

# T-Gel 160

## Epoxy Tooling Gelcoat System

- **Thermally stable up to 160°C (320°F) when fully postcured**
- **Resistant to thermal cycling damage**
- **Sag resistant to 0.75mm thickness on vertical surfaces**
- **Low shrinkage for accurate mould manufacture**
- **Application by roller or brush**

### Introduction

T-Gel 160 is an epoxy gelcoat system for manufacturing glass or carbon reinforced mould tools. T-Gel 160 is compatible with Gurit's range of 160°C tooling infusion and repair systems.

The system has a long over-coating time, which makes it suitable for larger infused T-Prime 160 tools. Pre-preg back up is not recommended with this system.

The formulation has been designed to provide excellent application handling and sag resistance to aid tool manufacture. As with all epoxy tooling systems, care must be taken to avoid exposure to sunlight to avoid breakdown of the surface.

To ensure sufficient strength for de-mould and gelcoat adhesion a mid cure of 4 hours at 40°C (104°F) is recommended after the ambient cure stage.

## Mix Ratio

T-Gel 160 should be mixed at the following mix ratio:

T-Gel 160 Resin	T-Gel 160 Hardener
100	35 (by weight)
100	49 (by volume)

Any deviation from the prescribed mix ratio may degrade the thermal capability and physical properties of the material.

## System Information

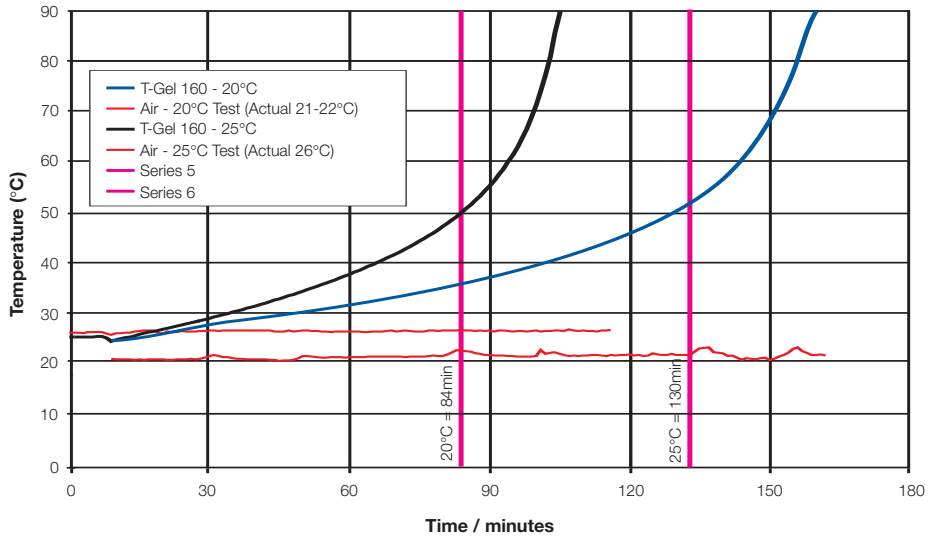
Component Properties		
	Resin	Hardener
Viscosity at 20°C (68°F)	172.7P (CAP 2000L, Cone 6, 375rpm)	34.9P (CAP 2000L, Cone 3, 150rpm)
Viscosity at 25°C (77°F)	119.2P (CAP 2000L, Cone 3, 50rpm)	19.5P (CAP 2000L, Cone 3, 150rpm)
Viscosity at 30°C (86°F)	75.6P (CAP 2000L, Cone 6, 375rpm)	11.2P (CAP 2000L, Cone 3, 150rpm)
Shelf Life (Months)	12	12
Colour (Gardner)	Black	1 (Pale Yellow)
Density gm/cm <sup>3</sup> (lb/ft <sup>3</sup> )	1.48 (92.4)	1.03 (64.3)
Hazard Category	Xi	T, C, N

Working Properties				
Mixed Density @ 20°C	1.35gm/cm <sup>3</sup> (84.3 lb/ft <sup>3</sup> )			
Initial Mixed Viscosity at 20°C (68°F)	204 P (CAP 2000L, Cone 6, 50rpm)			
Initial Mixed Viscosity at 25°C (77°F)	94 P (CAP 2000L, Cone 5, 100rpm)			
Initial Mixed Viscosity at 30°C (86°F)	61 P (CAP 2000L, Cone 5, 100rpm)			
Gel Time (150g in Water at 25°C)	0:51 (hours:minutes)			
Pot Life (500g in Air at 20°C)*	2:10 (hours:minutes)			
Pot Life (500g in Air at 25°C)*	1:24 (hours:minutes)			
Resin Gel times vs Temperature	20°C (68°F)	25°C (77°F)	30°C (86°F)	40°C (104°F)
Tack off Time (Thumb Test) (hours:minutes)	7:30	6:30	-	-
Brushable working time (5,000P Theoretical thin film) (hours:minutes)	4:40	3:40	2:40	1:45
Zero Flow Point (100,000P Theoretical thin film) (hours:minutes)	12:00	7:50	5:25	3:50
Overcoating window with T-Prime 160 at 20°C (68°F), 50-70% RH	6 days.			

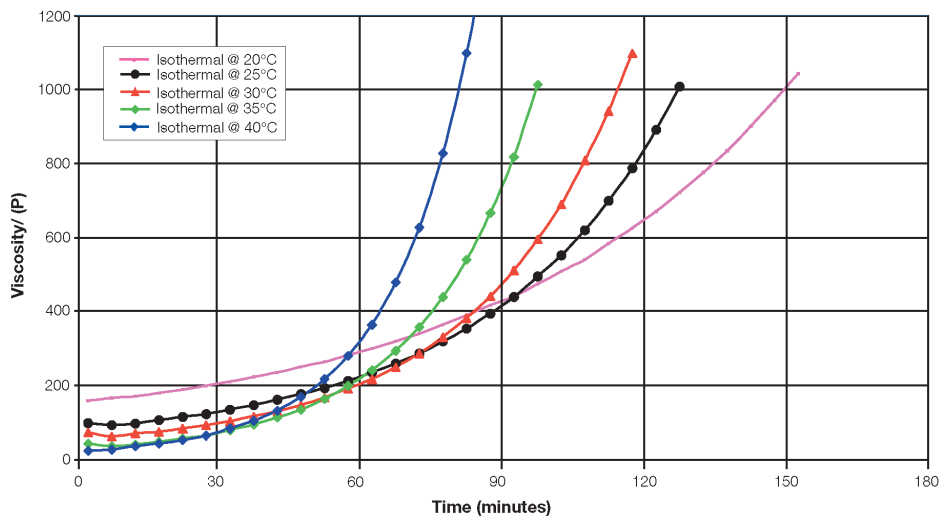
\* Pot life in larger volumes may be reduced. Material approaching its pot life is typically 40-50°C (104 – 122°F) in the centre of the pot and it will then thicken and become more difficult to work as it cools down on the plug or laminate surface.

**It is recommended to plan to change to a fresh mix of material every 45-60 minutes (at both 20°C / 68°F and 25°C / 77°F) to maintain ease of brushing.**

**T-Gel 160 500gm Pot-Life (SP Pot approx 55mm deep)**



**T-Gel 160 Isothermal Viscosity Profiles, CAP2000L Cone 6, 50rpm**



# Application Notes

- Any deviation from the prescribed mix ratio may degrade the thermal capability and physical properties of the material.
- 500 micron (0.66 Kg/m) is sufficient coating thickness for most moulds. For parts requiring post polishing or finishing a 800 micron (1.05 Kg/m<sup>2</sup>) coat is recommended
- Any pattern or plug materials, and release sealants and coatings should be fully cured to remove risk of inhibition and out gassing marks. When in doubt a suitable test panel should be done to simulate the workshop process.
- The recommended workshop temperature is between 18°C and 25°C (64°F and 77°F), 50-70% RH
- If “drill” style mixing is used, this must be on the lowest setting to reduce the air introduced. Particular attention is needed to mix the sides and bottom of the container.
- If a single mixing pot is used for application, avoid using the last material from the side and bottoms of the container, as this is most likely to be poorly mixed. Mix more resin to finish the last part of the job rather than scraping the container. Best practice is to mix in one pot, dispense into another and remix before use.
- As an approximate guide; if mixing small quantities (500gm) by hand it takes 2-3 minutes for the first mix. Dipense into a new container and mix again for 2-3 minutes. It is always recommended to mix for a further time period after you believe full mixing has been achieved to ensure it has been mixed correctly.
- Pouring large amounts of gelcoat onto the surface to work out can lead to markings and colour variations in the final tool surface. It is advised to only pour out the amount needed to brush out straight away, and then continuously add more to work along the tool. If using a roller it is best practice to pour the gelcoat onto the roller to then apply a film of gelcoat onto the plug surface.
- When using T-Gel 160, allow at least 24 hours at 20°C (68°F) before applying vacuum to ensure sufficient stiffness has been reached. Applying vacuum to early can lift the gelcoat and cause sink marks.
- With all epoxy gelcoat materials bi-product formation with carbon dioxide and water is a potential risk. T-Gel 160 is formulated to be a very low bi-product system but it has not been tested is every range of workshop conditions and users should satisfy themselves of the product suitability.
- The most common occurrence of bi-product is when materials are left in a workshop that is allowed to cool overnight and becomes damp. Maintain workshop environmental controls both day and night until the gelcoat hardens. When this is not possible apply the gelcoat in the morning to increase the degree of cure.

■ Bi-product has occurred if the surface looks or feels “oily” or “crocodile skinned”. Although T-Prime 160 is tolerant to bi-product, if seen this surface should be removed using a light solvent scotch bright scrub to increase bond strength.

# Cured Properties

## Ambient cure

When using together with T-Prime 160 a mid cure is recommended once these systems have been cured at ambient temperature together with the T-Gel 160.

## Mid cure

A mid cure of at least **4 hours at 40°C (104°F) is recommended before de-moulding T-Gel 160 when used with T-Prime 160** to maximise gelcoat adhesion and build sufficient resin strength for demould. Ramp rate is not critical at this stage.

Any obvious repairs are often easier to repair at this point, as T-Gel 160 will be softer and some un-reacted material remains for a chemical bond. PPE equipment is still required as at this point as approximately 13% un-reacted material still presents which poses an increased skin irritant risk to that of the fully cured system. (To reduce the remaining un-reacted material to less than 5% T-Gel 160 needs to be heated to at least 80°C following the postcure ramp rate).

## Post Cure

To achieve full postcure, ramp at **0.2°C /min to 150°C (8.5 hours) and dwell for 2 hours (0.36°F /min to 248°F)**. Faster postcure risks thermal softening of the tool and will increase the risk of distortion and shape change. The postcure can be stopped and re-started to look for and repair surface defects such as blisters from air inclusion during wet-laminating or other process failures if this is required. Contact SP for advice when in doubt.

Cured Properties			
Property	Unit	Mid Cure 4 Hours at 40°C (104°F)	Mid Cure + Postcure 2 hours at 150°C (302°F)
Cured Density	gm/cm <sup>3</sup> (lb/ft <sup>3</sup> )	1.32 (82.4)	1.32 (82.4)
Total Linear Shrinkage by density change	%	0.24	0.24
Barcol Hardness	-	43	52
Tg2 – by DSC	°C (°F)	53°C (127°F)	164°C (327°F)

# Approximate Materials Coverage

Zero waste allowance figures at different application thickness (An additional 10-15% waste allowance is normally used for materials estimation purposes)

- 500 Micron = 0.66 Kg/m<sup>2</sup>
- 800 Micron = 1.05 Kg/m<sup>2</sup>

Or coverage by pack size;

Pack Size / Kg	500 micron Coverage / m <sup>2</sup>	800 micron Coverage / m <sup>2</sup>
6.75	Zero waste = 11.3 Allowing 10% Waste = 10.2	Zero waste = 7.1 Allowing 10% Waste = 6.4
13.5	Zero waste = 22.6 Allowing 10% Waste = 20.4	Zero waste = 14.2 Allowing 10% Waste = 12.7

## Health and Safety

Users should ensure that some elevated temperature cure is applied to the component before trying to machine it. In a component made from T-Gel 160 that has seen no heat, there will only be a partial cure. Therefore the sanding dust will be more irritating than dust from a laminate cured at elevated temperature, in which there will be more thorough cross linking.

The following points must be considered:

1. Skin contact must be avoided by wearing protective 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. Overalls or other protective clothing should be worn when mixing, laminating or sanding. Contaminated work clothes should be thoroughly cleaned before re-use.
3. Eye protection should be worn if there is a risk of resin, hardener, solvent or dust entering the eyes. If this occurs flush the eye with water for 15 minutes, holding the eyelid open, and seek medical attention.
4. Ensure adequate ventilation in work areas. Respiratory protection should be worn if there is insufficient ventilation. Solvent vapours should not be inhaled as they can cause dizziness, headaches, loss of consciousness and can have long term health effects.

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 and if it settles on the skin then it should be washed off. After more extensive sanding operations a shower/bath and hair wash is advised.

Gurit produces a separate full Material Safety Data Sheet 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 from Gurit, and can be found on our website at [www.gurit.com](http://www.gurit.com)

## Applicable Risk & Safety Phrases

### Resin

R 36/38, 43, 52/53  
S 7, 8, 23, 24, 26, 37/39, 61

### Hardener

R 22, 23/24, 35, 43, 51/53  
S 4, 9, 26, 36/37/39, 45, 57



## Transport & Storage

The resin and hardener should be kept in securely closed containers during transport and storage. Any accidental spillage should be soaked up with sand, sawdust, cotton waste or any other absorbent material. The area should then be washed clean (see appropriate Safety Data Sheet).

Adequate long term storage conditions will result in a shelf life of 12 months for both the resin and hardener. Storage should be in a warm dry place out of direct sunlight and protected from frost. The temperature should be between 10°C and 25°C. Containers should be firmly closed. Hardeners, in particular, will suffer serious degradation if left exposed to air. The materials should be stirred before use.

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### **Gurit (Canada) Inc**

175 rue Péladeau,  
Magog, (Québec)  
J1X 5G9, Canada

**T** +1 819 847 2182

**F** +1 819 847 2572

**E** [info-na@gurit.com](mailto:info-na@gurit.com)

**W** [www.gurit.com](http://www.gurit.com)

### **Gurit (Kassel) GmbH**

Otto-Hahn-Strasse 5  
D-34123 Kassel  
Germany

**T** +49 (0) 561 99 85 63-0

**F** +49 (0) 561 99 85 63-22

**W** [www.gurit.com](http://www.gurit.com)

### **Gurit (Spain) SA**

Polígono Industrial Romica  
C/K, Parc.11c  
02080 - Albacete  
Spain

**T** +34 967 254 507

**F** +34 967 254 005

**W** [www.gurit.com](http://www.gurit.com)

### **Gurit (Tianjin) Composite Materials Co., Ltd.**

Hengtong Road, YSP.TEDA.  
Tianjin. P.R. China

**T** +86 22 8210 6850

**F** +86 22 8210 8622

**W** [www.gurit.com](http://www.gurit.com)

### **Gurit (UK) Ltd**

St Cross Business Park  
Newport, Isle of Wight  
United Kingdom PO30 5WU

**T** +44 (0) 1983 828 000

**F** +44 (0) 1983 828 100

**E** [info-uk@gurit.com](mailto:info-uk@gurit.com)

**W** [www.gurit.com](http://www.gurit.com)