



# FR308

## Flame Retardant Prepreg

### Introduction

FR308 prepreg is a flame retardant resin system meeting the flame, smoke and toxicity (FST) requirements of aerospace standard CS 25.853 and rail standard EN 45545. It can be supplied on a variety of fabrics to meet your cost and manufacturing requirements. This resin system colour is dark brown / black.

**Typical applications:** *Aerospace / Rail / Flame retardant*

### Key Features & Benefits

- **FST properties:**
  - **CS 25.853** compliant (Heat Release < 25kW/m<sup>2</sup>)
  - **EN 45545** compliant, rated **HL3**
- Cure temperature from **100°C**
- Work life at 20°C: **21 days**
- Storage life at -18°C: **12 months**

### Available Reinforcements (standard)

**Carbon:** 200g/m<sup>2</sup> 2x2 twill fabric, T300 3K fibre

**Glass:** 300g/m<sup>2</sup> 8 harness satin fabric, E-glass fibre

Note – other reinforcements may be available on request. Please enquire for details.

### Storage & Out Life

This material should be kept frozen at -18°C for a maximum storage life. If kept refrigerated at 6°C storage life will be reduced to 2 months. It must be kept sealed in a polythene bag which must not be opened until fully thawed to room temperature. If the material is not fully used, then the material must be resealed in the polythene bag to prevent moisture absorption.

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## Cure Cycles & performances

### RECOMMENDED CURE CYCLES:

#### **Autoclave cure**

*P3 Release film recommended*

- For carbon prepreg:
  - o 90°C for 15 mins then 100°C for 3 hrs, at a ramp rate of 2-3°C/min
- For glass prepreg:
  - o 90°C for 15 mins then 130°C for 1 hr, at a ramp rate of 2-3°C/min

#### **Oven cure**

- Contact SHD for details

#### **Press cure**

- Contact SHD for details

#### **Notes:**

- The cures given are as a guide only and will be subject to changes in part geometry and construction.
- Other cure cycles may be considered depending on the exact reinforcement type and laminate requirements. As FR308 is new and unique resin technology we would strongly recommend you contact SHD's Technical Department for more detailed advice.
- Due to the chemical nature of this material, water is evolved during the cure. If press curing, the press may need to be vented during the cure for best results. If curing under vacuum, it is recommended that a water trap is placed in the vacuum line to prevent moisture contamination to the vacuum system.



## Cured Material Properties

### Flame, Smoke and Toxicity properties

<b>CS 25.853</b>		<b>Results</b>	<b>Limit</b>		
60s vertical burn		<b>0.2</b>	6.0	<i>in</i>	<i>PASS</i>
15s horizontal burn		<b>0.0</b>	2.5	<i>in/min</i>	<i>PASS</i>
Heat release	Peak	<b>20.4</b>	65	<i>kW/m2</i>	<i>PASS</i>
	2 min average	<b>14.1</b>	65	<i>kW.min/m2</i>	
Smoke emission		<b>4.27</b>	200		<i>PASS</i>
Toxic gas emission	CO	<b>115</b>	1000		<i>PASS</i>
	HCN	<b>1</b>	150		
	HF	<b>0</b>	100		
	HCL	<b>2</b>	150		
	SO2	<b>0</b>	100		
	NOx	<b>5</b>	100		

Material tested: 8 plies of FR308-G300-8HS-33%RW prepreg  
Cured 1h@130°C

<b>CS 25.853 – Sandwich panel</b>		<b>Results</b>	<b>Limit</b>		
Heat release	Peak	<b>20.8</b>	65	<i>kW/m2</i>	<i>PASS</i>
	2 min average	<b>17.6</b>	65	<i>kW.min/m2/</i>	

Material tested: 2 plies of FR308-G300-8HS-42%RW prepreg on each side of a 12mm Nomex core  
Cured 1h@130°C

<b>EN 45545</b>		<b>Results</b>	<b>Limits for category R1</b>			<b>Rating</b>
			<b>HL1</b>	<b>HL2</b>	<b>HL3</b>	
ISO 5658-2	CFE ( <i>kW/m2</i> )	<b>44.47</b>	20 ( <i>min</i> )	20 ( <i>min</i> )	20 ( <i>min</i> )	<i>HL1, HL2, HL3</i>
ISO 5660-1	MAHRE ( <i>kW/m2</i> )	<b>30.3</b>	N/A	90	60	<i>HL1, HL2, HL3</i>
ISO 5659-2	DS4	<b>38.5</b>	600	300	150	<i>HL1, HL2, HL3</i>
	VOF4	<b>83.34</b>	1200	600	300	<i>HL1, HL2, HL3</i>
EN 45545-2	CITG (4min)	<b>0.007</b>	1.2	0.9	0.75	<i>HL1, HL2, HL3</i>
Annex C.1	CITG (8min)	<b>0.009</b>	1.2	0.9	0.75	<i>HL1, HL2, HL3</i>

Material tested: 8 plies of FR308-G300-8HS-38%RW prepreg  
Autoclave cured (6bar) 1h@130°C

Tests completed independently by a UKAS approved organisation. Tests results can be supplied upon request.



## Mechanical Properties

Tests performed on **FR308-G300-8HS-38%RW** laminates

(300gsm 8 harness satin fabric, E-glass fibre)

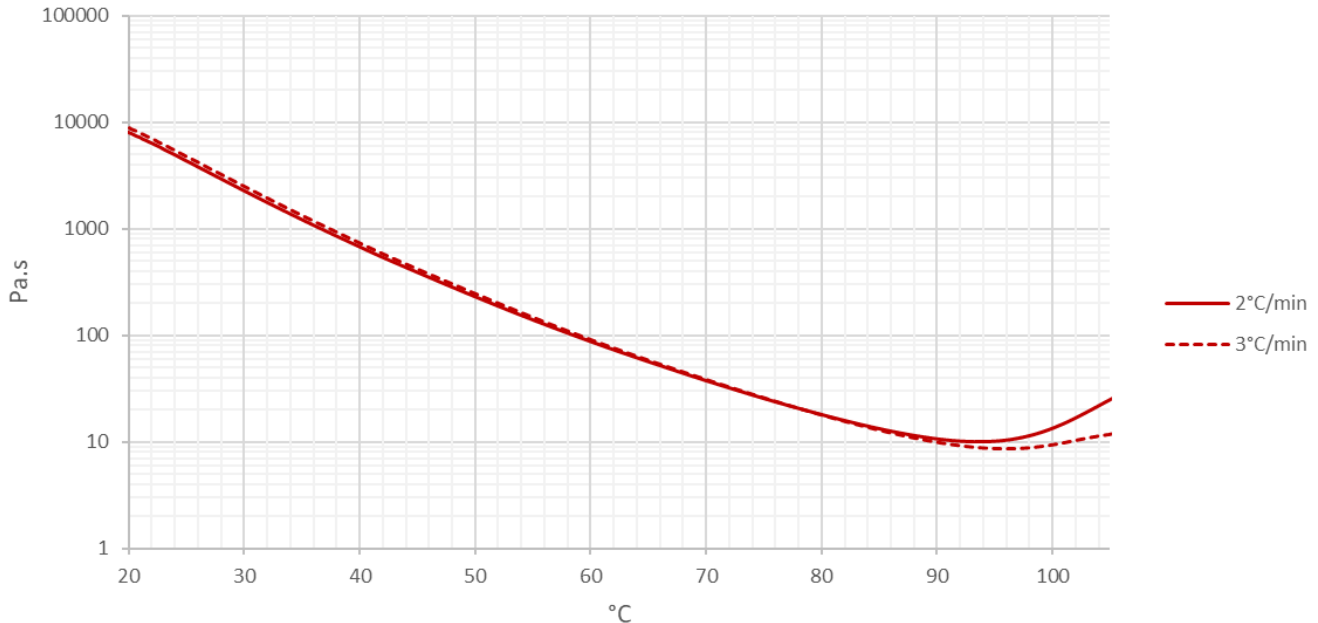
Test	Results			Standard
<b>Vf</b>	Fibre volume fraction	<b>52.87</b>	<b>%</b>	<i>BS EN ISO 14127 Method B</i>
<b>CPT</b>	Cured ply thickness	<b>0.225</b>	<b>mm</b>	<i>BS EN ISO 14127 Method B</i>
<b>Tensile 0°</b>	Tensile strength	<b>397</b>	<b>MPa</b>	<i>BS EN ISO 527-4</i>
	Tensile modulus	<b>23.5</b>	<b>GPa</b>	
	Poisson's ratio	<b>0.08</b>		
<b>Tensile 90°</b>	Tensile strength	<b>307</b>	<b>MPa</b>	
	Tensile modulus	<b>21.2</b>	<b>GPa</b>	
	Poisson's ratio	<b>0.07</b>		
<b>Compressive 0°</b>	Compressive strength	<b>605</b>	<b>MPa</b>	<i>prEN 2850 Type B</i>
	Compressive modulus	<b>26.1</b>	<b>GPa</b>	
<b>Compressive 90°</b>	Compressive strength	<b>494</b>	<b>MPa</b>	
	Compressive modulus	<b>24.4</b>	<b>GPa</b>	
<b>Flexural 0°</b>	Flexural strength	<b>593</b>	<b>MPa</b>	<i>BS EN ISO 14125</i>
	Flexural modulus	<b>24.0</b>	<b>GPa</b>	
<b>Flexural 90°</b>	Flexural strength	<b>606</b>	<b>MPa</b>	
	Flexural modulus	<b>21.0</b>	<b>GPa</b>	
<b>In-Plane Shear ±45°</b>	In-Plane shear strength (5% strain)	<b>46.3</b>	<b>MPa</b>	<i>BS EN ISO 14129</i>
	In-Plane shear strength (ultimate)	<b>74.0</b>	<b>MPa</b>	
	In-Plane shear modulus	<b>3.20</b>	<b>GPa</b>	
<b>Interlaminar Shear 0°</b>	Interlaminar shear strength	<b>45.8</b>	<b>MPa</b>	<i>BS EN ISO 14130</i>
<b>Interlaminar Shear 90°</b>	Interlaminar shear strength	<b>44.1</b>	<b>MPa</b>	
<b>DMA – Dry Tg</b>	Tg E' Onset	<b>142</b>	<b>°C</b>	<i>Modified ASTM D7028 (Single Cantilever)</i>
	Initial cure	Tg Peak Tan δ	<b>181*</b>	

Mechanical testing carried out at 21±2°C. Initial cure: 15mins at 90°C followed by 1hr at 130°C, autoclave 6bar. All figures in this report are actual test results and have not been normalised. Testing was either completed by SHD Composites laboratories, or independently by UKAS approved organisations. Complete test reports can be supplied independently upon request. \*FR308 can potentially reach a Peak Tan δ Tg above 232°C after high temperature post-cure cycles.



## Viscosity Profile

Testing carried out using a rotational rheometer.



## Health and Safety

Please refer to the product Safety Data Sheet before using this material. The following precautions must be taken when using PFA resin prepregs:

- Impervious gloves are recommended.
- To avoid exotherm, particular care must be taken with thick laminates.
- Ramp rates must not exceed 3.0°C/min during initial cure and 1.0°C/min during post cure.

**Disclaimer:** Technical advice, instruction, data or recommendation, whether verbal or in writing, is given in good faith. The SHD company providing any such advice gives no warranty or guarantee, whether express or implied, in relation to such advice.

Customers must carry out their own tests and assessments as necessary in order to determine the quality and suitability of the product for their particular application and circumstances. Such testing should be performed under conditions identical to those to which the final component/product may be subjected. Values listed in any SHD document are for typical properties of the product or substance in question and are not intended to be used in establishing either statistical specifications nor engineering basis values. They do not constitute either minimum or maximum values for the product or substance in question.