ST 70

Carbon Structural SPRINT®

- **Award winning SPRINT® matrix**
- **Long outlife at room temperature**
- **Zero volatile/solvent content**
- **Improved health and safety: Diuron-Free**
- **Available with a range of reinforcements**
- **Suitable for vacuum bag processing**
- **Controllable in thick sections**
- **Low exothermic properties**
- **Recommended cure between 70ºC and 120ºC**
- **Excellent laminate quality, low bleed**
- **Also available as ST70-1 Single Sided SPRINT®**

Introduction

ST70 is part of the range of SPRINT® products. This unique product range provides technically and commercially competitive engineering materials, ideal for use either solely, or in conjunction with other products from within the product range along with other SP-High Modulus products.

ST70 is a hot melt, Diuron free epoxy SPRINT® ideally suited to the manufacture of thick sections. It can be cured at temperatures as low as 70°C, but can also be used for the rapid manufacture of components through its 25-minute cure at 120°C. All of this can be achieved together with an out-life of 21 days at 21°C.

ST70 is designed for vacuum bag processing and offers excellent mechanical performance on glass fibre reinforcements. Currently ST70 is manufactured into a SPRINT® structure with E-glass and Carbon fibres, which are manufactured into biax or woven materials. This data sheet is concerned with carbon reinforcements.

Instructions for Use

1. The moulding surface must first be treated with a release agent. If a Surface Film is required, this should be applied directly to the tool face prior to the layup of SPRINT®. Please refer to Processing Notes for application details.

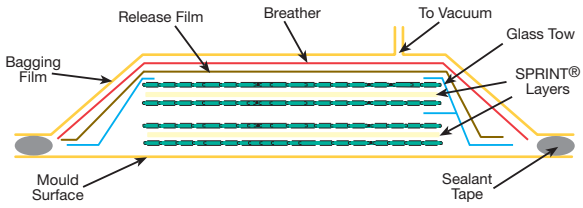
   The required number of plies of SPRINT® are then placed on to the tool and a thermocouple inserted into the lay-up outside the net trim line. Dry glass tows should be inserted between plies of SPRINT® to provide an air evacuation path out of the laminate. The second end of the tow should be made available for contact with the breather

2. If required, a peel ply, pre-impregnated or dry, can be applied over the top of the laminate stack. Note that for good secondary bonding of a peel-plied surface of a laminate, a nylon peel ply such as SP-High Modulus/Tygavac Stitch Ply A, is strongly recommended. The peel ply is covered entirely with a non-perforated release film such as SP-High Modulus/Tygavac WL3600 or a low bleed release film, such as WL3600RP2. The release film is then covered with breather material, such as SP-High Modulus/Tygavac Econoweave 44W, so that it extends over the release film in all directions and contacts the dry glass strands.

3. Once the lay up is complete, a vacuum bag is installed by standard techniques. At least two vacuum stems should be inserted through the bag, one connecting to the vacuum source and the other, at a point on the part furthest from the source, to a calibrated vacuum gauge. The major benefit of SPRINT® is that it enables all of the air to be removed from the laminate prior to fibre wet out and resin cure. It is recommended that a vacuum is applied at ambient temperature prior to cure, to fully evacuate the laminate stack. This should be held for between 5 minutes and 1 hour, depending upon the size and thickness of the component. Full vacuum is then maintained throughout the cure.

   PLEASE NOTE: Further advice can be found in the SPRINT® Processing Notes or by contacting Gurit Technical Services.

4. Cure the laminate in accordance with the specification given later in this data sheet.



Typical processing diagram showing two SPRINT® layers

Curing schedule

Cure Envelope and Cured Properties

Structural SPRINT® ST 70 has a relatively flexible cure envelope. The minimum cure is 16 hours 70°C and a rapid cure is 25 minutes at 120°C. Other cure temperatures and times are given in the Working Properties section.

Structural SPRINT® ST 70 works by first applying a vacuum to the laminate stack to remove all air. It is recommended that an ambient vacuum is applied prior to cure, to fully evacuate the laminate stack. The temperature is then increased so that the matrix resin reduces in viscosity and wets the evacuated reinforcement within the laminate. A dwell can be used at the "infusion" temperature to ensure good laminate quality. The temperature is then further increased to cause the matrix resin to cross-link and is then held at the cure temperature until the cross linking process is complete. Once this is achieved heating is removed so that the temperature is reduced under natural cooling. The vacuum must be maintained throughout the cure and until the part has cooled to below 60°C.

Note: The successful use of these cure schedule will depend on part size and laminate construction. Heat up rate and dwell periods need to be tailored to take consideration of oven capacity, thermal mass of tool, laminate construction etc. It is recommended that Gurit is contacted for further advice before utilising any of the suggested cure cycles. (See table on Cure Cycles).

70°C should be considered to be the minimum cure temperature to generate optimum mechanical properties. All temperature readings during cure should be taken from the lowest reading thermocouple.

Typical Cure Profiles

The successful use of these cure schedules will depend on part size and laminate construction. Heat up rate and dwell periods need to be tailored to take consideration of oven capacity, thermal mass of tool, laminate construction etc. Data in the table below is based on laminate temperatures, air temperatures may need to be higher. It is recommended that Gurit is contacted for further advice before utilising any of the suggested cure cycles.

	Ultra Slow Cure Schedule	Standard Cure Schedule	Fast Cure Schedule
	0.3°C/minute ramp to 55°C	1°C/minute ramp to 55°C	2°C/minute ramp to 55°C
	1 hour dwell @ 55°C	1 hour dwell @ 55°C	1 hour dwell @ 55°C
	0.3°C/minute ramp to 70°C	1°C/minute ramp to 70°C	2°C/minute ramp to 120°C
	16 hour dwell @ 70°C	16 hour dwell @ 70°C	25 minutes @ 120°C
Total Time	**20 hours**	**18 hours**	**2 hours 15 minutes**

NB. It is strongly recommended that laminate temperatures are monitored throughout the cure. 0.3°C/minute should be considered the minimum acceptable laminate ramp rate.

ST70 SPRINT® materials can be used with both SPRINT® or prepreg products. It is supplied with a poly backer and can be applied to the substrate with either side against the tool.

In order to maximise the potential of ST70 product range please contact the Gurit Technical Department. Contact details are on the back of this Product Data Sheet.

General prepreg working practices apply to these products, details of which can be obtained from the Gurit Guide to Composites or by contacting the Gurit Technical Department.

Matrix Properties

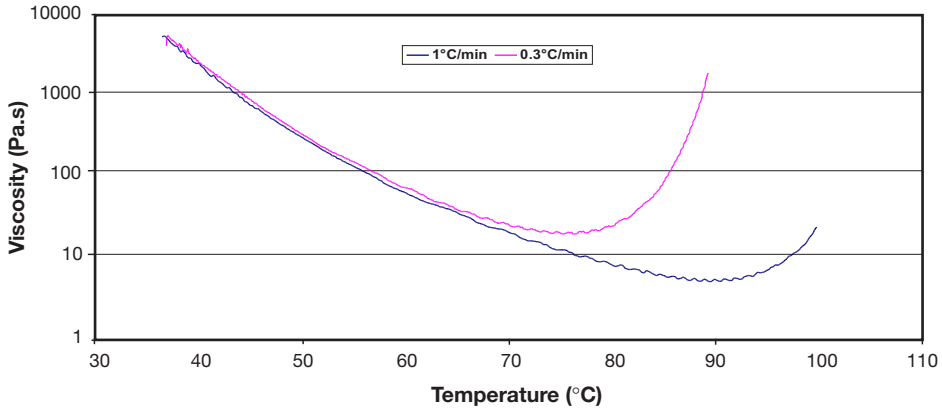
Uncured

Thermal properties (cure 20°C-250°C @ 10°C/minute)	
Enthalpy (J/g)	320

Colour	
Matrix	Translucent

Cure Temp (°C)	Cure Time
Minimum Cure Temperature (°C)	70
Time @ Min. Cure Temp (hours)	16
80°C (mins)	6hrs
90°C (mins)	3hrs
100°C (mins)	1.5hrs
110°C (mins)	45mins
120°C (mins)	25mins

Rheology	30-120°C @1°C/min	30-120°C @0.3C/min
Temperature @ Min Viscosity (°C)	See Chart Below	See Chart Below



Cured - Neat Resin Properties

Mechanical Properties	
Tensile Modulus (GPa)	3
Tensile Strain (%)	3
Compression Strength (MPa)	125
Compression Modulus (GPa)	4
Matrix density (g/cm3)	1.2

SPRINT® Properties

Uncured

Material Properties		Notes
Tack	3-4 (for Tack Film)	Med Tack

Outlife	
At -18°C (months)	24
At 21°C (days)	30
Tack life at 21°C (days)	20

Material Safety Information	
Hazard Code	Xi, N
Risk Phrases	36/38, 43, 51/53
Safety Phrases	24, 26, 28, 37/39, 57, 60
Solvent Content	0
Volatiles Content	0

SPRINT® Reinforcement	ST70/RC303T/51%/RC303T	ST70/RC660T/51%/RC660T
Resin Content (%)	51	51
Fibre Weight (g/m2)	600	1320
Aerial Weight (g/m2)	1200	2640
Product Code	SA11-4475	SA11-4477
Resin Weights Available	41-50%	41-50%
Stitch Type/Weave	Twill	Twill
Fleeced	No	No
Backer Type	100µm MDPE	100µm MDPE
Available Roll Length (m)	-	-
Available Roll Width (mm)	1270	1270
Packaging Type	Packaging type is dependant on the length of roll requested	

Cured

SPRINT® Reinforcement	RC303/RC	RC660T/RC	Test Method
16hrs 70°C	51%	51%	
Tg1 (°C) (Laminate)	85	85	DMA
Tg Peak Tan Delta	104	104	DMA
0° Tensile Strength (MPa)	835	717.5	BS EN ISO 527
0° Tensile Modulus (GPa)	49.4	50.34	BS EN ISO 527
0° Tensile Strength (MPa) Normalised to 60%Vf	1213	1017.7	BS EN ISO 527
0° Tensile Modulus (GPa) Normalised to 60%V_f	72	71.4	BS EN ISO 527
0° Compressive Strength (MPa)	478	519.9	ISO 14126
0° Compressive Modulus (GPa)	40.9	42.4	ISO 14126
0° Compressive Strength (MPa) Normalised to 60%V_f	694.9	735.9	ISO 14126
0° Compressive Modulus (GPa) Normalised to 60%V_f	59.4	60	ISO 14126
0° ILSS (MPa)	57	49	BS EN ISO 14130
45° Tensile Strength (MPa)	127	155.9	BS EN ISO 527
45° Tensile Modulus (GPa)	11	12	BS EN ISO 527
Core Bonding Fracture Toughness Peel (J/m^2) P500 core	600	600	Gurit Internal

Health and Safety

The following points must be considered:

1. Skin contact must be avoided by wearing gloves. Gurit recommends the use of disposable nitrile gloves for most applications. The use of barrier creams is not recommended, but to preserve skin condition a moisturising cream should be used after washing.
2. If working in an enclosed area, local extraction and ventilation should be used.
3. Overalls or other protective clothing should be worn when laminating or sanding. Contaminated work clothes should be thoroughly cleaned before re-use.
4. Eye-protection should be worn. If contamination of the eyes occurs then flush the eye with water for 15 minutes, holding the eyelid open, and seek medical attention.
5. If the skin becomes contaminated then the area must be immediately cleansed. The use of resin-removing cleansers is recommended. To finish, wash with soap and warm water. The use of solvents on the skin to remove resins etc. must be avoided.

Washing should be part of routine practice:

- before eating or drinking
- before smoking
- before using the lavatory
- after finishing work

6. The inhalation of sanding dust should be avoided. If it settles on the skin then it should be washed off. After more sanding operations, a shower/bath and hair wash is advised.

Gurit produces a separate full Material Safety Data Sheet (MSDS) for all hazardous products. Please ensure that you have the correct MSDS to hand for the materials you are using before commencing work. A more detailed guide for the safe use of Gurit resin systems is also available and can be found on our website at www.gurit.com. Note: safety datasheet legislation can vary with country of use. CPDS are also available upon request.

Storage Conditions & Outlife

Storage time and temperature will have an affect on resin reactivity and fibre impregnation. When stored at –18°C SPRINT® can be stored for 24months without detrimental changes to the product. Storage times at higher temperatures are a function of fabric construction, roll length and resin content. These can be obtained upon request. However, the ST70 matrix resin system has specific properties that enable most combinations of fabric construction, roll length and resin content to be stored at 20°C for up to 21 days.

Transport & Storage

All SPRINT® materials should be stored in a freezer when not in use to maximise their useable life, since the low temperature reduces the reaction of resin and catalyst to virtually zero. However, even at -18°C, the temperature of most freezers, some reaction will still occur. In most cases after some years, the material will become unworkable.

Notice

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The Company strongly recommends that Customers make test panels and conduct appropriate testing of any goods or materials supplied by the Company to ensure that they are suitable for the Customer's planned application. Such testing should include testing under conditions as close as possible to those to which the final component may be subjected. The Company specifically excludes any warranty of fitness for purpose of the goods other than as set out in writing by the Company. The Company reserves the right to change specifications and prices without notice and Customers should satisfy themselves that information relied on by the Customer is that which is currently published by the Company on its website. Any queries may be addressed to the Technical Services Department.

Gurit are continuously reviewing and updating literature. Please ensure that you have the current version, by contacting Gurit Marketing Communications or your sales contact and quoting the revision number in the bottom right-hand corner of this page.

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