

# AMPREG™ 31

## EPOXY WET LAMINATING SYSTEM

**Ampreg 31 has been optimized for the manufacture of large composite structures using hand layup and vacuum bagging techniques whilst offering improved health and safety.**

The viscosity of Ampreg 31 has been optimized for good fabric wet-out whilst maintaining good drainage resistance for application on vertical surfaces. Ampreg 31 has been designed to give excellent mechanical and thermal properties from both ambient temperature cures and moderate temperature postcures.

The unique formulation offers improved health & safety through the careful selection of low toxicity raw materials as well as Light Reflective Technology which in conjunction with a UV light-source can detect droplets as small as 1mm for easy identification of contamination to improve industrial hygiene.

Ampreg 31 contains BIO sourced materials as standard with a BIO content range from 6% to 32%.

This system is available with all Ampreg 3X Hardener speeds, as well as Ampreg High Tg Hardener and in a wide range of formats from small pack sizes to drums and IBCs. For further advice please contact Gurit Technical Support.



- Uses Ampreg 3X low toxicity hardeners
- Up to 32% BIO carbon content in resin
- Viscosity optimized for good fabric wet-out and drainage resistance
- Tough resin matrix giving good laminate mechanical properties
- Formulated with Gurit LRT (Light Reflective Technology)
- Tested in high humidity environments
- Lloyds Register & DNV certified
- Speciality hardeners available
- Ampreg 3X Fast, Standard, Slow, Extra-Slow Hardener
- Mix ratio by weight 100:26

## INSTRUCTIONS FOR USE

### APPLICATION

The product is optimized for use between 18 - 25°C (64 – 77°F), mixing is recommended at minimum 15°C. The mixed system will cure at lower temperatures on substrates down to 5°C. Lower application temperatures will progressively increase the viscosity of the resin and hardeners making it difficult to mix and wet out the reinforcement. The preferred level of humidity for use is <70%, however the product can be used at higher levels, see appropriate section in this TDS.

### 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. Ampreg 3X fast and extra-slow hardeners can be blended in order to achieve intermediate speeds as indicated in the table.

HARDENER	FAST	STANDARD	SLOW	EXTRA-SLOW
Ampreg 3X Fast	100%	67%	25%	0%
Ampreg 3X Extra-slow	0%	33%	75%	100%

When blending hardeners, it is recommended that the hardener components are dispensed and mixed together for approximately 2 minutes before the addition to the resin.

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. As soon as the material is mixed the reaction begins. This reaction produces heat (exothermic), which will in turn accelerate the reaction. If this mixed material is left in a confined mixing vessel the heat cannot disperse and 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](http://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).

### APPLICATION

Ampreg 31 resin used with Ampreg 3X hardeners is usually applied by foam roller from a roller tray or brush. Accurate fiber volume fractions can be obtained by applying a known weight of mixed resin / hardener to each fabric / fiber layer. If the laminate is particularly thick, it is recommended that slower hardeners are used for laminating the first layers and faster hardeners in the later layers. In this way the whole thickness laid down remains workable for approximately the same time. For further advice, please contact Gurit Technical Support.

### CURE SCHEDULE

The system has been developed to provide good mechanical properties after an ambient only cure. The minimum recommended cure temperature is 18°C. Excellent mechanical/thermal properties can be achieved after a slightly elevated temperature post-cure. An initial cure of at least 48 hours (with slow hardener) or 16 hours (with fast hardener) at 18°C (64°F) is recommended before demolding.

When using the Slow, Extra Slow or High Tg Hardeners exclusively, an elevated temperature postcure is strongly recommended.

Post curing the laminate will greatly increase mechanical/thermal properties. The system will achieve similar properties with a cure of 5 hours at 70°C (158°F) or 16 hours at 50°C (122°F). The latter temperature is easily achievable with low cost heating and insulation techniques.

The post cure need not be carried out immediately after laminating. It is possible to assemble several composite components and post-cure the entire assembly together. It is recommended, however, that elevated temperature curing should be completed before any further painting / finishing operations. Furthermore, care should be taken to adequately support the laminate if it is to be post cured after demolding, and the laminate must be allowed to cool before the support is removed.

When postcuring it is recommended to use a ramp rate of 10°C (18°F) / hour when heating from ambient to the postcure temperature, to ensure that the thermal performance of the laminate stays ahead of the oven temperature. Higher ramp rates may result in the resin softening and distortion of the part.

### HIGH HUMIDITY DURING LAMINATION

Although the recommended ambient relative humidity remains <70%, Gurit has successfully carried out testing at 90% relative humidity using the Fast Hardener which showed no significant drop in ILSS. For the testing carried out by Gurit, subsequent plies were applied within 5 mins of each other and vacuum & heat was applied directly following full lamination. As mechanical properties are highly dependent on the processing method, Gurit recommends that a test laminate is manufactured and evaluated in representative conditions in order to ensure that the required performance is achieved.

### LIGHT REFLECTIVE TECHNOLOGY (LRT)

Ampreg 31 is formulated with Gurit's Light Reflective Technology included as standard, which causes the resin or mixed system to fluoresce under UV light and can assist in developing best practise post work. This ensures minimum exposure and no transfer of epoxy outside the workshop, significantly reducing the risks of sensitization and other conditions associated with contact with uncured resins. Contact Gurit Technical Support for further information.

## 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 (50 – 77°F)
Ampreg 31 Resin	Months	36
Ampreg 3X Fast, Std. Slow, Extra Slow Hardeners	Months	36
Ampreg 3X Ultra Slow Hardener. Ampreg 3X High Tg Hardener	Months	24

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 - 25°C (50 – 77°F), 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 color change if very old and new hardeners are used on the same project.

## AMPREG 31 RESIN & AMPREG 3X FAST 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	AMPREG 31 RESIN	FAST HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Yellow	Dark Orange	Orange	-
Mix ratio by weight	Parts by weight	100	26	-	-
Mix ratio by volume	Parts by volume	100	30	-	-
Density at 21°C	g/cm3	1.00 - 1.20	0.90 - 1.10	1.08	ISO 1183-1B

## COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	20°C	25°C	30°C	TEST METHOD
Ampreg 31 resin viscosity	cP	3900 - 4300	2000 - 2800	900 - 1300	-
Ampreg 3X Fast Hardener viscosity	cP	500 - 600	300 - 500	150 - 250	-
Initial mixed system viscosity	cP	1360 - 1470	730 - 840	480 - 590	-
Pot life (150 g, mixed in water)*	hrs:min	-	00:25 - 00:35	-	Tecam gel time
Earliest time to apply vacuum	hrs:min	-	01:20	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	01:50	-	Theoretical, thin film
Earliest demold time	hrs:min	-	02:45	-	Theoretical, thin film

## CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Glass transition temp.	T <sub>g2</sub>	°C	59	79	92	ISO 11357 (DSC)
Ultimate glass transition temp.	UT <sub>g2</sub>	°C	-	100	-	ISO 11357 (DSC)
Cured density	ρ <sub>CURED</sub>	g/cm3	-	1.16	-	ISO 1183-1A
Linear shrinkage	-	%	-	1.56	-	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	-	33	-	ISO 62
Tensile strength	σ <sub>T</sub>	MPa	46.3	73.0	80.8	ISO 527-2
Tensile modulus	E <sub>T</sub>	GPa	3.69	3.45	3.38	ISO 527-2
Tensile strain	ε <sub>T</sub>	%	1.37	3.58	8.59	ISO 527-2
Flexural strength	σ <sub>F</sub>	N/mm2	85.5	121.6	125.3	ISO 178
Flexural modulus	E <sub>F</sub>	GPa	3.53	3.23	3.18	ISO 178
Flexural strain	ε <sub>F</sub>	%	2.85	8.79	8.06	ISO 178

## CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Fiber volume fraction	V <sub>FVF</sub>	%	-	-	-	ASTM D 3171 Method II
ILSS***	X <sub>ILSS</sub>	MPa	47.9	51.4	-	ISO 14130
ILSS (after 7 days in water)***	X <sub>ILSS</sub>	MPa	-	52.2	-	ISO 14130

\*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline

\*\*initial cure of 24 hours at 21°C

\*\*\*laminate construction: 8 plies of RE301H8, 50% resin content by weight

## AMPREG 31 RESIN & AMPREG 3X STANDARD 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	AMPREG 31 RESIN	STANDARD HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Yellow	Very Dark Orange	Orange	-
Mix ratio by weight	Parts by weight	100	26	-	-
Mix ratio by volume	Parts by volume	100	30	-	-
Density at 21°C	g/cm <sup>3</sup>	1.00 - 1.20	0.95 - 1.15	1.08	ISO 1183-1B

## COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	20°C	25°C	30°C	TEST METHOD
Ampreg 31 Resin viscosity	cP	3900 - 4300	2000 - 2800	900 - 1300	-
Ampreg 3X Standard Hardener viscosity	cP	150 - 200	100 - 150	50 - 100	-
Initial mixed system viscosity	cP	850 - 950	500 - 590	300 - 400	-
Pot life (150 g, mixed in water)*	hrs:min	-	01:00 - 01:10	-	Tecam gel time
Earliest time to apply vacuum	hrs:min	-	02:00	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	02:40	-	Theoretical, thin film
Earliest demold time	hrs:min	-	05:00	-	Theoretical, thin film

## CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Glass transition temp.	T <sub>g2</sub>	°C	59	78	91	ISO 11357 (DSC)
Ultimate glass transition temp.	UT <sub>g2</sub>	°C	-	99	-	ISO 11357 (DSC)
Cured density	ρ <sub>CURED</sub>	g/cm <sup>3</sup>	-	1.16	-	ISO 1183-1A
Linear shrinkage	-	%	-	1.61	-	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	-	33	-	ISO 62
Tensile strength	σ <sub>T</sub>	MPa	47.6	76.9	78.0	ISO 527-2
Tensile modulus	E <sub>T</sub>	GPa	3.62	3.42	3.24	ISO 527-2
Tensile strain	ε <sub>T</sub>	%	4.46	4.94	8.51	ISO 527-2
Flexural strength	σ <sub>F</sub>	N/mm <sup>2</sup>	92.5	126.4	123.7	ISO 178
Flexural modulus	E <sub>F</sub>	GPa	3.53	3.43	3.21	ISO 178
Flexural strain	ε <sub>F</sub>	%	3.63	8.40	8.02	ISO 178

## CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Fiber volume fraction	V <sub>FVF</sub>	%	-	-	-	ASTM D 3171 Method II
ILSS***	X <sub>ILSS</sub>	MPa	42.3	43.8	-	ISO 14130
ILSS (after 7 days in water)***	X <sub>ILSS</sub>	MPa	-	41.8	-	ISO 14130

\*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline

\*\*initial cure of 24 hours at 21°C

\*\*\*laminare construction: 8 plies of RE301H8, 50% resin content by weight

## AMPREG 31 RESIN & AMPREG 3X SLOW 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	AMPREG 31 RESIN	SLOW HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Yellow	Burnt Orange	Yellow	-
Mix ratio by weight	Parts by weight	100	26	-	-
Mix ratio by volume	Parts by volume	100	31	-	-
Density at 21°C	g/cm <sup>3</sup>	1.00 - 1.20	0.90 - 1.10	1.08	ISO 1183-1B

## COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	20°C	25°C	30°C	TEST METHOD
Ampreg 31 Resin viscosity	cP	3900 - 4300	2000 - 2800	900 - 1300	-
Ampreg 3X Slow Hardener viscosity	cP	24 - 34	20 - 30	14 - 20	-
Initial mixed system viscosity	cP	425 - 525	235 - 335	150 - 250	-
Pot life (150 g, mixed in water)*	hrs:min	-	03:20 - 03:40	-	Tecam gel time
Earliest time to apply vacuum	hrs:min	-	03:20	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	04:15	-	Theoretical, thin film
Earliest demold time	hrs:min	-	12:00	-	Theoretical, thin film

## CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Glass transition temp.	T <sub>g2</sub>	°C	56	75	87	ISO 11357 (DSC)
Ultimate glass transition temp.	UT <sub>g2</sub>	°C	-	99	-	ISO 11357 (DSC)
Cured density	ρ <sub>CURED</sub>	g/cm <sup>3</sup>	-	1.15	-	ISO 1183-1A
Linear shrinkage	-	%	-	1.65	-	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	-	28	-	ISO 62
Tensile strength	σ <sub>T</sub>	MPa	44.1	72.9	79.4	ISO 527-2
Tensile modulus	E <sub>T</sub>	GPa	3.67	3.34	3.41	ISO 527-2
Tensile strain	ε <sub>T</sub>	%	1.48	5.02	7.52	ISO 527-2
Flexural strength	σ <sub>F</sub>	N/mm <sup>2</sup>	82.6	118.7	117.0	ISO 178
Flexural modulus	E <sub>F</sub>	GPa	3.51	3.27	3.05	ISO 178
Flexural strain	ε <sub>F</sub>	%	3.10	9.48	9.53	ISO 178

## CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Fiber volume fraction	V <sub>FVF</sub>	%	-	-	-	ASTM D 3171 method II
ILSS***	X <sub>ILSS</sub>	MPa	46.1	49.3	-	ISO 14130
ILSS (after 7 days in water)***	X <sub>ILSS</sub>	MPa	-	48.7	-	ISO 14130

\*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline

\*\*initial cure of 24 hours at 21°C

\*\*\*laminate construction: 8 plies of RE301H8, 50% resin content by weight

## AMPREG 31 RESIN & AMPREG 3X EXTRA-SLOW 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	AMPREG 31 RESIN	EXTRA-SLOW HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Yellow	Colorless / very pale yellow	Colorless / very pale yellow	-
Mix ratio by weight	Parts by weight	100	26	-	-
Mix ratio by volume	Parts by volume	100	31.5	-	-
Density at 21°C	g/cm <sup>3</sup>	1.00 - 1.20	0.85 - 1.05	1.07	ISO 1183-1B

## COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	20°C	25°C	30°C	TEST METHOD
Ampreg 31 Resin viscosity	cP	3900 - 4300	2000 - 2800	900 - 1300	-
Ampreg 3X Extra-Slow Hardener viscosity	cP	15 - 20	5 - 15	5 - 10	-
Initial mixed system viscosity	cP	290 - 390	160 - 260	90 - 190	-
Pot life (150 g, mixed in water)*	hrs:min	-	04:20 – 05:00	-	Tecam gel time
Earliest time to apply vacuum	hrs:min	-	04:20	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	05:30	-	Theoretical, thin film
Earliest demold time	hrs:min	-	20:00	-	Theoretical, thin film

## CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Glass transition temp.	T <sub>g2</sub>	°C	55	73	86	ISO 11357 (DSC)
Ultimate glass transition temp.	UT <sub>g2</sub>	°C	-	98	-	ISO 11357 (DSC)
Cured density	ρ <sub>CURED</sub>	g/cm <sup>3</sup>	-	1.147	-	ISO 1183-1A
Linear shrinkage	-	%	-	1.71	-	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	-	27	-	ISO 62
Tensile strength	σ <sub>T</sub>	MPa	42.5	72.3	72.0	ISO 527-2
Tensile modulus	E <sub>T</sub>	GPa	3.58	3.35	3.08	ISO 527-2
Tensile strain	ε <sub>T</sub>	%	3.28	5.85	7.22	ISO 527-2
Flexural strength	σ <sub>F</sub>	N/mm <sup>2</sup>	81.7	116	114	ISO 178
Flexural modulus	E <sub>F</sub>	GPa	3.41	3.24	3.04	ISO 178
Flexural strain	ε <sub>F</sub>	%	3.55	9.94	9.43	ISO 178

## CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	5 HOURS @ 70°C**	TEST METHOD
Fiber volume fraction	V <sub>FVF</sub>	%	-	-	-	ASTM D 3171 method II
ILSS***	X <sub>ILSS</sub>	MPa	45.7	48.9	-	ISO 14130
ILSS (after 7 days in water)***	X <sub>ILSS</sub>	MPa	-	48.4	-	ISO 14130

\*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline

\*\*initial cure of 24 hours at 21°C

\*\*\*laminare construction: 8 plies of RE301H8, 50% resin content by weight

## AMPREG 31 RESIN & AMPREG 3X ULTRA-SLOW HARDENER

### SPECIALITY HARDENER

This hardener does not fall within our low toxicity and common mix ratio range of the standard 3X range of hardeners, see MSDS for details. 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	AMPREG 31 RESIN	ULTRA-SLOW HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Yellow	Blue	Green	-
Mix ratio by weight	Parts by weight	100	29	-	-
Mix ratio by volume	Parts by volume	100	36	-	-
Density at 21°C	g/cm <sup>3</sup>	1.12	0.94	1.07	ISO 1183-1B

### COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	20°C	25°C	30°C	TEST METHOD
Ampreg 31 Resin viscosity	cP	4100	2400	?	-
Ampreg 3X Ultra-Slow Hardener viscosity	cP	22	14	?	-
Initial mixed system viscosity	cP	607	377	?	-
Pot life (150 g, mixed in water)*	hrs:min	-	07:45		Tecam gel time
Earliest time to apply vacuum	hrs:min	-	08:30		Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	10:00		Theoretical, thin film
Earliest demold time	hrs:min	-	55:00		Theoretical, thin film

### CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Glass transition temp.	T <sub>g2</sub>	°C	53	61	ISO 11357 (DSC)
Ultimate glass transition temp.	UT <sub>g2</sub>	°C	87	81	ISO 11357 (DSC)
Glass transition temp.	T <sub>g1</sub>	°C	51	66	ISO 6721 (DMA)
Cured density	ρ <sub>CURED</sub>	g/cm <sup>3</sup>	1.15	1.14	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	-	0.25	ISO 62
Tensile strength	σ <sub>T</sub>	MPa	34	59	ISO 527-2
Tensile modulus	E <sub>T</sub>	GPa	3.2	3.3	ISO 527-2
Tensile strain	ε <sub>T</sub>	%	1.2	2.3	ISO 527-2
Flexural strength	σ <sub>F</sub>	N/mm <sup>2</sup>	61	114	ISO 178
Flexural modulus	E <sub>F</sub>	GPa	3.4	3.4	ISO 178
Flexural strain	ε <sub>F</sub>	%	2.0	4.8	ISO 178

### CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Fiber volume fraction	V <sub>FVF</sub>	%	39	39	ASTM D 3171 method II
ILSS***	X <sub>ILSS</sub>	MPa	43	49	ISO 14130
ILSS (after 7 days in water)***	X <sub>ILSS</sub>	MPa	41	46	ISO 14130

\*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline

\*\*initial cure of 24 hours at 21°C

\*\*\*laminate construction: 8 plies of RE301H8, 50% resin content by weight



## AMPREG 31 RESIN & AMPREG 3X HIGH T<sub>g</sub> HARDENER

### SPECIALITY HARDENER

This hardener does not fall within our low toxicity and common mix ratio range of the standard 3X range of hardeners, see SDS for details. 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	AMPREG 31 RESIN	HIGH T <sub>g</sub> HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Yellow	Colorless	Yellow	-
Mix ratio by weight	Parts by weight	100	28	-	-
Mix ratio by volume	Parts by volume	100	29	-	-
Density at 21°C	g/cm <sup>3</sup>	1.12	0.96	1.08	ISO 1183-1B

### COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	20°C	25°C	30°C	TEST METHOD
Ampreg 31 Resin viscosity	cP	3900 - 4300	2000 - 2800	900 - 1300	-
Ampreg 3X High T <sub>g</sub> Hardener viscosity	cP	80	60	40	-
Initial mixed system viscosity	cP	1110	?	?	-
Pot life (150 g, mixed in water)*	hrs:min	05:40	?	-	Tecam gel time
Earliest time to apply vacuum	hrs:min	04:40	?	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	06:40	?	-	Theoretical, thin film
Earliest demold time	hrs:min	30:00	?	-	Theoretical, thin film

### CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	16 HOURS @ 50°C**	5 HOURS @ 85°C**	TEST METHOD
Glass transition temp.	T <sub>g2</sub>	°C	71	100	ISO 11357 (DSC)
Ultimate glass transition temp.	UT <sub>g2</sub>	°C	114	-	ISO 11357 (DSC)
Glass transition temp.	T <sub>g1</sub>	°C	77	-	ISO 6721 (DMA)
Cured density	ρ <sub>CURED</sub>	g/cm <sup>3</sup>	1.14	-	ISO 1183-1A
Linear shrinkage	-	mg	1.77	-	ISO 62
Tensile strength	σ <sub>T</sub>	MPa	75.6	-	ISO 527-2
Tensile modulus	E <sub>T</sub>	GPa	3.25	-	ISO 527-2
Tensile strain	ε <sub>T</sub>	%	6.58	-	ISO 527-2

### CURED LAMINATE\*\*\* MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	16 HOURS @ 50°C**	TEST METHOD
Cured ply thickness	-	mm	0.31	ASTM D792
Fiber volume fraction	V <sub>FVF</sub>	%	36-37	ASTM D 3171 method II
0° Tensile strength****	X <sub>T</sub>	MPa	401.4	ISO 527-4
0° Tensile modulus****	E <sub>t</sub>	GPa	20.9	ISO 527-4
0° Compressive strength****	X <sub>C</sub>	MPa	342.2	SACMA SRM1-94
0° Compressive modulus****	E <sub>c</sub>	GPa	-	SACMA SRM1-94
ILSS	X <sub>ILSS</sub>	MPa	43.4	ISO 14130

\*working time properties are highly subjective to ambient conditions and should be used as an approximate guideline

\*\*initial cure of 24 hours at 21°C

\*\*\*laminate construction: 8 plies of RE301H8, 50% resin content by weight \*\*\*\*normalised to 40% 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](http://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](http://www.gurit.com)

## 24-HOUR CHEMICAL EMERGENCY NUMBER

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

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