Gurit EPOXY

PRODUCT DATASHEET

Gurit

GR280

HIGH TG LOW VISCOSITY EPOXY

GR280 is a two-component toughened epoxy resin formulated for RTM and Filament winding processes for manufacturing high quality structural carbon and glass fiber components.

GR280 has a low mixed viscosity at room temperature and versatile curing, this allows for low temperature injection or winding, and can then be followed by a pre-cure between 80-120°C. The resin has low viscosity and a long cure window at low-medium temperatures which allows complex or thick section laminates to be manufactured.

For further advice please contact Gurit Technical Support.

- Low viscosity designed for RTM and Filament winding applications
- Long pot-life and wide injection window
- De-moldable after 20 min at 120°C
- High Tg (>190°C) following cure at 180°C
- Excellent mechanical properties
- Mix ratio by weight 1:1

INSTRUCTIONS FOR USE

APPLICATION

GR280 resin is used with its specific GR280 hardener and is intended for use in closed mould processing or filament winding where heat and pressure can be applied to the laminate. The information provided in the tables in this datasheet should allow the user to achieve a successful result with this resin.

GR280 retains a good level of clarity and good resistance to yellowing at high temperatures. It is still recommended that components are coated with a UV-resistant lacquer where long-term UV stability is required.

GR280 is suitable for use with reinforcements containing low levels of epoxy binder. Please consult your local sales contact for further information or contact Gurit Technical Support. Full contact details can be found at www.gurit.com.

MIXING AND HANDLING

Accurate measurement and thorough mixing are essential when using this system, and any deviation from the prescribed mix ratios will seriously degrade the physical properties of the cured system.

The resin and hardener must be stirred well for two minutes or more, with particular attention being paid to the sides and bottom of the container. It is preferable to degas the mixed system at a minimum of 95% vacuum to remove as may air bubbles as possible prior to injection. As soon as the material is mixed the reaction begins. This reaction produces heat (exothermic), which will in turn accelerate the reaction. The system will, however, require heat in order to complete the reaction fully. If this mixed material is left in a confined mixing vessel which the heat cannot disperse the reaction will become uncontrollable.

Gurit produces a separate full Safety Data Sheet for each component of this system. Please ensure that you have the correct SDS 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. 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).

CURE SCHEDULE

GR280 is designed to be use in a heat cured, closed mould process. Minimum pre-cure temperature to achieve any mechanical performance for demoulding is 80°C. Shorter processing times can be achieved following a pre-cure cycle of 20 min at 120°C to generate enough green strength for de-moulding. The component should then be post cured up to 180°C to achieve ultimate mechanical and thermal performance. The tables below give a range of precure temperatures and times to then be followed by the 180°C post cure, the speed of the ramp rate for the post cure is determined by the fact of if the component is still within the mould (1-3°C/min) or is freestanding (0.3°C/min).

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, as per table, from the date of manufacture for both the resin and hardeners, see product container label for expiry date.

COMPONENT	UNITS	10 – 25°C
GR280 Resin	Months	18
GR280 Hardener	Months	12

Storage should be in a warm dry place out of direct sunlight and protected from frost. The storage temperature should be kept constant between 10°C and 25°C, cyclic fluctuations in temperature can cause crystallization. Containers should be firmly closed. Hardener, in particular, will suffer serious degradation if left exposed to air. Hardeners may darken over time, however the physical properties are not affected. Be aware of a possible mixed system colour change if very old and new hardeners are used on the same project.

GR280 RESIN & GR280 HARDENER

This product summary is intended for use in conjunction with further advice provided under the Instructions for Use section. All data has been generated from typical production material and does not constitute a product specification.

PROPERTY	UNITS	GR280 RESIN	GR280 HARDENER	MIXED SYSTEM	TEST METHOD
Mix ratio by weight	Parts by weight	100	100	-	-
Color	Gardner	1	9	9	-
Density at 21°C	g/cm3	1.16	1.19	1.17	ISO 1183-1B

COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	GR280 RESIN/HARDENER			TEST METHOD
GR280 Resin viscosity @ 25°C	cP	617			-
GR280 Hardener viscosity @ 25°C	cP	80			-
Initial mixed system viscosity @ 25°C	cP	280			-
Injection pressure and temperature	N/a	1-6bar at 80-120°C*			-
Winding temperature	N/a	15 to 30°C			-
Recommended pre cure times and temperatures	N/a	80°C for 120 minutes	100°C for 35 minutes	120°C for 20 minutes	-
Gel times at pre cure temperatures	Mins	86	21	4.3	-
Recommended post cure cycle	N/a	0.3°C/min ramp rate to 180°C + 1hr @ 180°C			-
Recommended in-mold single stage cure cycle	N/a	120°C for 20 minutes, 1-3°C/min ramp rate to 180°C, 1hr @ 180°C			-

**Lower temperature injections are possible but will require elevated temperature pre cures.*

CURED RESIN PROPERTIES

All data presented in this datasheet is based on the mechanical testing of a single batch of material. 4mm resin cast oven cured using standard processing techniques with the standard cure of 20 minutes at 120°C followed by a cool down before a post-cure of 1 hour at 180°C.

PROPERTY	SYMBOL	UNITS	20MIN AT 120 °C + 1H AT 180 °C	TEST METHOD
Glass transition temp.	Tg_1	°C (°F)	195-198	ASTM D7028
Tensile strength	σ_T	MPa	87.3	ISO 527-2
Tensile modulus	E_T	GPa	3.04	ISO 527-2
Tensile strain	-	%	3.6	ISO 527-2
Flexural strength	σ_F	MPa	130.0	ISO 178
Flexural modulus	E_F	GPa	3.12	ISO 178
Flexural strain	-	%	5.3	ISO 178
Appearance	-	-	Transparent	-

CURED LAMINATE MECHANICAL PROPERTIES

Laminates were pre-cured for 60 minutes at 105°C followed by a cool down before a post-cure of 1 hour at 180°C.

PROPERTY	SYMBOL	UNITS	GR280 / Unidirectional	TEST METHOD
Fabric / fiber description	-	-	390g/m2 stitched unidirectional using T620 24k fiber	-
Resin injection method	-	-	85°C (185°F) resin injection at 3 bar pressure	-
Pre cure schedule	-	-	45 minutes at 85°C (185°F) followed by a 3°C/min ramp up to 105°C (221°F) for a dwell of 60 minutes	-
Post cure schedule	-	-	1 hour at 180°C (255°F) with a ramp rate of 0.3°C/min	
Cured ply density	P_{ply}	g/cm3 (lb/in3)	1.52 – 1.56 (0.055 – 0.057)	-
Glass transition temperature	Tg_1	°C (°F)	195 – 198 (383 – 388)	ISO 6721 (DMA)
Cured ply thickness	t_{ply}	mm (in)	0.39 – 0.42 (0.015 – 0.017)	ASTM D 3171 method II
0° tensile cured fiber volume*	V_f	%	48.4	ASTM D 3171 method II
0° tensile strength (Normalised to 55%)	X_T	MPa (Ksi)	1518 (220.2)	ISO 527-4
0° tensile modulus (Normalised to 55%)	E_{T11}	GPa (Msi)	120.4 (17.5)	ISO 527-4
0° compressive strength fiber volume*	V_f	%	50.9	ASTM D 3171 method II
0° compressive strength (Normalised to 55%)	X_C	MPa (Ksi)	866 (125.6)	SACMA SRM1-94
0° compressive modulus fiber volume*	V_f	%	51.6	ASTM D 3171 method II
0° compressive modulus (Normalised to 55%)	E_{c11}	GPa (Msi)	103.8 (15.1)	SACMA SRM1-94
90° tensile cured fiber volume*	V_f	%	49.8	ASTM D 3171 method II
90° tensile strength	Y_T	MPa (Ksi)	31 (4.4)	ISO 527-4
90° tensile modulus	E_{T22}	GPa (Msi)	7.3 (1.1)	ISO 527-4
90° compressive strength fiber volume*	V_f	%	50.9	ASTM D 3171 method II
90° compressive strength	Y_C	MPa (Ksi)	188 (27)	SAMCA SRM1-94
90° compressive modulus fiber volume*	V_f	%	51.6	ASTM D 3171 method II
90° compressive modulus	E_{c22}	GPa (Msi)	7.5 (1.1)	SACMA SRM1-94
0° flexural fiber volume*	V_f	%	50.4	ASTM D 3171 method II
0° flexural strength	X_f	MPa (Ksi)	1103 (160)	ISO 14125
0° flexural modulus	E_{F11}	GPa (Msi)	89 (13)	ISO 14125
±45° in-plane shear fiber volume	V_f	%	48.0	ASTM D 3171 method II
±45° in-plane shear strength (@ 5% shear strain)	τ_{12}	MPa (Ksi)	58 (8.5)	ISO 14129
±45° in-plane shear modulus	G_{12}	GPa (Msi)	4.1 (0.6)	ISO 14129
±45° in-plane shear poisson's ratio	ν_{12}	µm/m	0.55	ISO 14129
0° ILSS fiber volume*	V_f	%	52.5	ASTM D 3171 method II
0° ILSS	X_{ILSS}	MPa (Ksi)	77 (11)	ISO 14130

**Original fiber volume fraction*

HEALTH AND SAFETY

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 moisturizing cream should be used after washing.
2. 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 vapors 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 & vaping
   - 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 Safety Data Sheet for all hazardous products. Please ensure that you have the correct SDS to hand for the materials you are using before commencing work.

NOTICE

All advice, instruction or recommendation is given in good faith but the selling Gurit entity (the Company) only warrants that advice in writing is given with reasonable skill and care. No further duty or responsibility is accepted by the Company. All advice is given subject to the terms and conditions of sale (the Conditions) which are available on request from the Company or may be viewed at Gurit's Website: www.gurit.com/terms-and-conditions.aspx

The Company strongly recommends that Customers make test panels in the final process conditions and conduct appropriate testing of any goods or materials supplied by the Company prior to final use 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. Due to the varied nature of end-use applications, the Company does, in particular, not warrant that the test panels in the final process conditions and/or the final component pass any fire standards.

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 is continuously reviewing and updating literature. Please ensure that you have the current version by contacting your sales contact and quoting the revision number in the bottom left-hand corner of this page.

CONTACT INFORMATION

Please see local contact information at www.gurit.com

24-HOUR CHEMICAL EMERGENCY NUMBER

For advice on chemical emergencies, spillages, fires or exposures:

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