BRANSON

Technical Information PW-7

Ultrasonic Welding Characteristics of Textiles and Films

General Description

The ability to ultrasonically weld textiles and films depends on their thermoplastic content and the desired end result. This data sheet defines the weldability, in general terms, of the more common textiles and films. (The term 'welding' refers to all types of bonding and sealing, as in point bonding of fabric or continuous sealing of film.)

The table on the reverse side indicates relative weldability characteristics for the more common textiles and films.

Material Construction and Factors Influencing Weldability

The major categories of material construction of thermoplastic textiles and films are: wovens, nonwovens, knits, films, coated materials, and laminates.

Following are definitions of each of the constructions as well as factors of each type that influence their relative weldability.

WOVENS—Textiles formed by the regular interweaving of filaments or yarns.

- Factors Influencing Weldability: Yarn density, thermoplastic content, tightness of weave, uniformity of material thickness. Weld strength may vary according to the orientation of yarns or filaments.

NONWOVENS—Textiles formed by bonding and/or interlocking fibers, yarns, or filaments by mechanical, thermal, or chemical means.

- Factors Influencing Weldability: Uniformity of material thickness and thermoplastic content. Random orientation of fibers gives nonwovens excellent strength.

KNITS—Textiles formed by interconnecting continuous loops of filaments or yarns.

- Factors Influencing Weldability: Style of knit, thermoplastic content, and elasticity of construction.

FILMS—Thermoplastic material that has been cast, extruded or blown into a film, generally under 0.010" (0.254 mm) thick.

- Factors Influencing Weldability: Film thickness (at least 0.0005" [0.013 mm] thick), density, and thermoplastic type.

COATED MATERIALS—Textiles and films covered with a layer of thermoplastic, such as polyethylene or urethane. Base material need not be thermoplastic (i.e., coated cardboard or paper).

- Factors Influencing Weldability: Coating material, thickness, and substrate characteristics.

LAMINATES—Textiles and films consisting of two or more layers in a sandwich form.

- Factors Influencing Weldability: Thermoplastic type and content.

Welding Characteristics

Unlike welding of rigid plastic parts, the ultrasonic welding of textiles and films relies on a pattern or design on the tooling (i.e., the face of the horn, the anvil, drum, or stitching wheel) to focus the ultrasonic energy and produce a melt. (Refer to Branson data sheet PW-45 for patterns.) In general, favorable material characteristics that will help to ensure successful ultrasonic welding or bonding are:

- 65% thermoplastic content (minimum)
- Uniform thickness

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Relative Ease of Welding

The codes in the table below indicate relative ease of welding for the more common thermoplastic materials. The ratings *do not relate to the strength of the weld obtainable.* Use this table as a *guide only*, since variations in the materials and their form may produce slightly different results.

Note: These ratings may differ from characteristics of rigid plastic welding. This is because textile and film welding are considered very near-field welding (near-field welding refers to a joint or interface 0.25 inch [6.35 mm] or less from the horn contact surface), and are usually point-to-point contact (i.e., continuous sealing).

Note, also, that certain materials (e.g., foam) may weld better in the plunge mode (as on a bench-top welder), than in the continuous mode. This is because there is no hold time (cool down under pressure) in continuous bonding, and some material structures may require a slower buildup of heat and pressure to prevent material destruction.

Material	*Woven*	*Nonwoven*	*Knitted*	*Coated Materials*	*Laminates*	*Films*
Acrylic	4	—	4	—	—	(c)
EVA	—	—	—	2	—	1 (e)
Nylon	2	2	2	2	2	2
Polyester	2	1	2	1	1	1
Polyethylene	—	1	–	1	1	4-5 (a)
Polypropylene	1	1	2	1	1	1
PVC	3-5	—	—	3-5	3-5	3-5 (b)
Saran	—	—	—	1	—	1 (e)
Surlyn	—	—	—	1	—	—
Urethane	—	—	—	1	—	1 (d)
Natural Fibers with Fusibles	2	2	2	2	2	—

Code: 1 = Easiest; 5 = Most Difficult

Note: Categories left blank (—) indicate that the materials are not generally seen in this form.

a Thin polyethylene film (less than 0.003" [0.076 mm]) is generally considered poor for ultrasonic welding, because it has a low coefficient of friction and tends to break down or degrade during welding.

b PVC sheet or fiber is difficult to predict due to the broad range of additives used in its manufacture. Plasticizers are often added to PVC to increase flexibility. As the content of plasticizer increases, the ability to ultrasonically bond PVC can be inhibited.

c Acrylics can be ultrasonically tacked or cut. Continuous bonding is generally unsatisfactory due to embrittlement and low strength.

d *Thermoplastic* urethane (ester base) coated materials exhibit excellent strength when bonded ultra-sonically. Thermosetting urethanes (ether base) will degrade when subjected to ultrasonic energy.

e Cut and seal only.

Typical Applications

Following are some typical applications using ultrasonics:

Acrylic: Filters, awnings, blankets, knitting yarns, garments

Nylon: Carpet, sports gear, food bags, filters, garments, hook and loop material, seat belts.

Polyester: Conveyor belts, filters, garments, laminates, mattress pads, packaging, quilts.

Polyethylene: Laminates, packaging film, resealable bags.

Polypropylene: Bags, carpet backing, outdoor furniture, snack food packaging, tents, upholstery, disposable garments.

PVC: Films, outdoor furniture, shrink packaging, tarpaulins.

Urethane: Rainwear, coated materials.

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