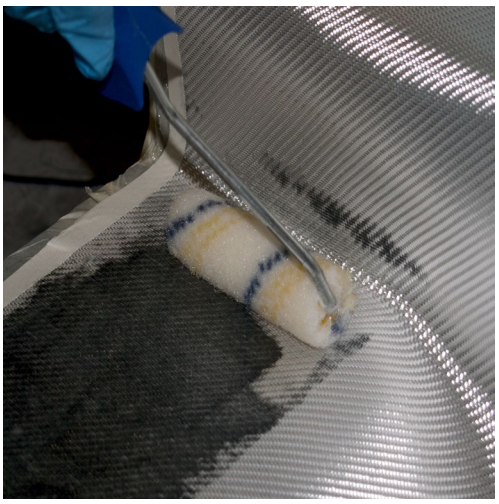
Gurit EPOXY

PRODUCT DATASHEET

Gurit

# AMPREG™ 3X AP RESIN

## EPOXY TO VINYLESTER ADHESION PROMOTER



**Ampreg 3X Adhesion Promoter (AP) is a unique resin system formulated to promote the adhesion between epoxy and vinylester resin.**

**This allows production boatbuilders to use existing polyester gelcoats with higher performance epoxy resins supplied by Gurit.**

This system is available with all Ampreg 3X Hardener speeds, as a 20 Kg pail. For further advice please contact Gurit Technical Support.

- Improves adhesion between vinylester (VE) and epoxy resins
- Improves the toughness at the VE/epoxy interface
- Uses Ampreg 3X low toxicity hardeners
- Low toxicity hardener formulations
  - Improved hazard labelling
  - CMR, SVHC & AEP** free
  - Environmentally non-hazardous
- Mix ratio by weight 100:26

## 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).

### TYPICAL BUILD SCHEDULE

It is recommended to produce test panels to verify the performance of the laminate and to define the manufacture route. It is important to use open times and environmental conditions that are representative of workshop conditions. Test panels should be visually inspected for surface quality and tests should be performed to assess the gelcoat adhesion.

The gelcoat adhesion can be assessed by using a knife to score and then prise the gelcoat off the surface of the laminate. In addition test panels can be supplied to Gurit to determine the gelcoat adhesion. The table below gives some indicative cleavage results from tests performed at Gurit.

| GELCOAT | TIECOAT | LAMINATE | CLEAVAGE STRENGTH (N) | FAILURE MODE |
|---|---|---|---|---|
| Polyester | Dion 9100-700 Vinylester | Dion 9100-700 Vinylester | 2080 | Within laminate |
| Polyester | Dion 9100-700 Vinylester | Ampreg 30 + A3X Slow Hardener | 3670 | Interface |
| Polyester | Dion 9100-700 Vinylester | Ampreg 3X AP + A3X Slow Hardener | 4220 | Within laminate |

The failure mode gives an important indication about the level of adhesion. Ideally failure should occur within the laminate. Typically a cleavage load of 2500-3000N indicates that a good bond has been achieved between polyester gelcoat and the backing laminate. The style of fabric reinforcement has an effect on the failure mode and test result. Heavier weight woven and biaxial reinforcements (greater than 500g/m2) give higher cleavage results when compared to CSM or lightweight fabrics.

A typical use for Ampreg 3X AP resin is in the bonding of a cosmetic polyester gelcoat / vinylester tiecoat to an epoxy backing laminate. A typical sequence is as described here.

1. Apply polyester gelcoat as per manufacturers' recommendations and allow to cure.
2. Using the vinylester resin, wet laminate 2 layers of 225gsm CSM onto the back of the polyester gelcoat. Based on tests at Gurit we recommend the vinylester should be backed up with the epoxy resin between 6 & 24 hours; 24 hrs should not be exceed.
3. Apply a thin layer (300g/m2) of Ampreg 3X AP to the surface of the vinylester skincoat.
4. Complete the laminate schedule using Ampreg 30, 31 or 36 resins and Slow or Extra-slow hardeners.
5. It is recommended that the laminate is vacuum bagged to aid the removal of any air entrapment between the VE tiecoat and the epoxy laminate. Please refer to the Ampreg 3X TDS on working times and recommended vacuum times.
6. The laminate should then be post-cured for a minimum of 16hrs at 50°C to achieve the optimum adhesion between the VE skincoat and the epoxy backing laminate. This also increases the strength and toughness of the epoxy resin. To achieve the best surface finish it is recommended to perform the postcure whilst the part is still in the mold.

### 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 or Extra Slow 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 3X AP resin | Months | 24 |
| Ampreg 3X Fast, Std. Slow, Extra Slow, Ultra Slow hardeners | 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 3X ADHESION PROMOTER 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 3X AP RESIN | SLOW HARDENER | MIXED SYSTEM | TEST METHOD |
|---|---|---|---|---|---|
| Color | - | Dark Yellow | Burnt Orange | Dark Yellow / Light Orange | - |
| Mix ratio by weight | Parts by weight | 100 | 26 | - | - |
| Mix ratio by volume | Parts by volume | 100 | 31 | - | - |
| Density at 21°C | g/cm3 | 1.13 | 0.90 – 1.10 | 1.09 | ISO 1183-1B |

## COMPONENT & MIXED SYSTEM PROPERTIES

| PROPERTY | UNITS | 15°C | 20°C | 25°C | 30°C | 40°C | TEST METHOD |
|---|---|---|---|---|---|---|---|
| Ampreg 3X AP Resin viscosity | cP | 2600 | 1500 | 1000 | 630 | 320 | - |
| Ampreg 3X Slow Hardener viscosity | cP | 34 - 42 | 24 - 34 | 20 - 30 | 14 - 20 | 8 - 16 | - |
| Initial mixed system viscosity | cP | - | 610 | - | 280 | - | - |
| Earliest time to apply vacuum | hrs:min | - | 06:25 | - | 04:05 | - | Internal Gurit method |
| Latest time to apply vacuum | hrs:min | - | 08:25 | - | 05:05 | - | Internal Gurit method |

## CURED RESIN PROPERTIES

| PROPERTY | SYMBOL | UNITS | 16 HOURS @ 50°C** | TEST METHOD |
|---|---|---|---|---|
| Glass transition temp. | $Tg_2$ | °C | 69.4 | ISO 11357 (DSC) |
| Ultimate glass transition temp. | $UTg_2$ | °C | 73.7 | ISO 11357 (DSC) |
| Glass transition temp. | $Tg_1$ | °C | 66.7 | ISO 6721 (DMA) |
| Ultimate glass transition temp. | $UTg_1$ | °C | 75.5 | ISO 6721 (DMA) |
| Cured density | $\rho_{CURED}$ | $g/cm^3$ | 1.15 | ISO 1183-1A |
| Linear shrinkage | - | % | 1.61 | ISO 1183-1A |
| Tensile strength | $\sigma_T$ | MPa | 48.8 | ISO 527-2 |
| Tensile modulus | $E_T$ | GPa | 2.7 | ISO 527-2 |
| Tensile strain | $\varepsilon_T$ | % | 7.1 | ISO 527-2 |
| Flexural strength | $\sigma_F$ | MPa | 86.7 | ISO 178 |
| Flexural modulus | $E_F$ | GPa | 2.7 | ISO 178 |
| Flexural strain | $\varepsilon_F$ | % | 10.7 | ISO 178 |

## CURED LAMINATE MECHANICAL PROPERTIES

| PROPERTY | SYMBOL | UNITS | 16 HOURS @ 50°C** | TEST METHOD |
|---|---|---|---|---|
| ILSS*** | $X_{ILSS}$ | MPa | 37.9 | ISO 14130 |
| ILSS (after 7 days in water)*** | $X_{ILSS}$ | MPa | 37.9 | ISO 14130 |

**working time properties are highly subjective to ambient conditions and should be used as an approximate guideline for all Ampreg systems*
***initial cure of 24 hours at 21°C*

## AMPREG 3X ADHESION PROMOTER 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 3X AP RESIN | EXTRA-SLOW HARDENER | MIXED SYSTEM | TEST METHOD |
|---|---|---|---|---|---|
| Color | - | Dark Yellow | Burnt Orange | Dark Yellow / Light Orange | - |
| Mix ratio by weight | Parts by weight | 100 | 26 | - | - |
| Mix ratio by volume | Parts by volume | 100 | 31 | - | - |
| Density at 21°C | g/cm3 | 1.13 | 0.90 – 1.10 | 1.09 | ISO 1183-1B |

## COMPONENT & MIXED SYSTEM PROPERTIES

| PROPERTY | UNITS | 15°C | 20°C | 25°C | 30°C | 40°C | TEST METHOD |
|---|---|---|---|---|---|---|---|
| Ampreg 3X AP Resin viscosity | cP | 2600 | 1500 | 1000 | 630 | 320 | - |
| Ampreg 3X Slow Hardener viscosity | cP | 18 - 28 | 15 - 20 | 5 - 15 | 5 – 10 | 4 - 8 | - |
| Initial mixed system viscosity | cP | - | 490 | - | 220 | - | - |
| Earliest time to apply vacuum | hrs:min | - | 08:30 | - | 05:20 | - | Internal Gurit method |
| Latest time to apply vacuum | hrs:min | - | 10:54 | - | 06:40 | - | Internal Gurit method |

## CURED RESIN PROPERTIES

| PROPERTY | SYMBOL | UNITS | 16 HOURS @ 50°C** | TEST METHOD |
|---|---|---|---|---|
| Glass transition temp. | $Tg_2$ | °C | 63.0 | ISO 11357 (DSC) |
| Ultimate glass transition temp. | $UTg_2$ | °C | 69.6 | ISO 11357 (DSC) |
| Glass transition temp. | $Tg_1$ | °C | 63.2 | ISO 6721 (DMA) |
| Ultimate glass transition temp. | $UTg_1$ | °C | 71.6 | ISO 6721 (DMA) |
| Cured density | $\rho_{CURED}$ | $g/cm^3$ | 1.14 | ISO 1183-1A |
| Linear shrinkage | - | % | 1.59 | ISO 1183-1A |
| Tensile strength | $\sigma_T$ | MPa | 46.9 | ISO 527-2 |
| Tensile modulus | $E_T$ | GPa | 2.70 | ISO 527-2 |
| Tensile strain | $\varepsilon_T$ | % | 11.09 | ISO 527-2 |
| Flexural strength | $\sigma_F$ | MPa | 82.5 | ISO 178 |
| Flexural modulus | $E_F$ | GPa | 2.6 | ISO 178 |
| Flexural strain | $\varepsilon_F$ | % | 10.3 | ISO 178 |

## CURED LAMINATE MECHANICAL PROPERTIES

| PROPERTY | SYMBOL | UNITS | 16 HOURS @ 50°C** | TEST METHOD |
|---|---|---|---|---|
| ILSS*** | $X_{ILSS}$ | MPa | 40.0 | ISO 14130 |
| ILSS (after 7 days in water)*** | $X_{ILSS}$ | MPa | 39.7 | ISO 14130 |

**working time properties are highly subjective to ambient conditions and should be used as an approximate guideline for all Ampreg systems*
***initial cure of 24 hours at 21°C*

## 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:

| | |
|---|---|
| Europe | +44 1273 289451 |
| Americas | +1 646 844 7309 |
| APAC | +65 3158 1412 |



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