Scotch-Weld™

583 Activatable Bonding Film

Product Data Sheet

Updated : October 2002
Supersedes : January 1988

Product Description

Scotch-Weld 583 bonding film is a flexible, 100% solids, heat or solvent activated dry film adhesive composed of synthetic elastomer, thermoplastic and thermosetting resins. The film softens and flows when either heat or solvents are applied and provides a strong, permanent bond to the surface to which it is applied.

583 is specially formulated for the nameplate industry where its special formula provides easy processibility and application.

583 is capable of developing structural type bonds if properly thermoset during heat activation. The thermoset bond provides ultimate heat, and chemical resistance for critical applications.

Physical Properties

Not for specification purposes

Adhesive Type	Synthetic Elastomer	**3M ref :**
Liner	Release Treated Paper	
Thickness (ASTM D-3652) Film Liner Total	 0.05 mm 0.09 mm 0.14 mm	
Adhesive Colour	Dark Brown	
Liner Colour	White	
Shelf Life	12 months from date of despatch by 3M when stored in the original carton at 21°C (70°F) & 50% Relative Humidity	

Technical Information

Scotch-Weld 583 bonding film is most commonly used to attach nameplates, escutcheon and decorative trim.

The automotive, appliance, electronic and aircraft industries have specified 583 bonding film for many years.

Converter Lamination

First, and most important, 583 should be laminated to a clean dry surface.

583 must be heat laminated to the nameplate metal. Solvent activation by the converter can cause serious problems such as:

1. High to impossible liner release.
2. Trapped solvent and associated hazards.
3. Adhesive distortion and oozing during die cutting.

The most common heat laminating technique *is hot roll lamination* (Figure 1) however, other techniques such as hand irons can be used.

583 should be heat laminated with the adhesive interfacial temperature at approximately 120°C. This may require the laminating roll be at a higher temperature than 120°C for sufficient heat transfer at the normal 2.7m/min laminating speed.

TWO CAUTIONS (Figure 2)

1. If the laminating temperature is too low, 93°C, the adhesive will not develop a suitable bond to the metal and may pull off with the liner when removed.
2. If the temperature is too high, 177°C the adhesive will begin to thermoset resulting in a non-activatable adhesive for the consumer. The liner release is also substantially reduced and may not remove at all.

Figure 1

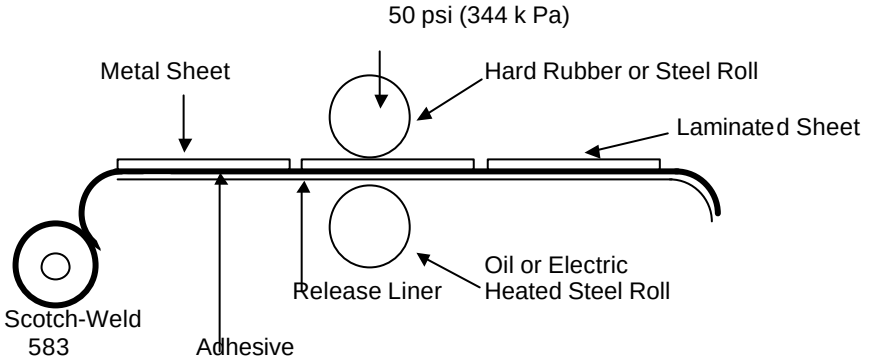
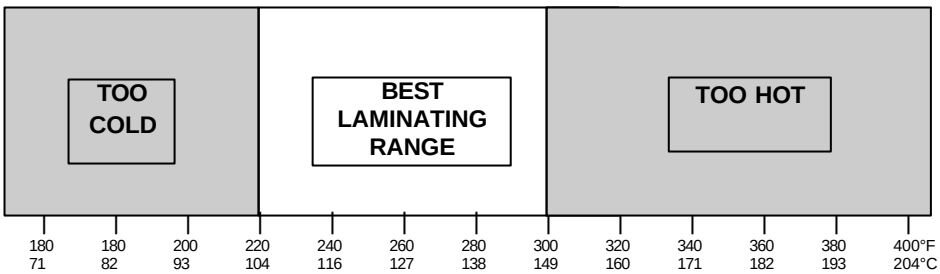


Figure 2



Converter Lamination

It is important that heat activating of 583 is done in a range of 104° - 138°C.

TEST: A simple test for proper laminating temperature is to quickly snap the liner off the laminated metal; If it *lifts* or distorts the adhesive, *more heat* is required. Secondly, a drop or two of activating solvent MEK on the adhesive will spot premature thermosetting.

If the adhesive softens, becoming stringy and sticky the laminating temperature is satisfactory. If it *only swells*, the adhesive has begin to thermoset and the laminating temperature should be lowered.

Laminating pressure should be sufficient to develop suitable adhesive contact with the metal. Typical laminating pressure is 50-70 psi (344-482-k Pa) at 121°C roll temperature. The pressure can be increased as the temperature is lowered and reduced as the temperature is increased. If temperature and pressure are too high, adhesive oozing can take place.

Consumer Application of 583 Backed Nameplate

Scotch-Weld 583 backed nameplates and decorative trim parts can be either solvent or heat activated depending on the application surface and equipment availability.

Scotch-Weld 583 bonds to most substrates as described right:

* MEK Activated
** 300°F - 50psi - 10sec dwell (149°C - 344k Pa)

	Solvent * Activation		**Heat ** Activation**
Aluminium	Excellent		Excellent
Stainless Steel	Excellent		Excellent
Epoxy	Excellent		Excellent
Phenolic	Excellent		Excellent
Polycarbonate	Very Good	}	Heat
Acrylic	Very Good	}	Sensitive
ABS	Very Good	}	Plastic
UPVC	Very Good	}	Not
Polystyrene	Good	}	Recommended
Polypropylene	Fair	}	for Heat
Polyethylene	Fair	}	Activation

Heat Activation

There are advantages and disadvantages with heat and solvent activation. But under normal conditions heat activation is generally regarded as the best method.

ADVANTAGES	**DISADVANTAGES**
Immediate Bond	Higher Equipment Cost
Higher Bond Strength	
Thermosettable	Limited to non-heat
Higher Solvent Resistance*	Sensitive surfaces.
Higher Heat Resistance*	
Faster Activation (Refer Fig 3)	
Lower Processing Cost	

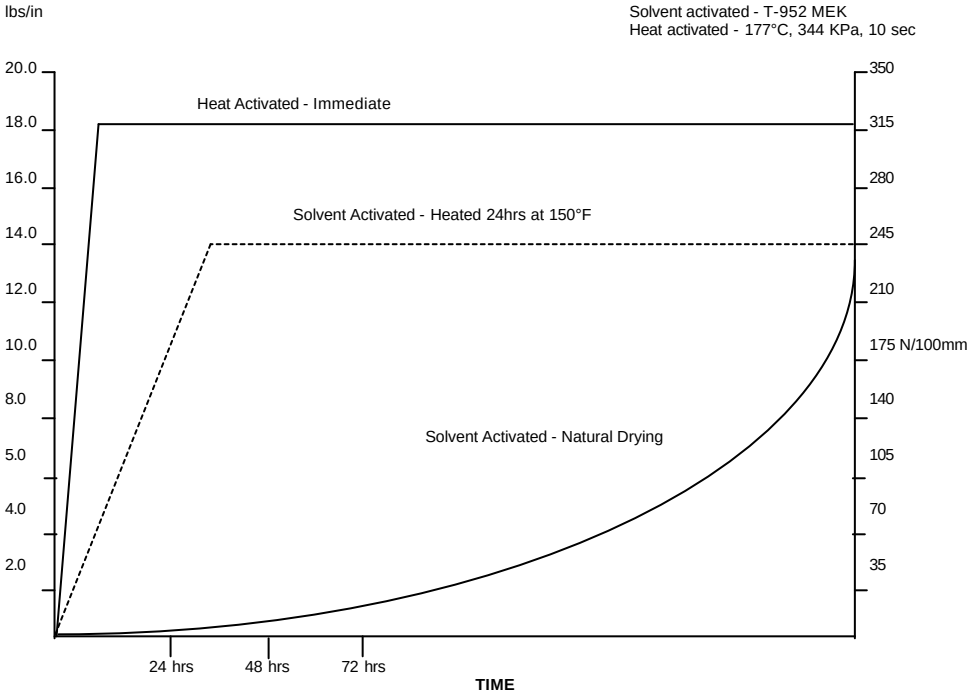
* If Thermoset

Solvent Activation

ADVANTAGES	**DISADVANTAGES**
Lower Equipment Cost	Solvent Ventilated Area
Bond to most surfaces	Depending on solvent -
Good overall bond strength	Potential fire & Toxicity
Versatile Applications	hazards.
Good bonds to texturised surfaces.	Slow bond build-up (Refer Fig 3)

Figure 3

BOND STRENGTH BUILD-UP SCOTCH-WELD 583

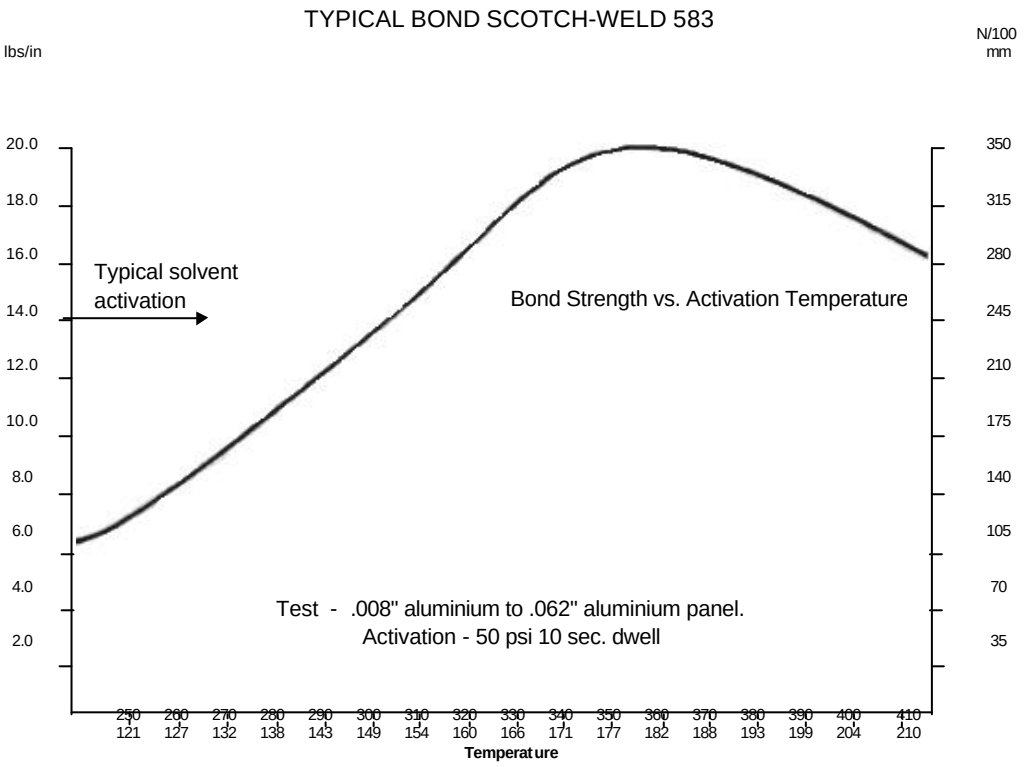


In addition to the high immediate bond achieved by heat activating, high ultimate bond strength can be reached by the proper selection of TIME-TEMPERATURE-PRESSURE for the specific equipment and surfaces involved. Figure 4 illustrates the relationship of temp vs. Bond with time and pressure constant at 10 sec. and 50 psi (344 kPa).

The ultimate bond is reached at 177°C This graph should be used as a guide only. The time - temperature-pressure conditions are dependent on many variables e.g. - equipment, heat transfer rates and surface.

It is extremely important that tests be performed on the specific equipment and materials to determine the ultimate bond and suitability of performance for the specific application.

Figure 4



Thermosetting

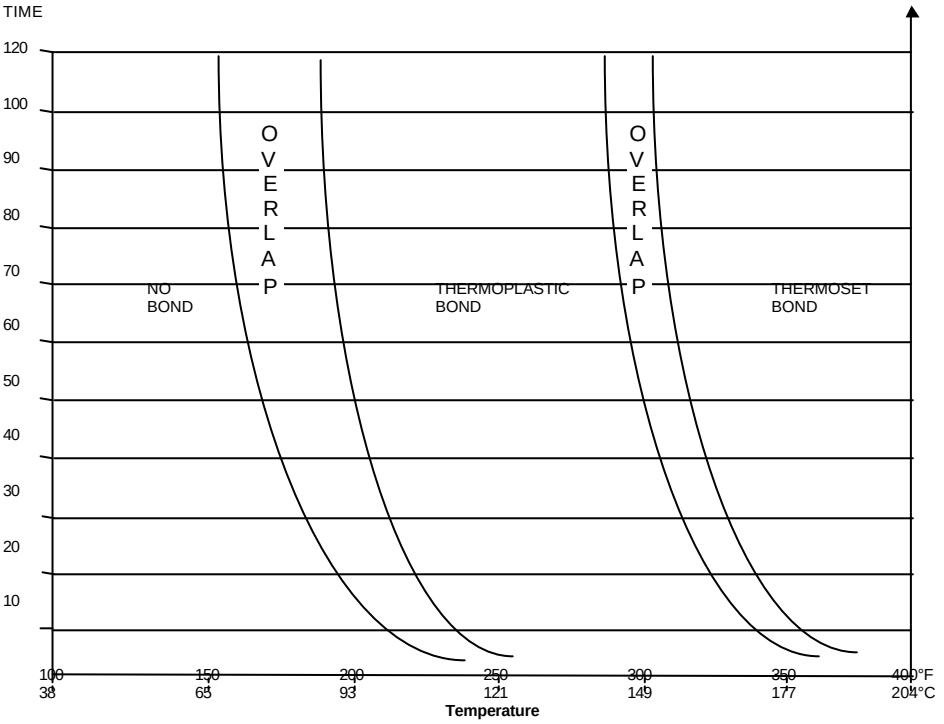
Scotch-Weld 583 is one of the few, if not the only heat activating adhesive that is thermosettable. 583 goes through a thermoplastic phase prior to thermosetting. The adhesive softens to a heavy liquid which flows to develop intimate surface contact and high adhesion. This occurs at 280°-340°F (138°-171°C). If the activating temperature is not increased it will remain a thermoplastic bond.

When thermosetting the activating temperature should be in the 350° - 380°F (177°-193°C) range. The adhesive goes through the thermoplastic phase and then chemically converts or reacts to form a solvent and heat resistant thermoset bond.

Figure 5 (below) illustrates the TIME - TEMPERATURE relationship to develop a thermoplastic or thermoset bond with 583.

Figure 5

BOND TYPE SCOTCH-WELD 583



Solvent activation offers versatility. Even though solvent activated bonds require considerable drying time, the versatility to a variety of surfaces is of primary significance. 583 bonds well to many plastics. The bonds strength approaches 15 lbs/in.

Solvent activation can be accomplished with several solvents but the most effective is MEK.

Activating Solvents & Relative Rate.

Acetone - 1-2 sec (Normally too fast)

MEK - 3-5 sec.

Toluene - 7-9 sec.

When solvent activating it is important that the solvent be allowed sufficient activating time to solvate the adhesive and bring it to a tacky, pressure sensitive state. Adhesive legs should appear during testing with a finger. At this point, the adhesive has enough integrity to hold a nameplate in position while it dries. If wet, the name plate will slip, if too dry, a bond may not develop.

SAFETY NOTE:
When using solvents, it is essential that proper precautionary measures for handling such materials be observed. These include, but are not restricted to:

Work only in well ventilated areas.

Keep away from heat, sparks and open flame.

No smoking in the work area.

Avoid breathing vapours.

Avoid eye and prolonged skin contact .

Keep solvent containers closed when not in use.

Industrial Activation

For structural bonds, not typically required in the nameplate industry, 583 can be heat laminated at a variety of temperatures with higher pressure and dwell time.

The table below illustrates the shear tensile strength attainable.

TEMP		PRESSURE		TIME	SHEAR TENSILE	
°F	(°C)	Psi	kPa	min	psi average	(k Pa)
200	93	150	1.034	30	600	4.1
250	121	150	1.034	30	950	6.5
300	149	150	1.034	30	2000	13.6
325	163	100	0.669	30	1500	10.3
325	163	150	1.034	30	1900	13.0
325	163	200	1.378	10	1000	6.8
325	163	200	1.378	20	1400	9.6
325	163	200	1.378	30	1900	13.0

The above specific conditions result in a maximum strength bond for that temperature. Since approximately 90% of the maximum strength is obtained within the first 75% of the recommended time, the bonding cycle can be shortened 25% without a great loss in bond strength.

Also, please keep in mind that in many applications maximum strength may not be necessary and therefore, shorter time can be used. The following general statements can be made concerning the bonding requirements.
For high strength bonds, the pressure must exceed the vapour pressure of water at the bonding temperature. A 50% pressure safety factor is recommended.

Excessively high pressure is not detrimental unless the adhesive is being squeezed out from between the parts to be bonded.

The higher the temperature and pressure the shorter the time required to reach maximum strength.

Applications

Paper Splicing.

Carpeting identification labels.

Mounting Printing Plates.

Honeycomb Construction.

Bonding Electrotypes to Aluminium base.

Holding wood tape to plywood edge.

Nameplates.

Specifications	MIL P-19834B Amend 1 Type II	583 is a UL recognised component.	583 meets the requirements put forth by AGA.

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Values presented have been determined by standard test methods and are average values not to be used for specification purposes. Our recommendations on the use of our products are based on tests believed to be reliable but we would ask that you conduct your own tests to determine their suitability for your applications.
This is because 3M cannot accept any responsibility or liability direct or consequential for loss or damage caused as a result of our recommendations.

Tapes & Adhesives

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