ACG BPS240
ZPREG® TECHNOLOGY BODY PANEL SYSTEM
VACUUM-BAG PROCESSING RECOMMENDATIONS

Product Description

BPS240 is a two-ply, partially impregnated epoxy prepreg system designed for the manufacture of Body-In-White (BIW) panels with excellent surface quality from vacuum-only processing at cure temperatures between 85°C - 150°C (185°F - 300°F).

The first ply utilises ACG's ZPREG partial impregnation technology, consisting of a structural fabric coupled to a surface scrim and a high performance resin system. The second ply combines low-density syntactic core material and structural fabric to create significant panel rigidity in a rapid laminating format.

Standard Formats

System	Surface Ply Backing Ply	Approximate Cured Thickness	Approximate Areal Weight
BPS240 Carbon	VTF242FRB/GF1200/CF1100 VTS243FR/CF3500-0.75mm	1.25mm	1.74 kg/m^2
BPS240 Glass	VTF242FRB/GF1200/GF1100 VTS243FR/GF1100-1.0mm	1.5mm	1.94 kg/m^2

Instructions for Use

1. The mould tool should be treated with a suitable release agent. Semi-permanent Frekote™ release agents are recommending. To attain the best results, particular attention should be given to the application Instructions.

2. If a pre-cut kit is not used, it is recommended that approximate shapes are cut from the roll to minimise waste. Paper or polyethene interleaves are used on the tacky side of the materials; these should be kept in place until placement in the mould to prevent contamination.

3. The surface ply should be placed into the mould first, with the tacky surface (glass scrim) being placed against the final part surface. This ply is then backed up with a syntactic layer, ensuring that the adhesive (high tack) surface is placed against the surface ply.

4. Wherever possible, the surface ply should be laid in a single piece for the entire component (to minimise risk of Class A distortion). Where this is not possible, it is recommended that joints are placed along features or style lines in the panel. The cut edge of the first piece should be placed directly in the corner and the second piece should overlap between 5 to 10mm (0.2 to 0.4in).

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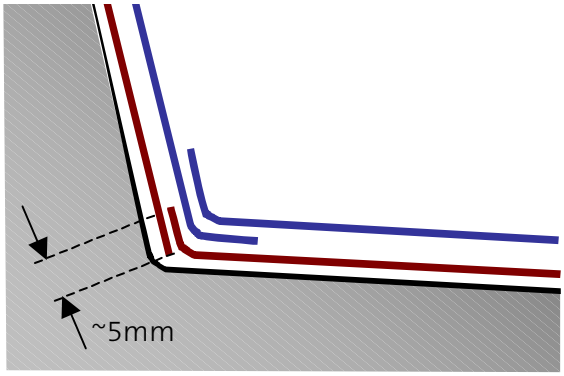

Jointing/Overlapping Schematic

The syntactic backing ply can be overlapped at any point in the panel, though preferably in features or style lines. It is recommended that the panel is split into manageable sections and 20mm (0.8in) overlaps employed to minimise laminating time.

Note: Additional syntactic plies can be used to provide local stiffening and in areas where laminating is difficult. It must be noted that additional thickness can generate local heat build-up during the curing process and that the total thickness should be limited to no more than 5mm.

5. It is essential that an open, unrestricted air path is maintained from the surface ply to the breather pack. This can be formed by leaving sections of the surface ply proud (>10mm) of the backing ply around the component's perimeter. Alternatively, glass tows or lightweight sacrificial glass fabrics can be interleaved between the surface and backing plies and positioned such that they extend beyond the edge of the component.

6. A standard vacuum stack should be applied across the laminate. It is recommended that P3-perforated release film be applied over the entire surface with a suitable breather medium. Particular care should be taken to avoid bridging of vacuum consumables across features in the component. Intensifiers and reusable bagging systems are desirable options.

Optimum quality parts are attained by applying the highest possible vacuum. Before placing in the oven, it is desirable to leave the component under vacuum for at least 5 minutes at room temperature as this will maximise the pre-curing evacuation process.

Cure Cycles

The following recommendations are made assuming ideal conditions. In a production situation, it is essential that the cure cycle is developed with respect paid to factors such as heat input and location, tooling thermal mass, part size, etc.

1. To maximise air-removal from the system, the vacuum should be applied to the component whilst it is still at room temperature; it should also be maintained throughout the cure cycle. Vacuum levels >90% are generally found to offer satisfactory results.

2. Heat can then be applied in a controlled manner to the mould and component. A typical cure cycle will use 2°C/minute ramps between temperatures. During this phase, the resin matrix will significantly reduce in viscosity and infuse into the evacuated reinforcement.

   Excessively fast ramp rates may result in premature gelation of the matrices before full infusion of the reinforcement has occurred. This will result in poor surface finish and high void content in the cured part.

   Care should be taken to maintain optimum temperature distribution and uniformity across the component surface. Premature infusion at the edges of the component can trap air at the centre of the part, thereby leading to inadequate quality.

3. The bulk of matrix cross-linking ('curing') occurs during the final dwell period. The final dwell conditions can be selected from those below or alternatives interpolated:

   5hrs @ 80°C (176°F)
   2hrs @ 100°C (212°F)
   60mins @ 120°C (248°F) – standard recommended conditions
   45mins @ 150°C (302°F)

   It is possible to cure the system for 16hrs @ 65°C (149°F) with a subsequent post-cure, but this has been shown to lead to inferior surface quality compared with higher temperature cures.

4. De-moulding should only occur when the part has cooled to a temperature at which it will not permanently deform. This is, typically, at least 30°C (86°F) below the cure temperature.

5. Where the service-temperature of the components exceeds the cure temperature, a free-standing post-cure is recommended. This may have implications regarding the achievable surface finish. Please contact ACG for further advice in such cases.

Exotherm

BPS240 system prepregs are reactive formulations that can undergo severe exothermic heat-up during the initial curing process if correct curing procedures are not followed.

Extreme care must be taken to ensure that safe heat-up rates, dwell temperatures and lay-up/bagging procedures are followed in detail, especially when moulding laminates in excess of 5mm (0.2in) thickness. The risk of exotherm increases with lay-up thickness and with increasing cure temperature. It is strongly recommended that trials, representative of all the relevant circumstances, are carried out by the user to allow a safe cure cycle to be specified. It is also important to recognise that the tool material and its thermal mass, combined with the insulating effect of breather/bagging materials, can affect the risk of exotherm in particular cases. Please contact the ACG technical department for further information on the exothermic behaviour of these systems.

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Tooling System

BPS240 has been developed for the manufacture of high quality, net-shape components from composite or metallic tooling. Abrasing or reworking the cured component surface may be detrimental to the aesthetic quality and longevity of that surface once it has been painted and, it should, therefore, be avoided.

ACG has developed a considerable knowledge base regarding the application of composite body panel solutions. Additionally, the Group can offer a range of composite tooling solutions intended for high surface-quality applications and will be pleased to offer further advice and support upon request.

Painting

BPS240 components have been successfully painted in a variety of 1K and 2K solvent-based and water-based OEM and refinish paint systems from several suppliers. Components were degreased and, in some cases, 'scuffed' with a Scotchbrite pad before painting.

Advice regarding painting of cured BPS240 components will vary between different paint suppliers and systems. It is recommended that the function responsible for the painting role works in cooperation with the application specialists from their paint supplier to ensure optimum results.

Out Life and Storage

	Storage Temperature	
	-18°C (0°F)	**21°C (70°F)**
VTF242FRB Surface Ply	>12 mths	7 days
VTS243FR Backing Ply	>12 mths	30 days

During storage, BPS240 material rolls should be supported through the cardboard core or by standing on end. If left unsupported on a surface the rolls will eventually self-impregnate, possibly leading to problems with handling and final surface finish.

When not in use, BPS240 should be stored in a freezer in a sealed polyethylene bag. When material is removed from the freezer, it is essential that the roll be allowed to thaw and reach room temperature before the bag is opened. For example, the thaw time for a 20lm roll taken from –18°C (0°F) storage into a 21°C (70°F) room is typically between 4 – 6 hours. Unless the material is fully thawed, condensation may form on the surface. Moisture within a curing laminate may be detrimental to final part quality and appearance.

Materials returned to the freezer they must be resealed to present ingress of moisture.

Health and Safety

BPS240 contains an epoxy resins which can cause an allergic reaction on prolonged or repeated skin contact. Gloves and protective clothing must be worn.

Wash the skin thoroughly with soap and water or resin-removing cream after handling. Do not use solvents to clean the skin.

Use a mechanical exhaust ventilation system when heat curing BPS240.

In the uncured state, ZPREG materials contain dry fibres. Small amounts of these fibres may be released into the atmosphere during cutting and handling. Skin contact with these fibres should be minimised, as should dispersal of the fibres into the workplace. Particular care should be taken when working with carbon fibre materials in the vicinity of electrical apparatus; such equipment should be made intrinsically safe.

For further information please consult ACG Material Safety Data Sheets:

MSDS415 VTF242FRB
MSDS428 VTS243FR

Attention

The success application and longevity of any body panel material is dependant upon many factors, including: component design, tooling quality, moulding process, paint application process, and lifetime environmental conditions. It is the responsibility of the user to demonstrate the fitness for purpose of BPS240 materials for their intended applications and processes.

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