BRANSON

Data Sheet SW-1

Joint Design and Material Compatibility for Spin Welding

General Description

Spin welding is a technique for welding thermoplastic parts that utilizes a circular spinning motion, in conjunction with applied pressure, to weld two parts together. The part-to-part interface must be circular. One part is held stationary in a holding fixture as another part is rotated against it using applied pressure. Heat generated by the friction between the two parts causes the plastic interfaces to melt and fuse together producing a strong hermetic seal.

This bulletin should be used as a guideline to aid the designer during the initial concept stage of designing a product for spin welding. Any dimensions given in the designs should be used as *guidelines only,* since the specifics of your application may require a variation to the basic design.

If you have questions or need assistance in designing your parts, contact your local Branson representative, your regional technical center, Branson in Honeoye Falls, NY, or the applications lab at Branson headquarters in Danbury, CT.

Key Design Considerations

There are several factors necessary for successful spin welding, including a determination of the speed for part rotation, and appropriate pressure of the driver as the parts are spun together. Also, a good spin welding joint should have a weld area greater than a typical wall section of the part and must also provide sufficient part-to-part alignment.

It is necessary that parts to be spin welded have a circular axis (such as a sphere, cylinder, disc, or ring) and a drive feature to enable spinning of the upper section (see Figures 1 and 2).

Primary Factors Influencing Joint Design

All of the following questions should be answered prior to the design stage to gain a total understanding of the weld joint requirements:

- What type of material(s) is to be welded?
- What is the overall part size and configuration?
- What are the final requirements of the part?
  - Is a structural bond desired and, if so, what load forces does it need to resist?
  - Is a hermetic seal required? If so, to what pressure?
  - Does the assembly require a visually attractive appearance?
  - Is flash or particulate objectionable inside and/or outside?
  - Any other requirements?

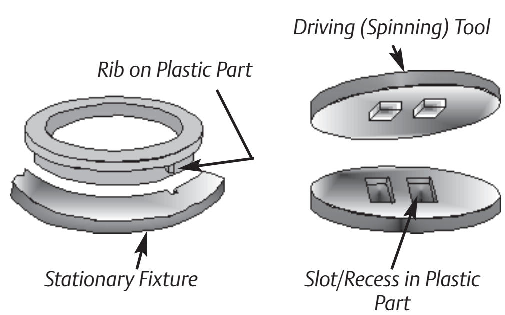

Figure 1. Drive Details

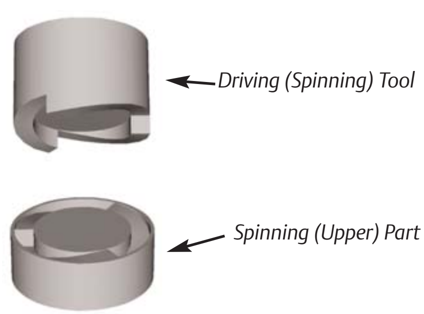

Figure 2. Self-Aligning Drive Details for Automation

Branson Worldwide Headquarters

41 Eagle Road
Danbury, CT
06813-1961
(203) 796-0349
Fax (203) 796-9838
Email: info@bransonultrasonics.com

EMERSON
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Typical Spin Welding Joint Designs

Note: Dimensions given in the designs should be used as *guidelines only*, since the specifics of your application may require a variation to the basic design.

T = Wall thickness
B = 1.5 x T
C = Clearance ~0.005”
R = Radius ~ 0.050”
L = Lead-in 0.020 to 0.040”
i = Interference 0.010 to 0.020”

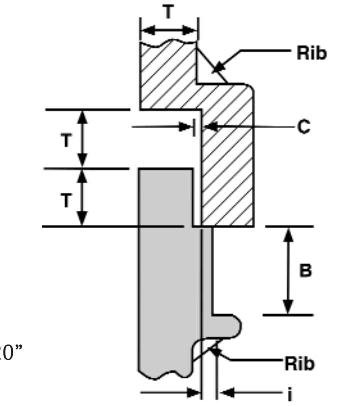

Figure 3. Shear Joint Design

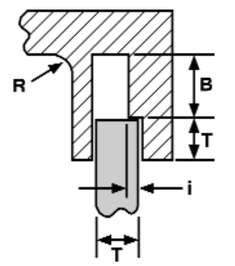

Figure 4. Flanged Shear Joint Design

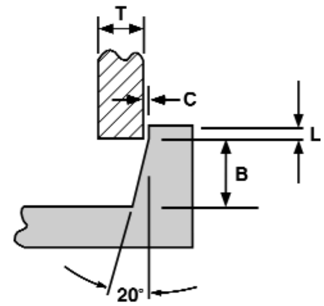

Figure 5. Shear Joint Design for Nylon

T = Wall thickness
F = 30° min.
A = Depth of weld ~ 0.5 x T to 0.8 x T
C + D = Weld surface, ~2.5 x T
E = A + 0.010”

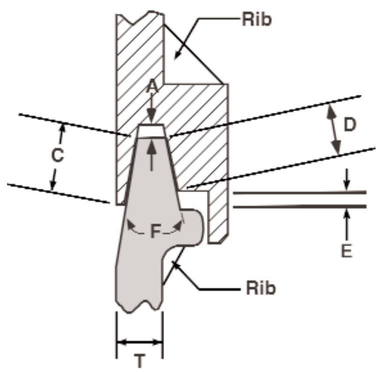

Figure 6. Tongue and Groove Joint with External Skirt

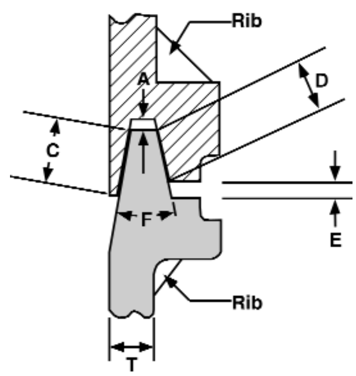

Figure 7. Tongue and Groove Joint

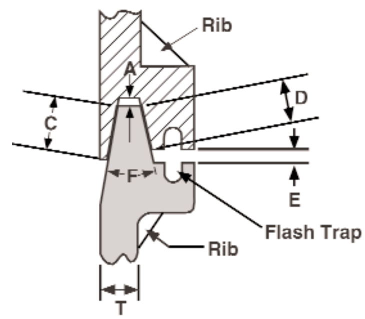

Figure 8. Tongue and Groove Joint with External Flash Trap

Table 1. Material Weldability

The codes in this table indicate **relative ease of welding** for the more common thermoplastics. **Note: The ratings below do not relate to the strength of the weld obtainable. Use these tables as a *guide* only, since variations in resins, fillers, and part geometry may produce slightly different results.**

Code: 1 = Easiest, 5 = Most difficult.

Material	Weldability
Amorphous Polymers	
ABS	1-2
ABS/polycarbonate alloy	2
Acrylic	2
Acrylic multipolymer	2
Butadiene-styrene	1-2
Phenylene-oxide based resins	2
Polyamide-imide	2-3
Polyarylate	2
Polycarbonate	1-2
Polyetherimide	2
Polyethersulfone	1-2
Polystyrene (general purpose)	1-2
Polystyrene (rubber modified)	2
Polysulfone	2
PVC (rigid)	1-2
SAN-NAS-ASA	1-2
PBT/polycarbonate alloy	2

Material	Weldability
Semi-Crystalline Polymers	
Acetal	2-3
Cellulosics	2
Fluoropolymers	3-4
Liquid crystal polymers	2-3
Nylon	1-2
Polyester, thermoplastic	
Polyethylene terephthalate/PET	2-3
Polybutylene terephthalate/PBT	2
Polyetheretherketone - PEEK	3
Polyethylene	3
Polyphenylene sulfide	2
Polypropylene	2

Branson
41 Eagle Road
Danbury, CT
06813-1961

475 Quaker Meeting House Road
Honeoye Falls, NY
14472
(585) 624-8000
Fax (585) 624-1262

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