

# ES161/ES161S

## EPOXY MATRIX

### GENERAL FEATURES

ES161/ES161S is an advanced epoxy matrix system designed for composite tooling construction.

### MAIN CHARACTERISTICS

ES161/ES161S is supplied in the form of both glass and carbon prepreg to offer the following advantages:

- low temperature cure
- excellent surface finish
- work life of 2/3 days at room temperature (23°C) and 6 months when stored at -18°C
- low shrinkage during the curing and post-curing process
- service temperature over 180°C after post-cure
- solvent free formulation

## OPERATIONAL INSTRUCTIONS

This epoxy matrix system can be processed at low temperature, starting from 23°C.

Temperature °C (°F)	Time	Tg °C (°F) DSC
45 (113)	14h	69 (156)
55 (131)	7h	75 (167)

## CURE PROCESS RECOMMENDATIONS

The curing cycles recommended are:

### 1. 14h@45°C, ramp 0,5°C/min:

- Dwell at RT for 60 minutes under full vacuum
- Apply a pressure of 6 bar
- Heat the laminate at a rate of 0.5°C/min to 45°C
- Hold the laminate at 45°C for 14 hours
- Cool the laminate to RT under pressure at 2°C/min

The Tg of the laminate made using this cure cycle is 63°C (by DMA onset).

### 2. 7h@55°C, ramp 0,5°C/min:

- Dwell at RT for 60 minutes under full vacuum
- Apply a pressure of 6 bar
- Heat the laminate at a rate of 0.5°C/min to 55°C
- Hold the laminate at 55°C for 7 hours
- Cool the laminate to RT under pressure at 2°C/min

The Tg of the laminate made using this cure cycle is 72°C (by DMA onset).

Temperature °C (°F)	Time	Tg °C (°F) DSC
45 (113)	14h	69 (156)
55 (131)	7h	75 (167)

## POST-CURE

All the cycles below are performed with a 0,2°C/min heating ramp:

Cure	Postcure	Tg °C (°F) E' DMA	Tg °C (°F) tan δ DMA	% cure by DSC
14h @45°C	5h @ 180°C	189 (372)	222 (432)	100%
7h @55°C	5h @ 180°C	191 (376)	228 (442)	100%

## RESIN MATRIX

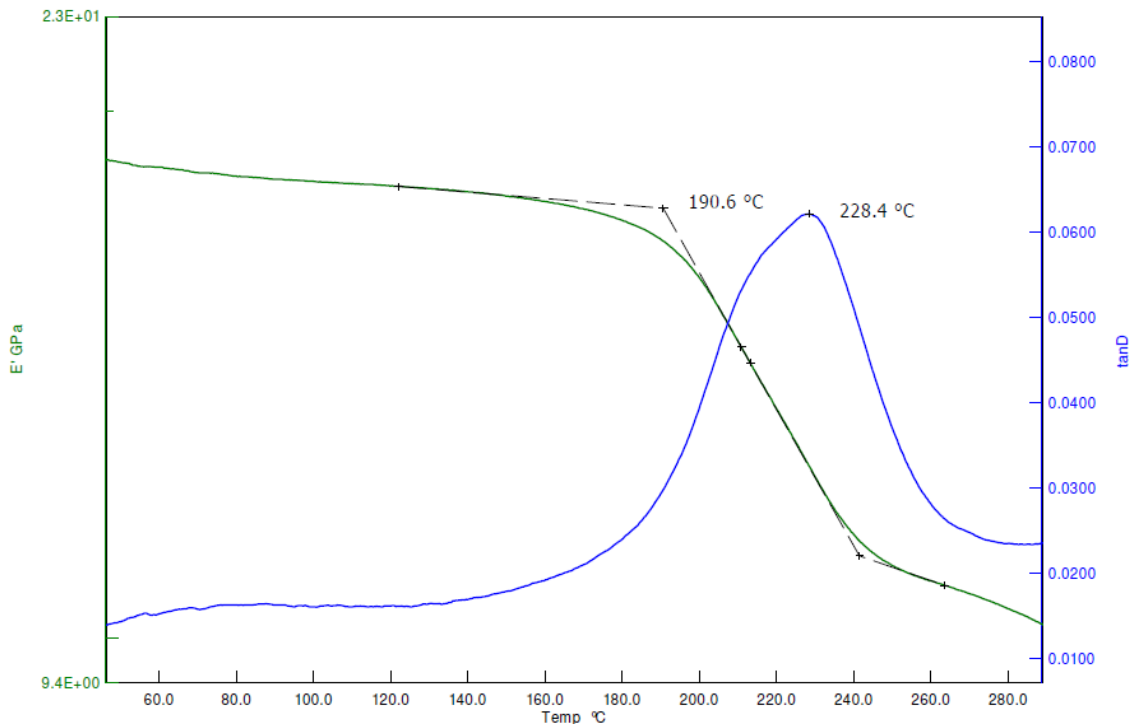
### GENERAL PROPERTIES

Property	Unit	Value	Standard
Storage life @ -18°C (0°F)	months	6	
Work life @ 23°C (73°F)	days	2-3	
Cured resin density	g/cm <sup>3</sup>	1.23	ASTM D792-00
Tg E' (DMA)*	°C (°F)	191 (376)	ASTM E1640-09
Tg Peak Tan δ (DMA)*	°C (°F)	228 (442)	ASTM E1640-09
CTE*	°C-1	4-6 x10 <sup>-6</sup>	ISO 11359-2
Tack		High	

\*Laminate Fully cured 7h@55°C plus post cure 5h@180°C

### THERMO-MECHANICAL DMA ANALYSIS

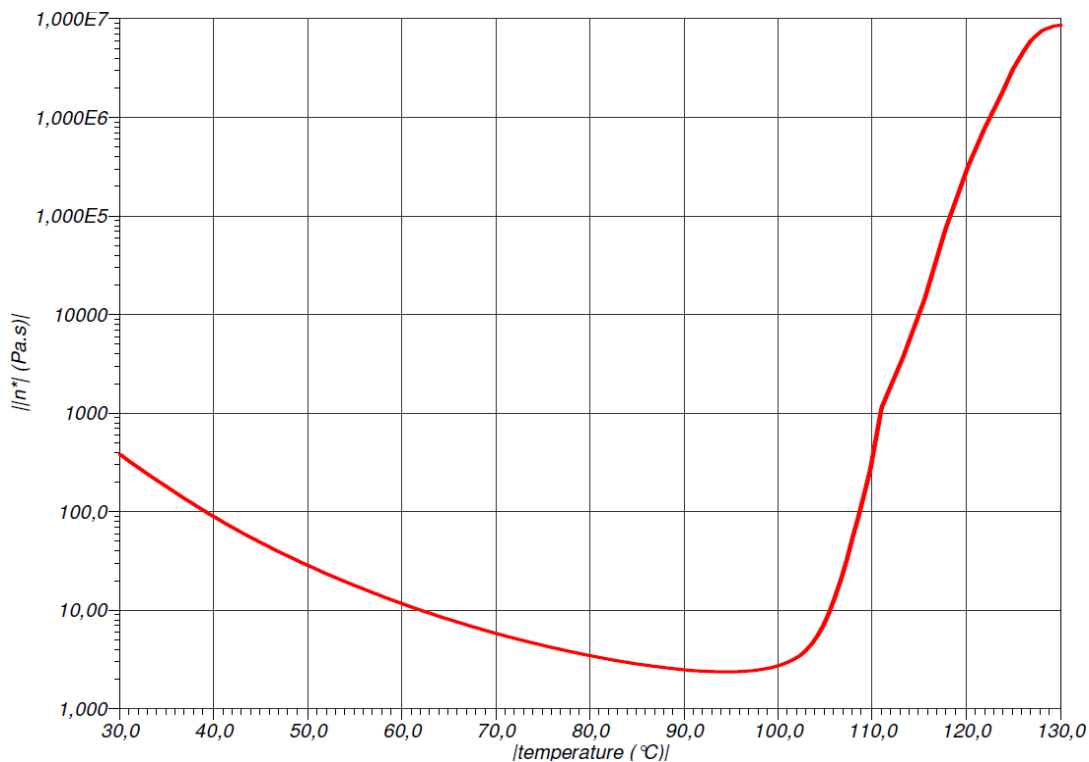
DMA trace of ES161/ES161S laminate cured for 7h @ 55°C + post cure 5h@180°C



DMA Analysis: modulus E' vs Temperature

Modulus E' evaluated under 2°C/min heating rate, 1Hz oscillating frequency.

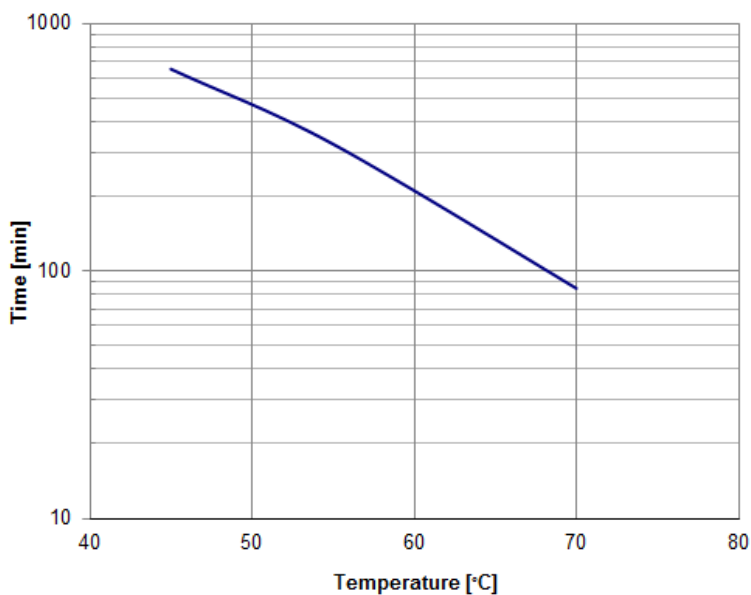
**VISCOSITY PROFILE**



Viscosity profile: temperature vs complex viscosity

Resin complex viscosity evaluated under 3°C/min heating rate, 1Hz oscillating frequency.

**GEL TIME**



Temperature °C (°F)	Gel Time (min)
45 (113)	653
55 (131)	325
70 (158)	85

## SAFETY CONSIDERATIONS

- Please consult the Material Safety Data Sheet.
- This product contains epoxy resin, and may cause allergic reaction.
- The use of latex gloves for handling is recommended.
- Waste material should be discarded following national law.

## DELIVERY FORM AND PACKAGING

Custom widths, roll size, and packaging are available on request.

**Prepreg fabrics:** Supplied on 75 mm (3") diameter cardboard cores with release paper on one side and polyethylene film separator on the other side. Rolls are sealed plastic bags and packed in cardboard boxes.

**Standard width:** 100 cm (39.4") or 127 cm (50").

**Standard length:** 50 m (54.7 In yds).

**Unidirectional Prepreg:** Supplied on 300 mm (12") diameter cardboard cores with release paper on one side and smooth polyethylene film separator on the other side. Rolls are sealed in plastic bags and packed in cardboard boxes.

**Standard width:** 60cm (23.6"), range from 30cm (11.8") up to 105cm (41.3")

**Standard length:** 100 m (109 In yds).

**Shipment:** Product should be shipped at  $< -18\text{ }^{\circ}\text{C}$  ( $< 0\text{ }^{\circ}\text{F}$ )

## HANDLING AND CONDITIONING

- Store rolls at  $-18\text{ }^{\circ}\text{C}$ , sealed in original packages.
- Shop life at  $23^{\circ}\text{C}$  refers to rolls sealed in original packages.
- Before using the prepreg, remove the roll from the freezer and let it warm up to room temperature for 6 hours sealed in its original package.

## IMPORTANT NOTICE:

The data and statements supplied in this datasheet are met to provide an overview of this product and its properties. Users should perform their own verification and testing to determine suitability of this material for their specific end use applications. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSED OR IMPLIED. Nothing herein is to be taken as permission to practice any patented invention without a licence.

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