

Picture This

Producing microholes with photoetching.



A selection of MicroEtch screens, which feature holes from 0.0030" to 0.0180" in diameter.

Most micro-hole-making applications involve mechanical drilling, EDMing and laser machining, but other methods exist. One of them is photoetching, which is a chemical etching process.

Steve Sylvia, business manager, custom products division, Tech-Etch Inc., Plymouth, Mass., explained that the process starts with a sheet of raw material that is coated with a photoresist, or light-sensitive, mask. A Mylar or glass photo tool is then applied to block certain areas from UV light. The areas exposed to light will polymerize, which creates an image or a hole pattern, for example, on the photoresist mask. The photo tool is then removed. "It's like the film in a camera," he said. "When you push the button, the lens opens up, lets light through and exposes an image. That's basically what we do."

Sylvia added that any portion of the photoresist mask that was blocked by the photo tool's black

opaque pattern washes away in the developing solution, exposing the base material. The pattern remaining on the mask is impervious to the chemistry used to etch, or eat, the workpiece material and create the part's burr-free pattern.

The standard patterns can consist of microholes from 0.0030" to 0.0180" in diameter used to produce 0.002"- to 0.015"-thick screens for products such as fuel filters, hydraulic valve screens and filters for the medical industry. A customer can buy a sheet of perforated material, which typically measures 24"×24" with border, and produce the required shapes from it, or Tech-Etch can customize the photo tool to create the exact profile the customer wants, such as a gasket.

Tech-Etch primarily makes its MicroEtch screens using 300 series stainless steel, but other materials, such as titanium and copper, can be used.

In photoetching, the hole diameter is 0.001" larger than the material thickness, so if the material is 0.002" thick,

the diameter is 0.003". That means a 0.003"-dia. hole in 0.005"-thick material would be outside the capability of the process.

Holes can be tapered to facilitate liquid filtration and back-flow cleaning. They can also be straight. To create straight holes, the chemistry etches the material evenly from both sides of the workpiece while slightly opening the sides of the holes. Therefore, the hole diameter is based on the measurement at the middle of the material's thickness. "For a 0.010" hole, if you measured the top or bottom surface, it might be 0.012" or a little larger, instead of 0.010"," Sylvia said. For tapered holes, the smaller end is the measured feature.

The webbing, or spacing between the holes, is typically equal to the material thickness. "You can get up to three million holes in a perforated pattern," Sylvia noted. △

For more information, contact Tech-Etch Inc. at (508) 747-0300 or www.tech-etch.com.