



Product Data

RenInfusion™ 8615/Ren® 8615 HIGH TEMPERATURE EPOXY RESIN SYSTEM

DESCRIPTION: RenInfusion 8615(Resin)/Ren 8615(Hardener) is a two-component, low-viscosity epoxy system developed for use in the production of advanced composites using vacuum-assisted resin transfer molding (VARTM), resin transfer molding (RTM), Seemans Composite Resin Injection Molding Process (SCRIMPSM), or other infusion processes. The low-mixed viscosity and wet-out potential of RenInfusion 8615/Ren 8615 enhance processability parameters.

RenInfusion 8615/Ren 8615 is a high temperature performance infusion system. Composites produced with this product can achieve a glass transition of over 350°F (149°C) following a postcure.

MIX RATIO: By weight: 100 to 50 Resin to Hardener

Mixing Instructions: Measure each component accurately (±5%) into clean containers. Thoroughly mix resin and hardener together (minimum 2 minutes) scraping container sidewalls, bottom, and mixing stick several times to assure a uniform mix.

TYPICAL HANDLING PROPERTIES: Tested @ 77°F(25°C) unless otherwise noted.

Property	Criteria	ASTM Test Method	Test Value
Color	Mixed		Light Amber Transparent
Specific Gravity	Resin Hardener	D-792	1.22 0.94
Viscosity, cP	Resin Hardener Mixed	D-2393	1,550 120 550
Gel Time	150 gram mass 4 fl.oz.	D-2471	20 hours

NOTE: Typical Properties – These physical properties are reported as typical test values obtained by our test laboratory. If assistance is needed in establishing product specifications, please consult with our Quality Control Department.

RECOMMENDED CURE SCHEDULE:

24 hours @ 77°F (25°C) plus 6 hours @ 250°F (121°C) plus 6 hours at 400°F (204°C), unless noted otherwise.

Please note that other cure schedules may be used to obtain comparable physical properties. Please contact RenShape Solutions' Technical Information Hotline (800) 759-7165 to discuss your application.

NEAT SYSTEM

TYPICAL CURED PROPERTIES: Cured 24 hours @ 77°F (25°C) plus 2 hours @ 250°F (121°C) plus 3 hours @ 350°F (177°C). Tested @ 77°F(25°C) unless otherwise noted.

Property	ASTM Test Method	Test Value
Specific Gravity	D-792	1.06
Cubic Inch per Pound		26
Hardness (Shore D)	D-2240	87
Ultimate Flexural Strength	D-790	9,995
Ultimate Flexural Modulus	D-790	429,672
Tg by DMA, E' onset, dry, °F (°C)	D-4065	422
Compressive Strength (psi) @ R.T.	D-695	36,439
Compressive Modulus (psi) @ R.T.	D-695	320,851

NOTE: All properties are of neat product form (non-composite).

LAMINATE SYSTEM

TYPICAL CURED PROPERTIES: Tested @ 77°F(25°C) unless otherwise noted.

Property	ASTM Test Method	Test ¹ Value
Hardness (Shore D)	D-2240	92
Ultimate Flexural Strength, psi	D-790	100,837
Flexural Modulus, psi	D-790	6.22 x 10 ⁶
Tg by DMA, E' onset, dry, °F (°C)	D-4065	422
Tg by DMA, E' onset, wet	D-4065	373
% wt. Gain		.698
Ultimate Compressive Strength, psi @ R.T.	D-695	62,366
Compressive Modulus, psi	D-695	11.3 x 10 ⁶

LAY-UP PROCESS:

Panel Type:	Approximately 3 ft. x 2 ft. flat panel
Cloth Type:	8 layers 1581 glass cloth
Cloth Rotation:	0, 90 degrees
Procedure:	Vacuum bagged, flat panel
Laminate Resin Content:	32.3%

NOTE: The RenInfusion™ R/H system will self-support cure with only an 8 hr. @ 125°F minimum cure after infusing material. The material will cure hard after 48 hours @ R.T., however, the 125°F minimum cure should be used for self-support. Post-cure can then be applied partially supported off of the master or foam model used.

- Provisional product information is provided on experimental products. Samples were tested at room temperature unless noted. All samples were cured 24 hrs. @ R.T. + 6 hrs. @ 250°F + 6 hrs. @ 400°F. Composite samples were from a room temperature infused 14" x 14" flat panel. The lay-up was 8 layer, 0° Rotation, TPI style #4114, lot #7027, 5HS carbon fabric 12 x 12, T-300-6K-309 yarn. Samples were cut and tested in the warp, (lengthwise) direction.

**Hot/Wet conditioning is 48 hr. tap water boil 98°C - 102°C). Sample weight measured before and after sample boils. % weight gain is measured.

PACKAGING:	<u>Unit</u>		<u>Weight</u>
	5 gallon	<i>Resin</i>	45 lb.
	5 gallon	<i>Hardener</i>	22.5 lb.
	Drum	<i>Resin</i>	500 lb.
	Drum	<i>Hardener</i>	250 lb.

STORAGE: Store at 60-100°F in a dry place. After use tightly reseal.

CONDITIONING: Stir well before use. This material will separate.

HANDLING: Work in a well ventilated area and use clean, dry tools for mixing and applying. For two component system, combine the resin and hardener according to mix ratio. Mix together thoroughly and use immediately after mixing. Material temperature should not be below 65°F (18°C) when mixing.

SHELF LIFE: Provided materials are stored under the recommended storage conditions in their original containers, they will remain in useable condition for at least one year from date of shipping.

SAFETY/HANDLING PRECAUTIONS: Do not use or handle this product until the Material Safety Data Sheet has been read and understood.

RenInfusion 8615

DANGER! Causes severe skin irritation and may cause skin burns. Can causes eye irritation and allergic skin reaction. Do not get on skin or on clothing. Avoid contact with eyes. Wash thoroughly after handling.

Nuisance dust may be generated when sanding or sawing cured material.

Ren 8615

DANGER! CORROSIVE – Causes skin and eye burns. Can be harmful if absorbed through skin or if swallowed. Do not get in eyes, on skin, or on clothing. Avoid tasting or swallowing. Keep container closed when not in use. Use with adequate ventilation. Wash thoroughly after handling.

Nuisance dust may be generated when sanding or sawing cured material.

FIRST AID: In case of contact with:

Skin: Immediately wash with soap and water. Remove contaminated clothing and launder before reuse. Destroy contaminated shoes.

Eyes: Immediately flush with water for at least 15 minutes. Call a physician.

Ingestion: If conscious, give plenty of water to drink. Do not induce vomiting. Call a physician.

Inhalation: Remove to fresh air. Administer oxygen or artificial respiration if necessary. Call a physician.

Other: Referral to physician is recommended if there is any question about the seriousness of any injury.

PRECAUTIONARY NOTE: Thermosetting systems generate heat when curing. The amount of heat and the period of time in which heat is released vary significantly between systems. Additionally, ambient or compound temperature, amount of material mixed, and construction and shape of the mold or container can also be factors in the temperature profile of a mixed system. In some cases, the thermosetting reaction can be vigorous, generating heat sufficient to cause decomposition of the system with subsequent liberation of large volumes of acrid smoke.

A good rule of thumb is never mix more material than can be applied during the stated pot life or gel time. Also take care when using materials in applications other than stated on the Product Data Sheet, i.e., a laminating resin for casting.

Please feel welcome to call our Product Information Department or your local Ren representative for instructions before you start your job.

IMPORTANT: The following supersedes Buyer's documents. SELLER MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING WARRANTIES AND CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No statements herein are to be construed as inducements to infringe any relevant patent. Under no circumstances shall Seller be liable for incidental, consequential, or indirect damages for alleged negligence, breach of warranty, strict liability, tort, or contract arising in connection with the product(s). Buyer's sole remedy and Seller's sole liability for any claims shall be Buyer's purchase price. Data and results are based on controlled or lab work and must be confirmed by Buyer by testing for its intended conditions of use. The product(s) has not been tested for, and is therefore not recommended for, uses for which prolonged contact with mucous membranes, abraded skin, or blood is intended; or for uses for which implantation within the human body is intended.

Distributed by: **FREEMAN MFG & SUPPLY CO.** 1101 MOORE RD / AVON, OH 44011
800-321-8511 www.freemansupply.com

RenInfusion 8615™ / Ren® 8615 Attachment

Provisional Product Data

RESINFUSION™ 8615 R/H (400°F Use RESINFUSION™ System)

Property	ASTM Method	RESINFUSION™ 8615 R/H Neat System	RESINFUSION™ 8615 R/H Graphite Laminate*
Reaction Ratio (by wt.)		100R/50H	
Specific Gravity (g/cc)	ASTM D-792 Resin - Hardener - Mixed -	1.18 .94 1.20 (cured)	
Viscosity (cps.) @ Room Temp. Resin Hardener Mixed Mixed @ 150°F		1,500 120 550 < 200	
Gel Time (Minutes)	D-2471 (150 g.)	20.0 Hours	
RDA Scan – Time to gel @ 150°F	150°F isothermal run	7.0 hrs.	
Tg (Dry) ** (Hot/Wet) % Wt. gain	DMA E' onset D-4065	422	422 373 .698
Deflection Temperature HDT	D-648 @ 264 psi	> 420°F	N/A
Hardness	D-2240	87 Shore D	92 Shore D
Flexural Strength (psi)	D-790	9,995	100,837
Flexural Modulus (psi)	D-790	429,672	6.22 x 10⁶
Compressive Strength (psi) @ R.T. .2% offset (psi)	D-695	37,507 13,200	62,366
Compressive Modulus (psi) @ R.T	D-695	396,410	11.3 x 10⁶

(See next page for various parameters used)

NOTE: Please read MSDS carefully before using the product. Proper storage and handling is essential for safe operation. The RESINFUSION™ R/H system will self-support cure with only an 8 hr. @ 125°F minimum cure after infusing material. The material will cure hard after 48 hours @ R.T., however the 125°F minimum cure should be used for self-support. Post-cure can then be applied partially supported off of the master or foam model used.

* Provisional product information is provided on experimental products. Samples were tested at room temperature unless noted. All samples were cured 24 hrs. @ R.T + 6 hrs. @ 250°F + 6 hrs. @ 400F. Composite samples were from a room temperature infused 14" x 14" flat panel. The lay-up was 8 layer, 0° Rotation, TPI style #4114, lot #7027, 5HS carbon fabric 12 x 12, T-300-6K-309 yarn. Samples were cut and tested in the warp, (lengthwise), direction.

** Hot/Wet conditioning is 48 hr. tap water boil (98°C – 102°C). Sample weight measured before and after sample boils. % weight gain is measured.

400° F Use Tooling Prepreg comparison data

RESINFUSION™ 8615 R/H (400°F Use RESINFUSION™ System)

Property	ASTM Method	RESINFUSION™ 8615 R/H Glass Laminate*	RESINFUSION™ 8615 R/H Graphite Laminate**
% Resin content (TGA Burnoff)		31.0	30.6
Fiber volume		Not Run	Not Run
Laminate thickness (in.)		.275	.220
DMA Tg (E' onset)	D-4065	215 (420)	216 (420)
Flexural strength (psi)	D-790		
R.T. tested -		59,907	71,064
250°F tested -		53,868	63,349
350°F tested –		31,744	33,069
Flexural modulus (psi)	D-790		
R.T. tested –		1.82 x 10⁶	3.40 x 10⁶
250°F tested –		1.44 x 10⁶	3.10 x 10⁶
350°F tested -		1.36 x 10⁶	2.38 x 10⁶
	Tensile strength (psi)	37,650	49,750
Tensile modulus (psi)	D-638	3.02 x 10⁶	6.81 x 10⁶
Tensile % elongation	D-638	6.3	.8
Compressive strength (psi)	D-695	31,666	Not Run
Compressive modulus (psi)	D-695	4.01 x 10⁶	Not Run

NOTE:

Composite samples were done from a room temperature mixture of RESINFUSION™ 8615 R/H infused into a 14" x 14" composite flat panel. The flat plate was heated underneath to 125°F during the infusion. The goal is to compare properties using the same typical lay-up used in a LTM 10 type 400°F use prepreg tooling system with these vacuum infused panels using the RESINFUSION 8615 R/H.

*The glass fabric panel was a 12 layer balanced layup: (1) 0° rotation 7781 8HS (300 gram) (2) 0° 1210 2 x 2 twill (810 gram) (3) + 45° same fabric (4) - 45° same fabric (5) 90° same fabric (6) 0° same fabric (7) 0° same fabric (8) 90° same fabric (9) -45 same fabric (10) + 45 same fabric (11) 0° same fabric (12) 0° 7781 8HS (300 gram)

**The graphite fabric panel was a 10 layer balanced lay-up: (1) 0° rotation 3K 2x2 twill (195 – 205 gram) (2) 0° rotation 12K 2 x 2 twill (640 – 670 gram) (3) +45 same fabric (4) -45 same fabric (5) 90° same fabric (6) 90° same fabric (7) -45 same fabric (8) +45 same fabric (9) 0° same fabric (10) 0° 3K 2 x 2 twill (195 – 205) gram. Final cure in oven after initial 125°F infusion cure was 6 hrs. @ 250°F + 6 hrs. @ 400°F. NOTE: A 6 hr. @ 250°F + 6 hr. @ 350°F top end cure appears to be enough to obtain optimum or very near optimum properties. Tg's generated with this cure yield the same results as with the 400°F top end cure.

Tg build data

RESINFUSION™ 8615 R/H (400°F Use RESINFUSION™ System)

Property	ASTM Method	RESINFUSION™ 8615 R/H Neat System
Tg 48 Hr @ R.T.	DMA E' onset D-4065	Not measured (non-self supporting)
6 hrs. @ 125°F		217°F
6 hrs. @ 200°F		294°F
6 hrs. @ 250°F		343°F
6 hrs. @ 300°F		392°F
6 hrs. @ 350°F		420°F
6 hrs. @ 400°F		422°F

NOTE: All samples were cured the 6 hrs. @ 125°F first, then directly to the 6 hours times at the different heat cure temperatures listed above before testing. All were neat material samples.

Neat shrinkage data

RESINFUSION™ 8615 R/H (400°F Use RESINFUSION™ System)

Property	ASTM Method	RESINFUSION™ 8615 R/H Neat System	
Shrinkage (in./in.) (Cast shrinkage # 0 mold)	D-2566	Nil (not measurable)	
48 Hr @ R.T.			
+ 6 hrs. @ 125°F			.0006
+ 6 hrs. @ 250°F			.0029
+ 6 hrs. @ 400°F			.0035