

# Ultrasonic Spot Welding

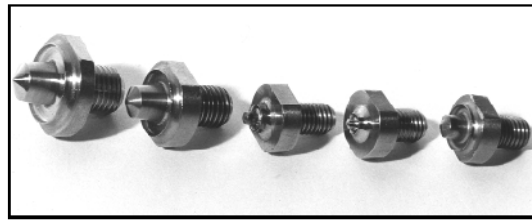
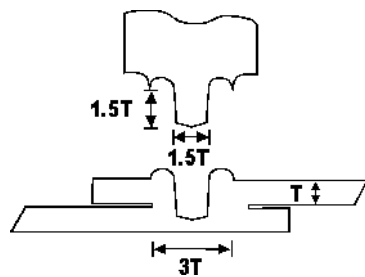
## General Description

Ultrasonic spot welding is an assembly technique for joining two similar thermoplastic components at localized points with no preformed hole or energy director. Spot welding produces a strong, structural weld and lends itself to large parts, sheets of extruded or cast thermoplastic, corrugated thermoplastic board, and parts with complicated geometry and hard-to reach joining surfaces. Most thermoplastics can be spot welded.

## Mechanics of Ultrasonic Spot Welding

Vibrating ultrasonically, the pilot of the spot welding tip passes through the top component. The molten plastic displaced is shaped by a radial cavity in the tip and forms a neat, raised ring on the surface. Simultaneously, energy is released at the interface producing frictional heat. As penetration of the bottom section is made with the tip, displaced molten plastic flows between the two surfaces into the surrounding interface area and forms a permanent molecular bond.

The standard tip produces a head having a diameter three times the thickness of the top layer. (See Figure 1.) The length of the protruding tip is



times the thickness of the one and one-half times the

Figure 2. Standard Spot Welding Tips

## Spot Welding Variations

Inverse spot welding, where the fixture is fitted with spot welding tips and a flat-faced bar horn contacts the outside of the part, may be used when part configuration precludes normal spot welding or when a blind spot is required. This method forms the spot welds on the inside surface.

Applications requiring a smooth top layer surface may be a candidate for a custom step tip design. While standard spot welding tips form the excess molten material above the surface, the step design forces excess material beneath the surface. (Figure 3.) (Note: this tip is custom and available on request.)

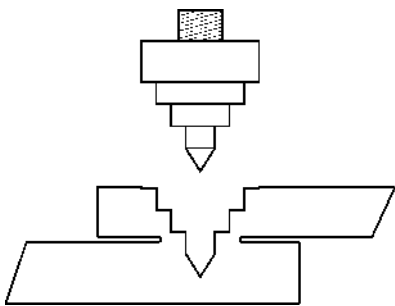


Figure 3. Custom Step Tip Design

Figure 1. Standard Spot Welding Tip Design

## Advantages of Spot Welding

Ultrasonic spot welding offers several advantages over other methods in joining large parts, sheets, or extruded or cast thermoplastics, including:

- Fast cycle time – typically less than one second.
- Molded joint design is unnecessary.
- Elimination of consumable items such as screws, staples, rivets, or glues.
- Generally no specific fixturing required.
- Excellent high-strength bonds.
- One side has a cosmetic surface, while the other has a neat, raised ring.
- Can be done using a hand-held welder