CIRCUITS
- RIGID FLEX
- SMT ASSEMBLY
- SHIELDED CIRCUITS
- FINE LINE APPLICATIONS
- MICROVIAS
- CANTILEVERED AND WINDOWED LEADS
- BERYLLIUM COPPER CONDUCTORS



To order the Design Guide call 508-747-0300 or visit our website at [www.techetch.com](http://www.techetch.com).



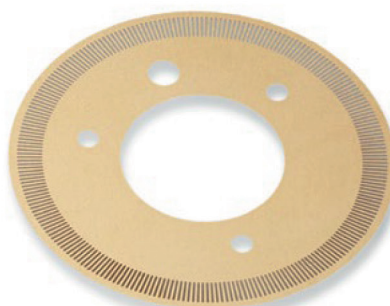
.050" Thick Titanium Fuel Cell Flow Field Plate.  
Chem Milled.



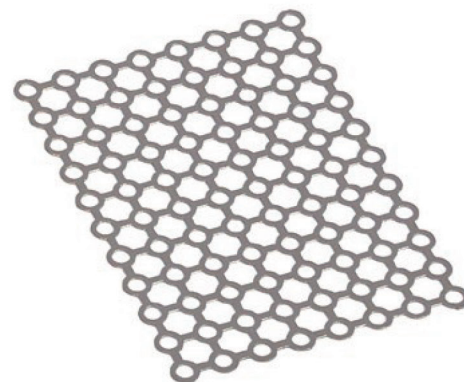
Dynamic Flexible Circuit  
(.0027" total Thickness) with a  
Large Polyimide Stiffener. Gold Plated.



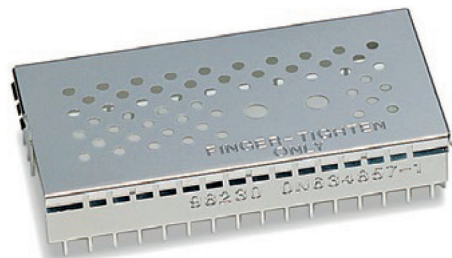
Single Layer Flexible  
Circuit with FR.4 Stiffeners  
and .010" Copper Fingers.



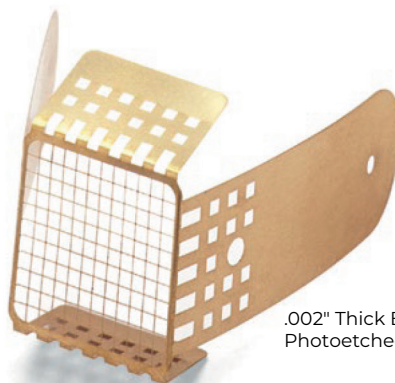
.005" Thick Beryllium Copper  
Alloy 25 Encoder Disc.  
Photoetched Blank.



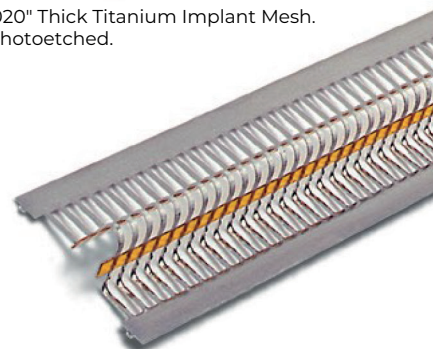
.020" Thick Titanium Implant Mesh.  
Photoetched.



Board Level Shield. Photoetched Blank.  
Cover: .010" Thick FH Brass Die Formed.  
Fence: .015" Thick 1/2H Brass.  
Depth Etched Bend Lines. Hand Formed.  
Solder Corner. Tin Plated.



.002" Thick Beryllium Copper Screen.  
Photoetched Blank. Die Formed. Gold Plated.



.003" Thick Beryllium Copper Interconnection  
with Laminated Polyimide Support Strip.  
Photoetched Blank. Die Formed.  
Tin Lead Plated with Solder Dip.

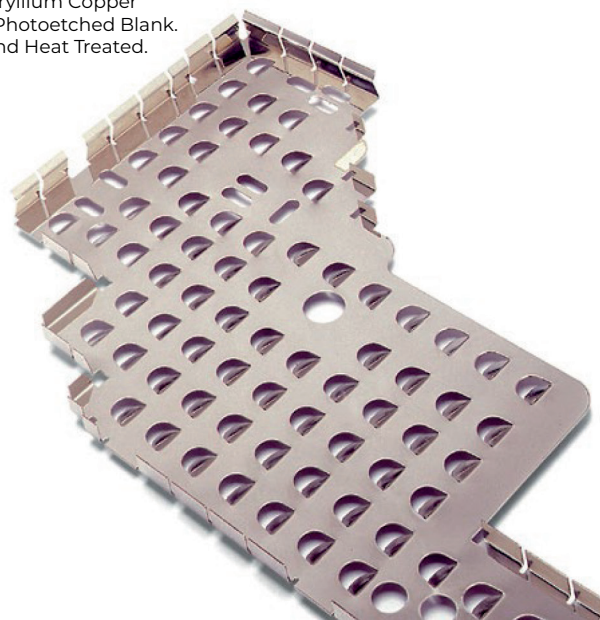


.020" Thick Stainless Steel.  
Indexed Plate. Photoetched Blank.  
Die Formed and Teflon Coated.



.020" Thick Brass. Depth Etched for Weight Reduction.  
Photoetched Blank.

.005" Thick Beryllium Copper  
Cover Shield. Photoetched Blank.  
Die Formed and Heat Treated.  
Silver Plated.



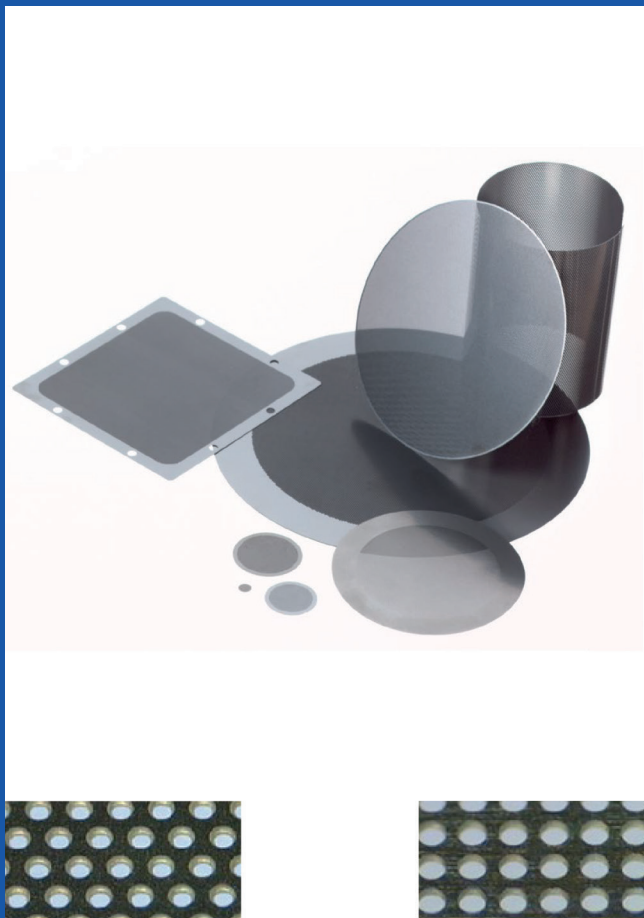


## MICROETCH® SCREENS

**MicroEtch® Screens** are manufactured by **Tech Etch** using photoetching technology. Unlike stamping, photoetching yields a burr-free product resulting in cleaner more efficient screens with greater material integrity. These superior quality screens feature higher tolerance hole sizes and greater dimensional stability than woven wire mesh, which makes them ideal in applications requiring frequent cleaning or in devices where there is mechanical contact. Unlike woven wire mesh screens, the fixed photoetched openings will not change through use.

Photoetching also enables designers to specify a tapered hole, which facilitates liquid filtration and back flow cleaning.

Typical applications of **MicroEtch® Screens** are filters used in the medical market, hydraulic valve screens, fuel filters, laser light filters, extruding screens, as well as particle separation and sizing. These tight tolerance screens are primarily produced from Stainless Steel, but other materials are available. **Tech Etch** offers a standard line of screens with holes in a 60° or 90° pattern that are available with a maximum guaranteed perforated area of 18" x 21". **Other sizes and custom shapes are also available.**



## INNOVATION CENTER

### QUICK PROTOTYPING

**Tech Etch** is leading the way to help facilitate you in quick prototyping by means of our state-of-the-art Innovation Center. The center is equipped with leading edge technology, expert engineering team, and top of the line software.

***Tech Etch is your one stop shop to take your idea and get it to production. For more information visit [www.techetch.com/innovation-center](http://www.techetch.com/innovation-center).***



Manufacturing Facilities - Made in USA

Tech Etch plants located in Plymouth and Fall River, Massachusetts have over 200,000 square feet of manufacturing space providing complete facilities for the production and finishing of EMI/RFI Shielding products.

45 Aldrin Road, Plymouth, MA 02360

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**EMAIL** [photoetch@techetch.com](mailto:photoetch@techetch.com)

**Click the QR code for the website**



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The data presented in this brochure is based on testing and to our knowledge is accurate and true. Since applications, test measures, and test procedures may vary, we recommend that users of our products perform their own tests to assure the suitability of these products for their specific applications.