

AMPREG™ 36

LOW VISCOSITY PREMIUM EPOXY WET LAMINATING SYSTEM

Ampreg 36 is Gurit's premium epoxy laminating system and is particularly suitable for the manufacture of large, high-performance composite structures, whilst offering improved health and safety through the careful selection of low toxicity raw materials. The product's superior laminate mechanical properties and high Tg's achievable from modest post-cures, make it well suited for heavily loaded applications, particularly those where a little extra thermal performance is required.

Ampreg 36 is optimized for use in hand-lay up and vacuum bagging processes, but can also be used in other processes such as RTM, vacuum infusion, pultrusion and filament winding. Ampreg 36 is recognised worldwide as the premium laminating system for the manufacture of racing sailboats, and high performance, one-off cruising boats.

The unique formulation offers improved health & safety through the careful selection of low toxicity raw materials.

This system is available with all Ampreg 3X Hardener speeds and in a wide range of formats from small pack sizes to drums and IBCs. For further advice please contact your Gurit representative.



- Uses Ampreg 3X low toxicity hardeners
- Improved fabric impregnation with lower initial mixed viscosity
- Faster mechanical property generation at ambient cure
- High flexural properties without compromising tensile performance
- Ampreg 3X Hardener mix ratio by weight 100:29

INSTRUCTIONS FOR USE

APPLICATION

The product is optimized for use between 18 - 25°C (64 – 77°F) At lower temperatures the product thickens and may become unworkable. At higher temperatures working times will be significantly reduced. Maximum relative humidity for use is 70%.

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. 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 36 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 (64°F). 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.

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 36 Resin	Months	24
Ampreg 3X Hardeners	Months	36

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 36 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 36 RESIN	FAST HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Colorless	Dark Orange	Orange	-
Mix ratio by weight	Parts by weight	100	29	-	-
Mix ratio by volume	Parts by volume	100	34	-	-
Density at 21°C	g/cm ³	1.15	1.00	1.13	ISO 1183-1B

COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	15°C	20°C	25°C	30°C	TEST METHOD
Ampreg 36 Resin viscosity	cP	3220	1840	1050	585	-
Ampreg 3X Fast Hardener viscosity	cP	900 - 1000	500 - 600	300 - 500	150 - 250	-
Initial mixed system viscosity	cP	-	-	696	-	-
Pot Life (150 g, mixed in water)*	hrs:min	-	-	00:25	-	Tecam Gel Time
Earliest time to apply vacuum	hrs:min	-	-	01:26	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	-	01:54	-	Theoretical, thin film
Earliest demold time	hrs:min	-	-	02:46	-	Theoretical, thin film

CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Glass transition temp.	T _{g2}	°C	57	79	ISO 11357 (DSC)
Ultimate glass transition temp.	UT _{g2}	°C	-	98	ISO 11357 (DSC)
Cured density	ρ _{CURED}	g/cm ³	-	1.18	ISO 1183-1A
Linear shrinkage	-	%	-	1.37	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	0.9	-	ISO 62
Tensile strength	σ _T	MPa	64	85	ISO 527-2
Tensile modulus	E _T	GPa	3.82	3.51	ISO 527-2
Tensile strain	ε _T	%	2.29	5.72	ISO 527-2
Flexural strength	σ _F	N/mm ²	89	135	ISO 178
Flexural modulus	E _F	GPa	2.96	3.61	ISO 178
Flexural strain	ε _F	%	3.27	8.33	ISO 178

CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Fiber volume fraction	V _{FVF}	%	34.5	35.3	ASTM D 3171 Method II
ILSS***	X _{ILSS}	MPa	46.7	47.8	ISO 14130
ILSS (after 7 days in water)***	X _{ILSS}	MPa	-	45.6	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 36 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 36 RESIN	STANDARD HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Colorless	Very Dark Orange	Orange	-
Mix ratio by weight	Parts by weight	100	29	-	-
Mix ratio by volume	Parts by volume	100	35	-	-
Density at 21°C	g/cm ³	1.15	1.00	1.13	ISO 1183-1B

COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	15°C	20°C	25°C	30°C	TEST METHOD
Ampreg 36 Resin viscosity	cP	3220	1840	1050	585	-
Ampreg 3X Standard Hardener viscosity	cP	200 - 300	150 - 200	100 - 150	50 - 100	-
Initial mixed system viscosity	cP	-	-	446	-	-
Pot life (150 g, mixed in water)*	hrs:min	-	-	01:00	-	Tecam Gel Time
Earliest time to apply vacuum	hrs:min	-	-	02:19	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	-	02:59	-	Theoretical, thin film
Earliest demold time	hrs:min	-	-	05:49	-	Theoretical, thin film

CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Glass transition temp.	T _{g2}	°C	58	77	ISO 11357 (DSC)
Ultimate glass transition temp.	UT _{g2}	°C	-	95	ISO 11357 (DSC)
Cured density	ρ _{CURED}	g/cm ³	-	1.18	ISO 1183-1A
Linear shrinkage	-	%	-	1.40	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	0.8	-	ISO 62
Tensile strength	σ _T	MPa	53	81	ISO 527-2
Tensile modulus	E _T	GPa	3.90	3.48	ISO 527-2
Tensile strain	ε _T	%	1.64	5.97	ISO 527-2
Flexural strength	σ _F	N/mm ²	80	130	ISO 178
Flexural modulus	E _F	GPa	3.46	3.54	ISO 178
Flexural strain	ε _F	%	2.40	9.30	ISO 178

CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Fiber volume fraction	V _{FVF}	%	36.8	36.5	ASTM D 3171 Method II
ILSS***	X _{ILSS}	MPa	48.5	50.3	ISO 14130
ILSS (after 7 days in water)***	X _{ILSS}	MPa	-	49.2	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 36 RESIN & AMPREG 3X SLOW HARDENER

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PROPERTY	UNITS	AMPREG 36 RESIN	SLOW HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Colorless	Burnt Orange	Yellow	-
Mix ratio by weight	Parts by weight	100	29	-	-
Mix ratio by volume	Parts by volume	100	36	-	-
Density at 21°C	g/cm ³	1.15	1.00	1.11	ISO 1183-1B

COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	15°C	20°C	25°C	30°C	TEST METHOD
Ampreg 36 Resin viscosity	cP	3220	1840	1050	585	-
Ampreg 3X Slow Hardener viscosity	cP	34 - 42	24 - 34	20 - 30	14 - 20	-
Initial mixed system viscosity	cP	-	-	276	-	-
Pot life (150 g, mixed in water)*	hrs:min	-	-	03:35	-	Tecam Gel Time
Earliest time to apply vacuum	hrs:min	-	-	03:32	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	-	04:26	-	Theoretical, thin film
Earliest demold time	hrs:min	-	-	13:04	-	Theoretical, thin film

CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Glass transition temp.	T _{g2}	°C	57	70	ISO 11357 (DSC)
Ultimate glass transition temp.	UT _{g2}	°C	-	94	ISO 11357 (DSC)
Cured density	ρ _{CURED}	g/cm ³	-	1.17	ISO 1183-1A
Linear shrinkage	-	%	-	1.63	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	0.8	-	ISO 62
Tensile strength	σ _T	MPa	52	78	ISO 527-2
Tensile modulus	E _T	GPa	3.69	3.37	ISO 527-2
Tensile strain	ε _T	%	1.69	5.58	ISO 527-2
Flexural strength	σ _F	N/mm ²	83	126	ISO 178
Flexural modulus	E _F	GPa	3.60	3.46	ISO 178
Flexural strain	ε _F	%	2.43	10.2	ISO 178

CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Fiber volume fraction	V _{FVF}	%	37.3	35.9	ASTM D 3171 Method II
ILSS***	X _{ILSS}	MPa	45.3	51.1	ISO 14130
ILSS (after 7 days in water)***	X _{ILSS}	MPa	-	50.5	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 36 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 36 RESIN	EXTRA-SLOW HARDENER	MIXED SYSTEM	TEST METHOD
Color	-	Colorless	Colorless / Very Pale Yellow	Colorless / Very Pale Yellow	-
Mix ratio by weight	Parts by weight	100	29	-	-
Mix ratio by volume	Parts by volume	100	36	-	-
Density at 21°C	g/cm ³	1.15	0.95	1.10	ISO 1183-1B

COMPONENT & MIXED SYSTEM PROPERTIES

PROPERTY	UNITS	15°C	20°C	25°C	30°C	TEST METHOD
Ampreg 36 Resin viscosity	cP	3220	1840	1050	585	-
Ampreg 3X Extra-Slow Hardener viscosity	cP	18 - 28	15 - 20	5 - 15	5 - 10	-
Initial mixed system viscosity	cP	-	-	209	-	-
Pot life (150 g, mixed in water)*	hrs:min	-	-	06:06	-	Tecam Gel Time
Earliest time to apply vacuum	hrs:min	-	-	04:40	-	Theoretical, thin film
Latest time to apply vacuum	hrs:min	-	-	05:43	-	Theoretical, thin film
Earliest demold time	hrs:min	-	-	21:18	-	Theoretical, thin film

CURED RESIN PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Glass transition temp.	T _{g2}	°C	56	69	ISO 11357 (DSC)
Ultimate glass transition temp.	UT _{g2}	°C	-	93	ISO 11357 (DSC)
Cured density	ρ _{CURED}	g/cm ³	-	1.16	ISO 1183-1A
Linear shrinkage	-	%	-	1.65	ISO 1183-1A
28 day water uptake (coupon size 60x60x1mm)	-	mg	0.8	-	ISO 62
Tensile strength	σ _T	MPa	51	78	ISO 527-2
Tensile modulus	E _T	GPa	3.86	3.45	ISO 527-2
Tensile strain	ε _T	%	1.62	5.05	ISO 527-2
Flexural strength	σ _F	N/mm ²	94	126	ISO 178
Flexural modulus	E _F	GPa	3.51	3.53	ISO 178
Flexural strain	ε _F	%	3.32	9.84	ISO 178

CURED LAMINATE MECHANICAL PROPERTIES

PROPERTY	SYMBOL	UNITS	28 DAYS @ 21°C	16 HOURS @ 50°C**	TEST METHOD
Fiber volume fraction	V _{FVF}	%	40.1	39.7	ASTM D 3171 Method II
ILSS***	X _{ILSS}	MPa	41.5	46.3	ISO 14130
ILSS (after 7 days in water)***	X _{ILSS}	MPa	-	44.4	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

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

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