

Figure 1.
Drive Details

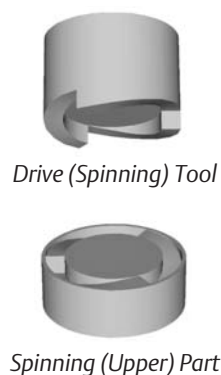


Figure 2.
Self-Aligning
Drive Details for
Automation

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?

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 = $1.5 \times T$

C = Clearance 0.005 - 0.010"

R = Radius ~ 0.050 "

L = Lead-in 0.020 to 0.040" at a minimum

i = Interference 0.010 to 0.020"

depending on part size, requirements and tolerances

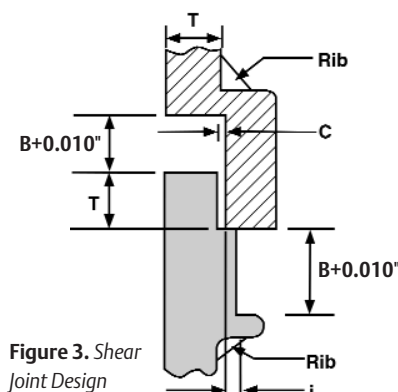


Figure 3. Shear Joint Design

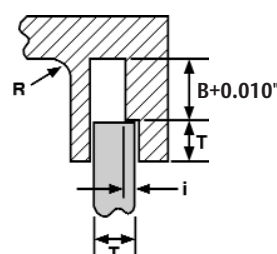


Figure 4. Flanged Shear Joint Design

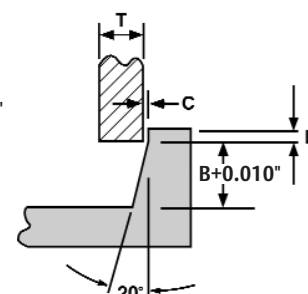


Figure 5. Shear Joint Design for Nylon

T = Wall Thickness

F = 30° min

A = Depth of weld
 $\sim 0.5 \times T$ to $0.8 \times T$

C + D = Weld surface,
 $\sim 2.5 \times T$

E = $A + 0.010$ "

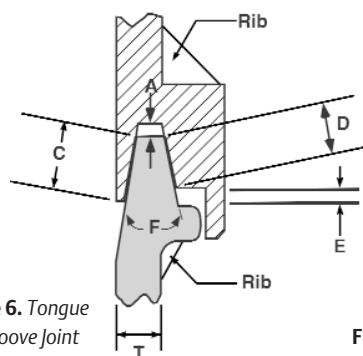


Figure 6. Tongue and Groove Joint with External Skirt

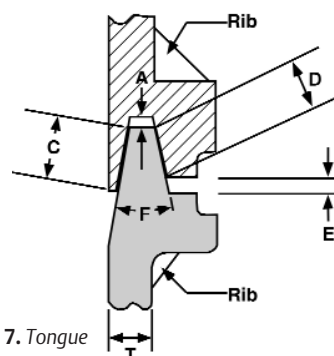


Figure 7. Tongue and Groove Joint

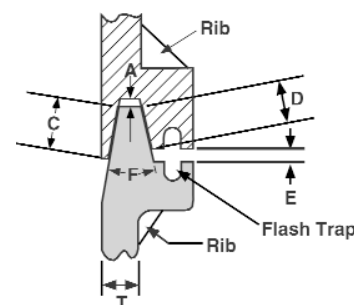


Figure 8. Tongue and Groove Joint with External Flash Trap

Table 1. Material Weldability

The codes in this table indicate relative ease of welding for the more common thermoplastics.

Note: The ratings 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.

MATERIAL

Amorphous Polymers

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

WELDABILITY

1-2
2
2
2
2
1-2
2
2-3
2
1-2
2
1-2
2
2
1-2
1-2
2

MATERIAL

Semi-Crystalline Polymers

Acetal
Cellulosics
Fluoropolymers
Liquid crystal polymers
Nylon
Polyester, thermoplastic
Polyethylene terephthalate/PET
Polybutylene terephthalate/PBT
Polyetheretherketone - PEEK
Polyethylene
Polyphenylene sulfide
Polypropylene

WELDABILITY

2-3
2
3-4
2-3
1-2
2-3
2
3
3
2
2

Code: 1 = Easiest, 5 = Most difficult.

BRANSON

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