

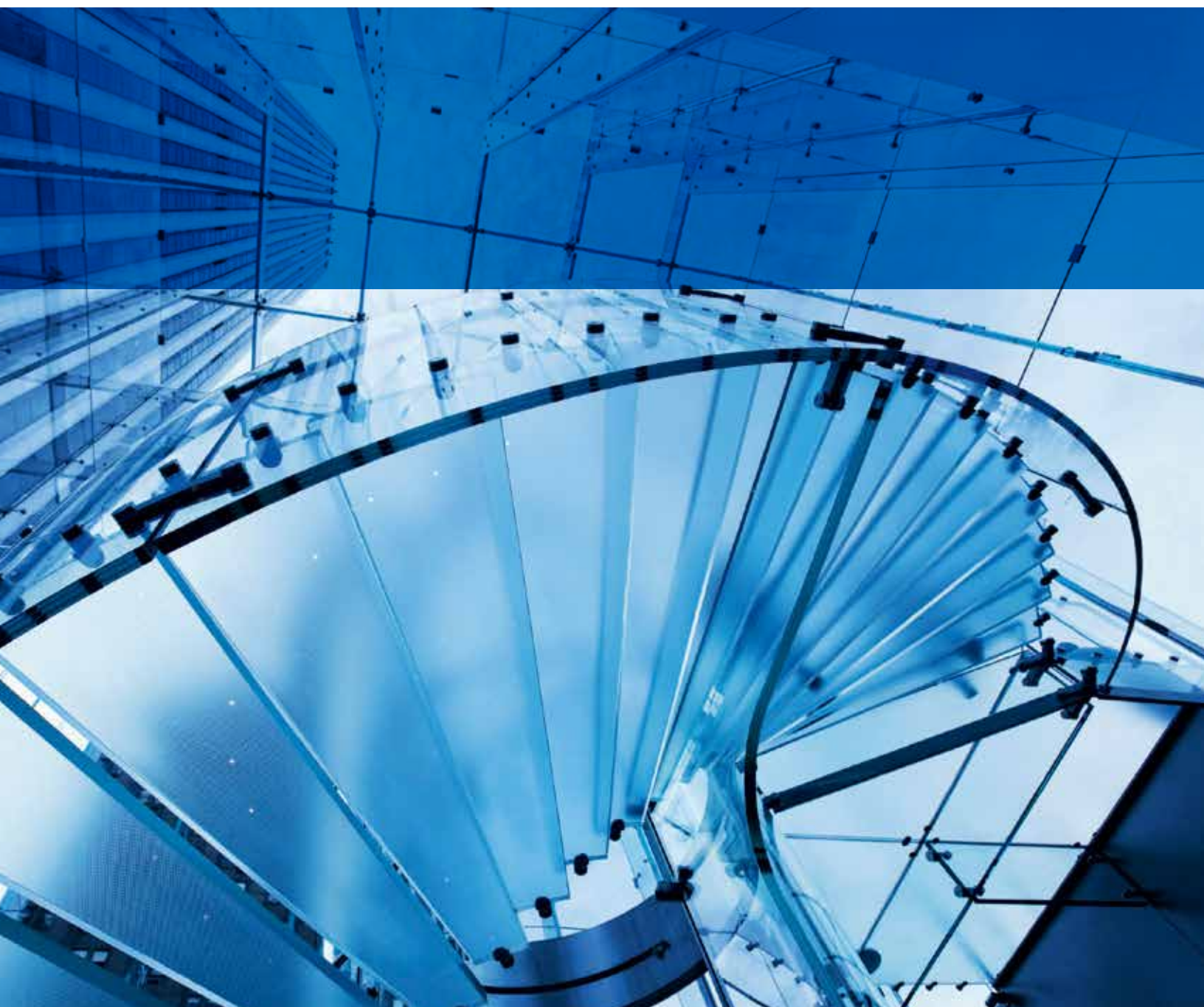


SOLVAY

asking more from chemistry®

Vacuum Bonding of Safety and Architectural
Glass Laminates

**COMPOSITE
MATERIALS**



Solvay specializes in the manufacture and distribution of one-use or reusable vacuum bagging materials and systems used in the vacuum bonding process of safety and architectural glass laminates.

We operate out of facilities in the UK, France, Italy and the USA and provide our customers with industry leading technical service.

Vacuum Bagging Film

Nylon has traditionally been the choice of film used for the vacuum bag. This is due to its excellent heat resistance and very high strength, coupled with good elongation properties. Both sheeted and tubular films are used, typically in thicknesses of 50 or 75 µm. In some cases, if the laminate is very large and heavy, highly puncture resistant 100 or 125 µm film may be used.

Tubular film is often used to ‘envelope bag’ the laminate. The laminate is placed inside an open ended length of tubular film, thus requiring the sealing of just the two ends rather than all around the periphery of the laminate. This method is particularly suited to bonding of lightweight laminates which are easy to manipulate.

Sheet film is also widely used in the industry. In this case the glass laminate is placed on top of a length of the film which is subsequently folded over the top of the laminate and sealed all around the periphery.

Vacuum Bagging Film Product Selector Guide

Product Reference	Color	Thickness	Widths	Max use temp	Cure Method
VACFILM™ 450V	Violet	50µm and 75µm (100µm and 125µm available to special order)	600mm (24in), 900mm (36in), 1200mm (48in), 1500mm (60in), 2000mm (80in)	170°C (338°F)	Oven or autoclave
VACFILM™ 800G	Green	50µm and 75µm (100µm and 125µm available to special order)	600mm (24in), 900mm (36in), 1200mm (48in), 1500mm (60in), 2000mm (80in)	200°C (392°F)	Oven or autoclave

Flashtape

High temperature resistant tape used to secure the peel ply and breather fabric around the edge of the glass laminate.

Product Selector Guide: Flashtape

Product Reference	Color	Thickness	Width	Length	Max use temp
FLASHTAPE 1	Blue	62 (µm)	25mm (1in) and 50mm (2in)	66m (217ft) rolls	205°C (401°F)

FLASHTAPE 1 is a polyester tape with a high temperature silicone adhesive which strips cleanly from the glass following bonding.

Peel Ply Fabric

Peel ply is a woven nylon heat cleaned fabric which is positioned around the periphery of the laminate in direct contact with the PVB or EVA adhesive interlayer. This material is used as a barrier and effectively prevents the vacuum bag and breather fabric polluting the adhesive layer. The fabric is hot knife slit to avoid loose fibers contaminating the cured adhesive and is easily stripped away from the laminate at the end of the cure cycle (Fig 1).

Peel Ply Fabric Product Selector Guide

Product Reference	Width	Length	Weight	Max Use Temp
A100PS	50mm (2in), 75mm (3in), and 100mm (4in)	100m (328ft) rolls	80gsm	204°C (400°F)
B100 FINE WEAVE	50mm (2in), 75mm (3in), and 100mm (4in)	100m (328ft) rolls	60gsm	204°C (400°F)

If an alternative to textured peel ply finish is required, Solvay offers release films which are designed to leave a smooth finish.

Product Reference	Thickness	Width	Length	Weight	Max Use temp
A6000		1.2m (4ft) and 1.5m (5ft)	150m rolls (492ft)	80gsm	232°C (450°F)
A6000 P3	20 µm	Slit 40mm (1.6") or 60 mm (2.4")	150m rolls (492ft)	35gsm	232°C (450°F)

Breather Fabric

Breather fabric is made from high temperature polyester fiber. Its function is to ensure vacuum is evenly distributed and enable air to be removed from the laminate. It is wrapped around the laminate on top of the peel ply and strips are also positioned on the upper and lower surface of the glass, linked to the vacuum port. Strips of breather fabric can also be positioned on the upper and lower surface of the glass to improve vacuum flow (Fig 2). For high pressure autoclave processing, we recommend a heavyweight coarse fiber material.

For oven processing under vacuum only, a lighter weight, more economical material can be used. A range of widths are available.

Breather Fabric Product Selector Guide

Product Reference	Width	Length	Weight	Max Use Temp	Cure Method
AIRBLEED 100	75mm (3in), 100mm (4in) and 150mm (6in)	100m (328ft) rolls	150gsm	205°C (401°F)	Oven
AIRBLEED 10	75mm (3in), 100mm (4in) and 150mm (6in)	50m (164ft) rolls	330gsm	205°C (401°F)	Oven or autoclave

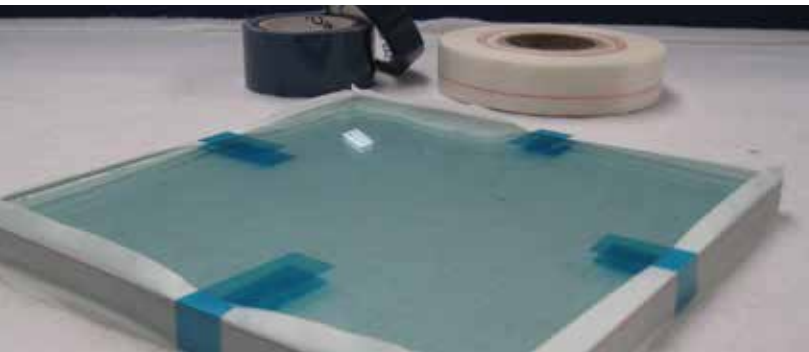


Figure 1. Positioning of A100PS peel ply held in place with Solvay blue FLASHTAPE 1, 25mm (1in) wide.



Figure 2. Breather fabric is attached to the glass and across the flat surfaces using Solvay blue FLASHTAPE 1, 25mm (1in) wide. Note that the material must extend to the underside of the vacuum port.

Vacuum Bag Sealant Tapes

This product is used to seal the nylon film vacuum bag to itself, forming a leak proof, and vacuum tight seal. It consists of high temperature extruded mastic (Fig 3). When vacuum bagging with sheet film, it is likely that there may be some excess film on the top surface once the bag has been folded over the glass. This requires the use of extra sealant tape, sealing the excess film on the top surface, thus creating a pleat. Sealed pleats can be seen in Fig 9-10. It is imperative that the sealant tape extends to the very top of the pleat.

Vacuum Bag Sealant Tape Product Selector Guide

Product Reference	Color	Thickness	Width	Length and Quality	Max Use Temp
LTS90B	Black	3mm (0.1in)	12mm (0.5in)	15m (49ft) rolls, 22 rolls per box	150°C (300°F)
SM5142	Yellow	3mm (0.1in)	12mm (0.5in)	9m (30ft) rolls, 32 rolls per box	205°C (401°F)
UCS180	Cream	3mm (0.1in)	13mm (0.51in)	7.6m (25ft) rolls, 40 rolls per box	180°C (350°F)

LTS90B is our lower temperature economical tape with high tack. SM5142 operates at higher temperatures and exhibits lower levels of tack. Both are designed for use in this application.

Vacuum Hardware

To apply vacuum to the bag, a range of vacuum connectors is required. This is a very simple range of products which offer excellent heat resistance, durability and vacuum integrity. Products available include:

- Vacuum breach unit 2 part
- Brass non return male plug
- Brass non return female socket Vacuum gauge
- Vacuum gauge fitted with non-return socket
- High temp silicone rubber hose

Our products have a standard 6mm (0.25in) BSP thread and 50mm (2in) or 75mm (3in) diameter. Our vacuum hoses can be pre-fitted with non-return couplings and 90 degree elbows, T pieces, etc. Repair instructions are available on request.

Vacuum Couplings

Our double shut off plug and socket units are fitted with high temperature Viton seals (Fig 7). Typically the male plug is bonded to the upper part of the vacuum breach unit (Fig 4). The female part is attached to the vacuum hose (Fig 5-6). Once connected, vacuum can be applied. The valves can be quickly and easily disconnected without loss of vacuum to allow the finished lay up to be moved to the oven or autoclave.



Figure 3. Sealant tape attached to the vacuum film. Release paper should be left in place until ready to complete the bagging process. Note that the lower part of the vacuum breach unit must be positioned prior to sealing the bag together.



Figures 4-7. Show two part vacuum breach unit (with 50mm (2 in) base plate), vacuum hose end and socket assembled, vacuum hose with threaded end only and finally brass plug and socket units.

Vacuum Breach Units

These two part metallic units are positioned in the vacuum bag and provide a pathway for air to be removed once the vacuum bag has been sealed. The male thread of the top part of the unit is designed to allow a clean hole to be cut in the vacuum bag. The top part is inserted into the hole in the base part of the unit and tightened. This automatically cuts a hole in the vacuum bag. The resulting disc of film can be removed by unscrewing the unit before re-positioning and tightening the two parts together again. A silicone washer ensures an air tight seal is achieved.

Vacuum Hoses

Our high strength, high temperature silicone hoses are designed for both oven and autoclave applications. They are fitted with an internal reinforcing spring to prevent the hose collapsing at high autoclave pressures. An additional benefit with these hoses is that in the event of damage, they are quickly and easily repairable at the customers own premises.

Vacuum Gauge

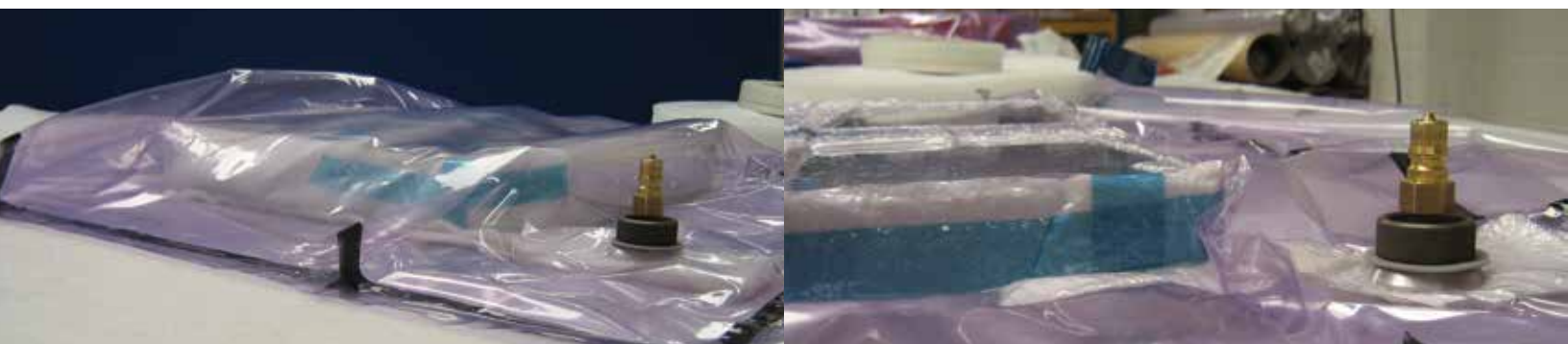
It is imperative that once the vacuum has been applied and all the air is evacuated from the bag, the vacuum level is checked. This is achieved by using a vacuum gauge.

The hose and non-return socket are disconnected and replaced with the vacuum gauge, also fitted with a non-return socket (Fig 11). If the needle indicator on the gauge descends, there is a leak somewhere in the bag and this will require sealing.

Areas to check are the tightness of the fastening of the vacuum port or leak paths between the sealant tape and the vacuum bagging film. If leaks are not adequately dealt with, the quality of the finished product will be seriously compromised. An ultrasonic leak detector is available in our range to assist in locating leaks.

Silicone Vacuum Bagging Aid

Solvay's silicone rubber vacuum bag aid INTENSIFLEX is designed to reduce potential vacuum bag failures caused by sharp edges and open areas in the glass laminate. INTENSIFLEX is a 12mm (0.5in) thick uncured silicone rubber sheet that easily molds to the geometry of the glass laminate features simplifying the vacuum bagging operation. INTENSIFLEX is cured at 90°C (194°F) and can be re-used several times making this unique product a cost effective solution for solving vacuum bag failures.



Figures 8-9. Sealant tape attached to the vacuum film. Release paper should be left in place until ready to complete the bagging process. Note that the lower part of the vacuum breach unit must be positioned inside prior to sealing the bag.

Reusable Vacuum Bag (RVB)

Multi-use reusable vacuum bag systems manufactured from high performance silicone rubber compound.

Benefits include:

- Reusable system saves time compared to traditional consumable lay up
- Decreased material waste
- Reduced risk of operator error
- Cost effective versus traditional consumables over the life of the bag
- Bespoke bags manufactured to customer's exact requirements
- Maintenance and repair service available
- Currently being successfully used at 15 bar autoclave pressure
- Supplied with 6mm (0.25in) BSP vacuum fittings as standard (custom fittings also available)
- Designed for use with traditional breather fabric or PTFE mesh
- A range of compatible vacuum hoses and ancillaries available



Figure 12. The LOCK SEAL interlocking silicone rubber seal is designed to locate and close with ease.

Product Properties

Maximum Service Temperatures	230°C (440°F)
Color	Blue
Hardness	40 (Shore A)
Tensile Strength	1160 psi
Elongation at break	520%

*Other grades and colors of rubber available



Figure 10. The vacuum hose and socket unit are attached to the vacuum breach unit, allowing air to be evacuated and vacuum applied. If the position of the bag needs adjusting (i.e. if bridged), the hose can be easily and quickly disconnected. To release vacuum depress the nipple of the non-return plug and manipulate the film as required.



Figure 11. Shows the vacuum gauge and socket assembly attached to the vacuum breach unit.



Solvay

Composite Materials
4500 McGinnis Ferry Rd
Alpharetta, GA 30005-3914 USA
custinfo@solvay.com

Solvay

Composite Materials
Composites House, Sinclair Close, Heanor Gate
Industrial Estate, Heanor, Derbyshire, DE75 7SP, UK
custinfo@solvay.com