

PRODUCT DATA SHEET
RM-2014-LDK-TK LOW DIELECTRIC EPOXY PREPREG
FOR HIGH PERFORMANCE AEROSPACE APPLICATIONS



Renegade Materials Corporation is a global leader in manufacturing composite materials for aerospace applications. We deliver light-weight, highly-engineered prepregs, adhesives and hybrid composite systems to enable maximum fuel efficiency in commercial and military aircraft structures. For pricing or additional information on Renegade products, please call us at 937-350-5274 or visit our website at www.renegadematerials.com



RM-2014-LDk-TK Low Dielectric Epoxy Prepreg System

RM-2014-LDk-TK is a 300°F (150°C) cure, modified epoxy prepreg system with very low dielectric and loss properties. RM-2014-LDk-TK provides good tack, drape and handling, and a great balance of mechanical properties.

- Excellent Dielectric Properties.
- Lower cost than Cyanate Esters.
- Low Minimum Buys; No Set-Up Charges.
- Straightforward 300°F (150°C) Autoclave Cure Cycle.
- Vacuum Bag/Oven (VBO) Cure Option.
- Delivers an Excellent Balance of Properties for Service up to 180°F (83°C) Wet.
- Available on a Variety of Fabrics including Quartz, Glass and Carbon.

RM-2014-LDk-TK Low Dielectric Epoxy Typical Resin Properties

K_{IC}	0.91 –Mpa-m^{1/2}
G_{IC}	0.343 Kj/m²
Flexural Strength	12.3 ksi
Flexural Modulus	0.48 Msi
Tensile Strength	9.12 ksi
Tensile Modulus	0.413 Msi
Resin Density	1.184 g/cc

Seller makes no warranty regarding the accuracy of this information. Buyers should make their own evaluation to determine suitability of any product for their own intended purposes.



RM-2014-LDk-TK Low Dielectric Epoxy Resin Typical Dielectric Properties at Various Frequencies

Frequency(GHz) Region #1	Dk D1	Dk D2	Df D1	Df D2
9.3	2.793	2.786	0.0135	0.0132
10.7	2.788	2.779	0.0138	0.0127
12.1	2.795	2.785	0.0134	0.0129
Average	2.792	2.783	0.0135	0.0129
Std dev.	0.003	0.004	0.0002	0.0003
Frequency(GHz) Region #2	Dk D1	Dk D2	Df D1	Df D2
27.6	2.746	2.745	0.0133	0.0131
29.0	2.744	2.739	0.0122	0.0129
30.4	2.759	2.755	0.0134	0.0129
31.8	2.757	2.752	0.0135	0.0131
Average	2.752	2.748	0.0131	0.0130
Std. Dev.	0.008	0.007	0.0006	0.0001

Notes: Resin Plaque thickness – 0.152”. Dielectric Constant (Dk) and Loss Tangent (Df) of a RM-2014-LDk-TK resin sample was measured in two bands and two orthogonal in-plane directions (D1 and D2) using a Model 600T Open Resonator at room temperature.

RM-2014-LDk-TK Low Dielectric Epoxy on Quartz (4581) Laminate Typical Dielectric Properties

Dielectric Constant	Autoclave Cured Laminate – 3.15
	Vacuum Bag/Oven Cured Laminate – 2.92
Loss Tangent	Autoclave Cured Laminate – 0.006
	Vacuum Bag/Oven Cured Laminate – 0.006

-Dielectric properties were measured in a resonant cavity using cylindrical rods at discrete frequencies over Ku-band (12-18 GHz).

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**RM-2014-LDk-TK Low Dielectric Epoxy on Quartz
Typical Laminate Mechanical Properties - Autoclave Cured Laminate**

Mechanical Properties	Test Condition	Result	Test Method
Specific Gravity****	Dry	1.80-1.83 g/cc	ASTM D792
Tg via RDA, G''	Dry	152°C/306°F	ASTM D5279
	Wet*	136°C/277°F	
0° Tensile Strength	75°F Dry	105 ksi	ASTM D638
0° Tensile Modulus		3.67 Msi	
0° Compression Strength***	75°F Dry	107 ksi	ASTM D6641
	180°F Wet*	65 ksi	
	250°F Dry	77 ksi	ASTM D695
	250°F Wet**	52 ksi	
0° Compression Modulus	75°F Dry	5.2 Msi	ASTM D695
	250°F Dry	3.6 Msi	
	250°F Wet**	3.4 Msi	
Short Beam Shear Strength	75°F Dry	10.6 ksi	ASTM D2344
	180°F Wet*	6.7 ksi	
In-Plane Shear Strength	75°F Dry	10.6 ksi	ASTM D386
	180°F Wet*	6.8 ksi	
	250°F Dry	6.9 ksi	
	250°F Wet**	4.2 ksi	
Flexural Strength***	75°F Dry	98 ksi	ASTM D790
	180°F Wet**	46 ksi	
Flexural Modulus***	75°F Dry	4.0 Msi	ASTM D790
	180°F Wet**	3.3 Msi	

All panels were cured in the autoclave at 150°C (300°F) for four (4) hours at 85 psi.

*Wet Conditioning: 48 hour soak at 82°C (180°F); 0.04% moisture pick up.

**Wet Conditioning: 14 day soak at 77°C (170°F); 0.77% moisture pick-up.

***Compression Properties at RT and 180°F Wet and Flexural Properties were normalized to 52%.

****Specific Gravity at 55-57% Fiber Volume. "Seller makes no warranty regarding the accuracy of this information."

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**RM-2014-LDk-TK Low Dielectric Epoxy on Style 6781 S-2 Glass
Typical Laminate Mechanical Properties - Autoclave Cured Laminate**

Mechanical Properties	Test Condition	Result	Test Method
Specific Gravity****	Dry		ASTM D792
Tg via RDA, G''	Dry		ASTM D5279
	Wet*		
0° Tensile Strength	75°F Dry		ASTM D638
0° Tensile Modulus			
0° Compression Strength***	75°F Dry		ASTM D6641
	180°F Wet*		
	250°F Dry		ASTM D695
250°F Wet**			
0° Compression Modulus	75°F Dry		ASTM D695
	250°F Dry		
	250°F Wet**		
Short Beam Shear Strength	75°F Dry		ASTM D2344
	180°F Wet*		
In-Plane Shear Strength	75°F Dry		ASTM D386
	180°F Wet*		
	250°F Dry		
	250°F Wet**		
Flexural Strength***	75°F Dry		ASTM D790
	180°F Wet**		
Flexural Modulus***	75°F Dry		
	180°F Wet**		

All panels were cured in the autoclave at 150°C (300°F) for four (4) hours at 85 psi.

*Wet Conditioning: 48 hour soak at 82°C (180°F); 0.04% moisture pick up.

**Wet Conditioning: 14 day soak at 77°C (170°F); 0.77% moisture pick-up.

***Compression Properties at RT and 180°F Wet and Flexural Properties were normalized to 52%.

****Specific Gravity at 55-57% Fiber Volume

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**RM-2014-LDk-TK Low Dielectric Epoxy on Quartz - Typical Laminate Mechanical Properties
Vacuum Bag/Oven Cured Laminate**

Mechanical Properties	Test Condition	Result	Test Method
Compression Strength**	75°F Dry	98 ksi	ASTM D6641
	180°F Wet*	64 ksi	
Short Beam Shear Strength	75°F Dry	8.0 ksi	ASTM D2344
	180°F Wet*	6.7 ksi	

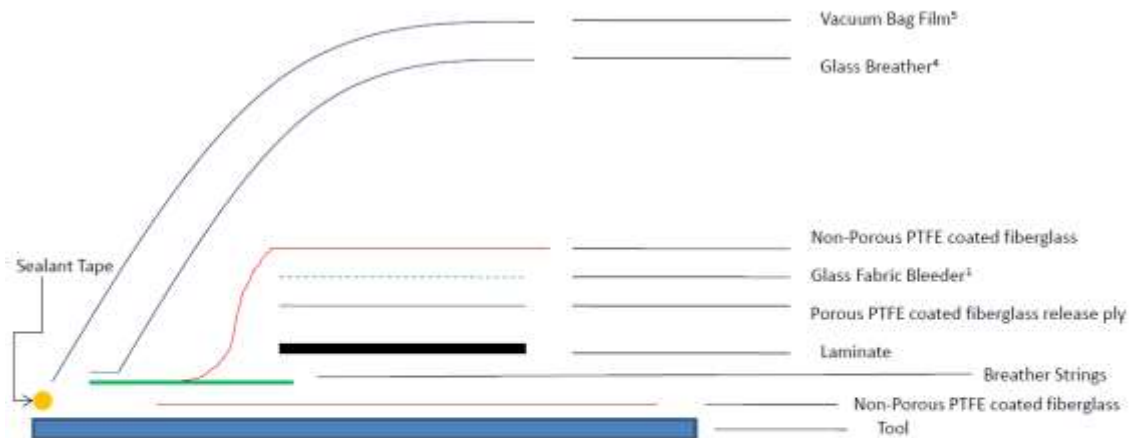
-All panels were cured vacuum bag/oven (VBO) at 150°C (300°F) for four (4) hours.

*Wet Conditioning: 48 hour soak at 82°C (180°F); 0.04% moisture pick up.

**Compression data was normalized to 52%.

Renegade Materials Recommended Bagging Scheme for Autoclave or Vacuum Bag/Oven Curing

RM-2014-LDk OoA Bagging Scheme



*Equivalent Materials can be used in place of anything listed.

1 - The amount of Bleeders plies to use depends on the target resin content. Bleeders and porous PTFE can be placed on both sides of the laminate or just the top. Peel plies can be used instead of porous PTFE and the glass bleeders.

2 - Any steel material capable of withstanding cure conditions; 1/8 inch minimum thickness, cut to same dimensions as prepreg stack-up (do not over-hang edges of lamina).

3 - Use any sealant tape capable of withstanding cure conditions making sure to cover with suitable release film so that not to transfer to breather. Using pressure sensitive tape may also be suitable as well. Be sure to seal off the part entirely to not allow resin to flow out to maintain the correct resin content. Breather strings are also optional.

4 - Use any glass breather that will withstand the cure conditions and use enough material to allow a breath path from vacuum ports, monitors, and parts.

5 - Use any vacuum bagging film that will withstand the cure conditions.

Debulk every 4plies.

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Renegade Materials Recommended Cure Cycles for RM-2014-LDk-TK

Autoclave Cure Cycle

Ramp at 2-5°F/min to 300°F with 50 to 85 psi pressure.
Vent to atmosphere at 30 psi pressure.
Cure for 4 hours.
Cool at 2-5°F/min.

Vacuum Bag/Oven Cure Cycle

Apply full vacuum to start; hold for 30 minutes before start of heating cycle.
Ramp at 3°F/ minute to 250°F hold for 30 minutes
Ramp at 3°F/min to 300°F hold for 4 hours
Cool at 5°F/ minute to 150°F under vacuum.

Note: In both cases, a thermocouple should be placed between the tool and the first ply to accurately measure the laminate temperature during the cycle.

Please contact Renegade Materials to discuss other cure cycle options that may be more suitable for your part geometry.

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