

Ultrasonic welding  
**Eastman Tritan™ copolyester**  
for thin-walled parts

## Ultrasonic welding Eastman Tritan™ copolyester for thin-walled parts

Like all ultrasonic welding applications, those involving Eastman Tritan™ copolyester may require some optimization. In general, small, thick-walled Tritan parts can be welded by following general practices developed by ultrasonic welder vendors for most amorphous thermoplastics. However, larger diameter, thin-walled Tritan parts may require additional consideration of part design and welding operation. The following suggestions can be viewed as starting points for developing a robust ultrasonic welding process.

### Key requirements

#### Ultrasonic welder

##### Suggested power requirements

- 2000–4000-watt generator (Power output may vary depending on part size and wall thickness.)
- 15- or 20-kHz converter (Small medical parts may be welded on 30 or 40 kHz.)
- Thin-walled applications using Tritan may require a minimum of 72 microns for 20 kHz or 96 microns for 15 kHz of amplitude to weld (converter × booster × horn).

##### Welder must be capable of fine tuning adjustments such as:

- Amplitude profiling
- Time or energy mode capability
- Feedback recording is critical for optimizing weld strength.

### Joint/part design

- A tongue and groove or step joint with a 60° energy director (measured at apex) is preferred (wall thickness dependent).
- Texturing the mating surface may improve weld strength.
- It is preferred to place the energy director on the horn side for optimization; however, placement on the opposing side should provide a robust weld as well.
- Near-field welding is critical. The distance between the ultrasonic horn and the weld joint should be 0.25 in. or less. If the distance is greater than 0.25 in., design changes will become necessary to accommodate near-field welding requirements.
- Additional weld joint designs, including unique energy directors, may be necessary for a given application and may not be listed within this document.

Figure 1. Joint design

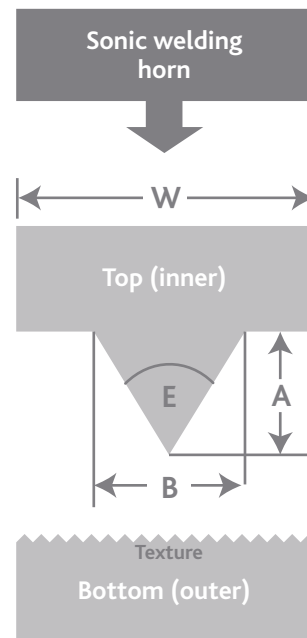


Table 1. Joint design

	Dimension	General guidelines
W	Wall thickness	Preferred greater than 0.080 in.
B	Energy director base width	W/4 to W/5
A	Energy director height	B/2 or minimum of 0.018 in.
E	Energy director angle	Preferred 60°

## Textured surface (opposite energy director)

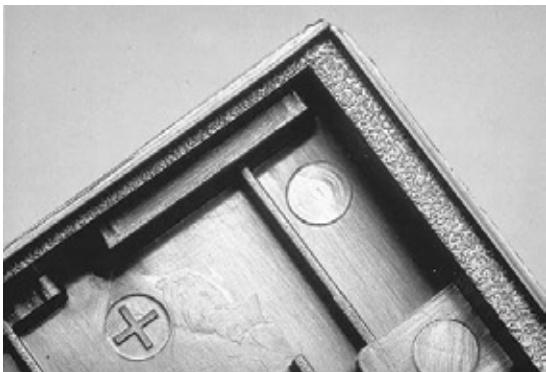
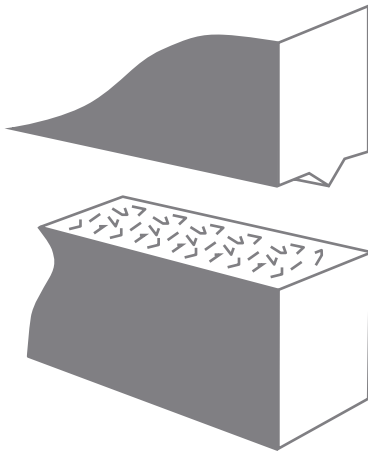
This guideline should be used for implementing a textured surface opposite the energy director.

The textured patterns consist of many small surface projections—3, 4, 5, or 6 mils—molded in the joint surface.

*Texturing the surface can provide the following benefits:*

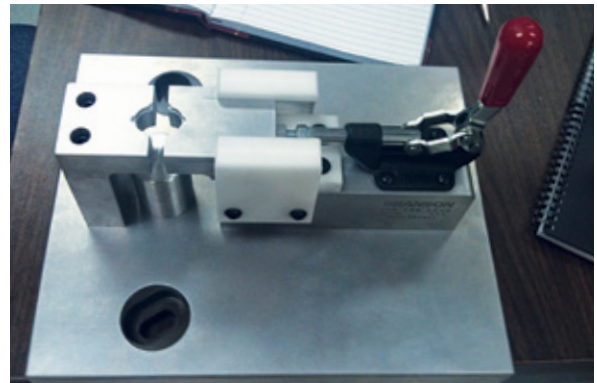
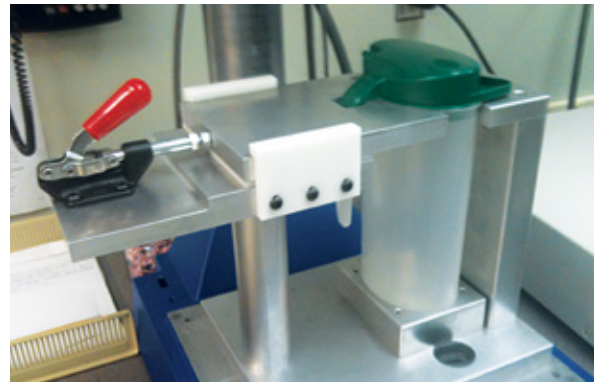
- Increases weld strength up to three times
- Reduces flash and particulate matter
- Reduces the total energy required

**Figure 2.** Textured surface joint



Close-up of a typical textured surface joint

**Figure 3.** Examples of stabilization devices for firmly securing parts during the welding process



## Stabilization

- Parts must be stabilized/locked in the sonic welding equipment to ensure proper alignment and to prevent the part from vibrating.
- A vibrating part leads to both poor energy transfer and the potential for the part to move out of alignment.
- Stabilization should be accomplished with a split-fixture clamping system (modified toggle clamp) which:
  - Holds and prevents movement of the outer section of the part
  - Accommodates faster cycle time and prevents part marring
- Fixture devices can be fabricated using any rigid material, such as aluminum.

Ultrasonic welding, though common, is a complex process which requires engagement between the design engineer and welding equipment supplier to achieve successful welds. Tritan is similar to other materials, as the unique properties of the material require application-specific support in optimizing the welding process. Seldom, if ever, will applications be found which merely require tweaks to equipment parameters when changing materials. Common development processes may require part and joint design modifications, changes to fixtures, and alterations to the welding process. As noted, these activities are not unique to Tritan; ***all material changes may require some combination or all of these components.***

## Eastman polymer welding contact

Brett Jones  
137 Regional Park Drive  
Kingsport, TN 37660  
Phone: 423-229-6415



**Eastman Corporate Headquarters**  
P.O. Box 431  
Kingsport, TN 37662-5280 U.S.A.

U.S.A. and Canada, 800-EASTMAN (800-327-8626)  
Other Locations, +(1) 423-229-2000

[www.eastman.com/locations](http://www.eastman.com/locations)

Although the information and recommendations set forth herein are presented in good faith, Eastman Chemical Company ("Eastman") and its subsidiaries make no representations or warranties as to the completeness or accuracy thereof. You must make your own determination of its suitability and completeness for your own use, for the protection of the environment, and for the health and safety of your employees and purchasers of your products. Nothing contained herein is to be construed as a recommendation to use any product, process, equipment, or formulation in conflict with any patent, and we make no representations or warranties, express or implied, that the use thereof will not infringe any patent. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS AND NOTHING HEREIN WAIVES ANY OF THE SELLER'S CONDITIONS OF SALE.

Safety Data Sheets providing safety precautions that should be observed when handling and storing our products are available online or by request. You should obtain and review available material safety information before handling our products. If any materials mentioned are not our products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

© 2017 Eastman. Eastman brands referenced herein are trademarks of Eastman or one of its subsidiaries or are being used under license. The ® symbol denotes registered trademark status in the U.S.; marks may also be registered internationally. Non-Eastman brands referenced herein are trademarks of their respective owners.