

PRODUCT DATA SHEET
RM-3002 BISMALIMIDE (BMI)
AUTOCLAVE CURE PREPREG SYSTEM
FOR HIGH PERFORMANCE AEROSPACE APPLICATIONS



Renegade Materials Corporation is a global leader in manufacturing high-temperature 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 Materials' products,
please call us at 937-350-5274
or visit our website at www.renegadematerials.com**



RM-3002 Bismaleimide (BMI) Prepreg Product Information

Developed using state-of-the-art formulating technologies and industry-leading advanced manufacturing processes, RM-3002 BMI prepreg products deliver superior hot/wet performance in airframe and propulsion applications at service temperatures up to 450°F (232°C).

RM-3002 “next-generation” BMI delivers improved damage tolerance at higher temperatures vs. industry-standard BMI’s. Renegade Materials’ prepregs exhibit excellent tack, out-time and handling characteristics and are precision made for the highest lot to lot consistency available in the composites industry.

RM-3002 prepregs are available on various fabrics including carbon, quartz and S2 glass. Renegade Materials offers similar performance in a Resin Transfer Molding (RTM) resin system (RM-3000). Paste (RM-3006 and RM-3007) and Film (RM-3011) Adhesives compatible with RM-3002 round out our BMI product line.

RM-3002 Resin Properties	
Cured Resin Density	1.27 g/cc
Resin Flex Strength	21 ksi (145 MPa)
Resin Flex Modulus	0.62 Msi (4.28 GPa)
Resin Flex Strain to Failure	3.6%
Resin CTE (below Tg)	57 ppm/°C

RM-3002 Shelf Life and Out-Time Information		
Shelf Life Warranty	12 months from date of shipment	Assumes storage at or below 0°F (-18°C)
Out-Time	28* days (with polyfilm liner kept in place)	RT
Re-certification	Per customer specification testing requirements	Up to 12-month extension
Moisture Pick-up	To prevent moisture pickup, prepreg should remain sealed until it reaches ambient temperatures. Carefully reseal prior to returning prepreg to the freezer.	

*Assumes lay-up room conditions including temperature and relative humidity control.

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RM-3002 Typical Mechanical Properties on Standard Modulus Carbon Fabrics

Test	Units	Test Method	Condition	HTS40-3K-E13-8HS	HTS40-3K-E13-PW
0° Tension Strength	ksi (MPa)	ASTM D3039	RT / Dry	146* (1007*)	148** (1020**)
			350°F / Dry	-	142** (979**)
0° Tension Modulus	Msi (GPa)	ASTM D3039	RT / Dry	10.9* (75*)	9.5** (66**)
			350°F / Dry	-	9.6** (66**)
90° Tension Strength	ksi (MPa)	ASTM D3039	RT / Dry	134* (924*)	-
90° Tension Modulus	Msi (GPa)	ASTM D3039	RT / Dry	10.3 *(71*)	-
0° Compression Strength	ksi (MPa)	ASTM D695	RT / Dry	120 (827)	-
			350°F / Dry	102 (703)	-
		SACMA SRM-1	RT / Dry	136* (938*)	119** (820**)
			350°F / Dry	-	119** (820**)
0° Compression Modulus	Msi (GPa)	ASTM D695	RT / Dry	9.0 (62)	-
			350°F / Dry	9.1 (63)	-
		SACMA SRM-1	RT / Dry	10.4* (72*)	9.8** (68**)
			350°F / Dry	-	8.8** (61**)
Short Beam Shear Strength	ksi (MPa)	ASTM D2344	RT / Dry	10.2 (70)	-
In-plane Shear Strength	ksi (MPa)	SACMA SRM-7	RT / Dry	12 (83)	-
In-plane Shear Modulus	Msi (GPa)	SACMA SRM-7	RT / Dry	0.81 (5.6)	-
G1C	in-lb/in2	ASTM D5528	RT / Dry [MCC]	2.84	-
			RT / Dry [MBT]	2.92	-
			RT / Dry [CC]	2.79	-
G2C	in-lb/in2	ASTM D7905	RT / Dry	11.8	-
Open Hole Tension	ksi (MPa)	SACMA SRM-5	-67°F / Dry	67* (462*)	-
			RT / Dry	69* (476*)	-
			350°F/wet***	65* (448*)	-
Open Hold Compression	ksi (MPa)	SACMA SRM-5	-67°F / Dry	49* (338*)	-
			RT / Dry	51* (352*)	-
			350°F/wet***	33* (228*)	-
Compression After Impact	ksi (MPa)	SACMA SRM-2	RT / Dry	26* (179*)	-

*Normalized Value to 0.01366" CPT. ** Normalized Value to 0.0078" CPT. ***Wet conditioning 160°F water soak for 14 days.

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RM-3002 Typical Mechanical Properties on Standard Modulus Carbon Fabrics

Test	Units	Test Method	Condition	HTS40-6K-E13-5HS	T650-35-6K-UC309-5HS
0° Tension Strength	ksi (MPa)	ASTM D3039	RT / Dry	140* (965)*	122* (841)*
0° Tension Modulus	Msi (GPa)	ASTM D3039	RT / Dry	9.6* (66)*	10.6* (73)*
0° Compression Strength	ksi (MPa)	ASTM D6641	RT / Dry	118* (814)*	106* (731)*
		ASTM D6641	350°F / Dry	99* (670)*	-
		ASTM D6641	350°F / Wet**	74* (510)*	-
0° Compression Modulus	Msi (GPa)	ASTM D6641	RT / Dry	9.3* (64)*	9.7* (67)*
		ASTM D6641	350°F / Dry	9.3* (64)*	-
		ASTM D6641	350°F / Wet**	9.2* (63)*	-
Short Beam Shear Strength	ksi (MPa)	ASTM D2344	RT / Dry	8.8 (61)	11 (76)
			350°F / Dry	8.1 (56)	-
			350°F / Wet**	5.5 (38)	-

*Normalized Value to 0.0140" CPT.

**Wet conditioning 160°F/85% RH to saturation

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**RM-3002 Typical Glass Transition (T_g) Development
By Increasing the Post Cure Temperature**

Cure	Post Cure	T _g taken at G' inflection (5-10°C/ min. ramp rate)
375 ± 10°F (191 ± 5.56°C)/6-hours (standard cure)	475°F (246°C) / 6 hours (standard post cure)	545°F (285°C) Dry/ 455°F (235°C) Wet*
375°F (191°C) /3 hours	No Post Cure	450°F (232°C) Dry
375°F (191°C) /3 hours	375°F (191°C) / 3 hours	478°F (248°C) Dry
375°F (191°C) /3 hours	440°F (227°C) / 6 hours	527°F (275°C) Dry
375°F (191°C) /3 hours	475°F (246°C) / 6 hours	545°F (285°C) Dry
375°F (191°C) /3 hours	510°F (256°C) / 6 hours	642°F (339°C) Dry

Typical TOS Properties of RM-3002 on Carbon Fabric

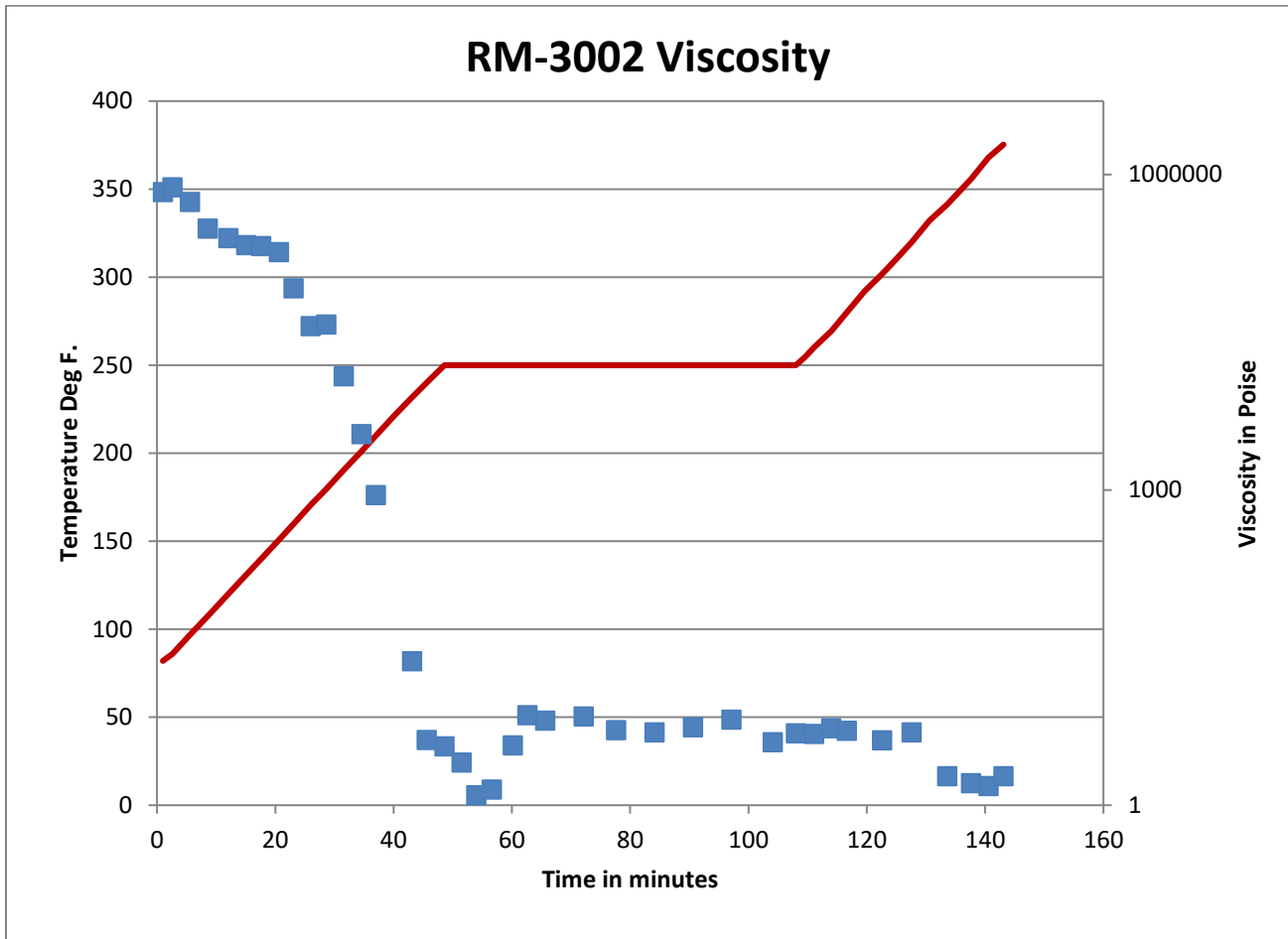
Property	Condition	Weight Loss
Thermal Oxidative Stability (% Weight Loss)	410°F, 150 psia, 125 Hours	0.40%

**RM-3002 Typical Properties on Astroquartz III
Style 4581 Fabric**

Notched Compression In-Plane Shear Strength ASTM-D3846-02	13 ksi (90 MPa)	Dry, Room Temp
Combined Loading Compression Strength / Modulus ASTM-D6641-09	78 ksi (538 MPa) / 3.8 Msi (26 GPa)	Dry, Room Temp
10 GHz, X band ASTM D2520, (0,90), Avg. 6 measurements	Dielectric Constant 3.3	Dielectric Loss 0.005

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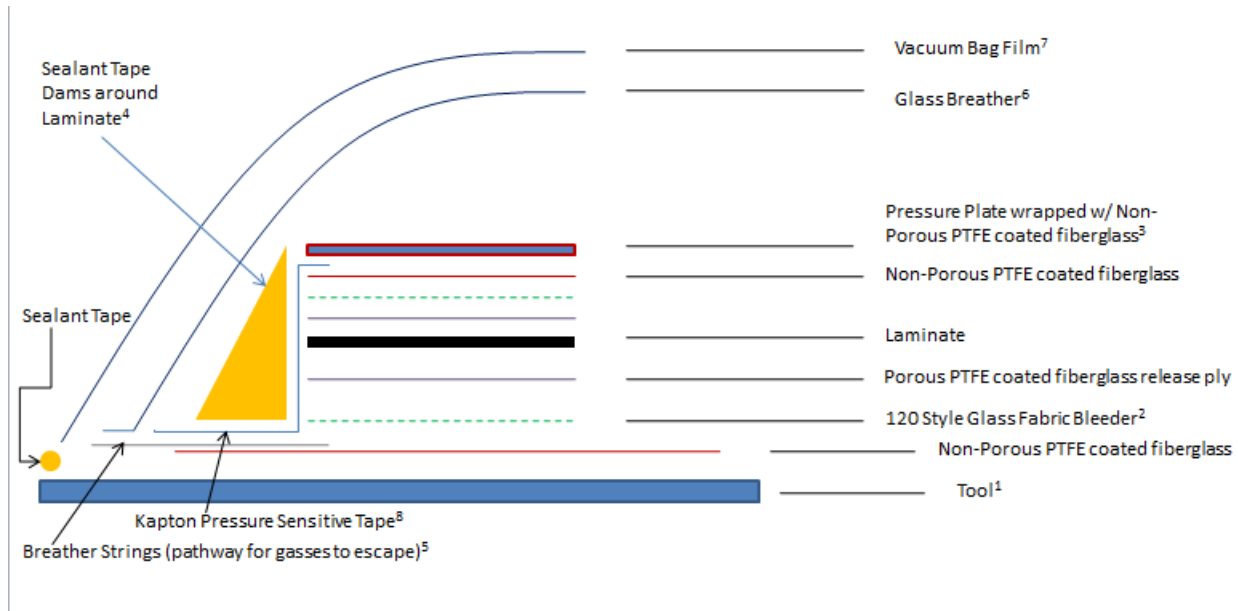
RM-3002 Typical Viscosity Profile



Please contact the technical support experts at Renegade Materials for more viscosity data to support your specific application. Tel: 937-350-5274

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Recommended Bagging Scheme for RM-3002



Equivalent Materials can be used.

- 1 - Any steel material capable of withstanding cure conditions; 1/8 inch (0.32cm) minimum thickness.
- 2 - The amount of bleeder plies to use depends upon the target resin content. Bleeders can be placed on both sides of the laminate or just on the top.
- 3 - Any steel material capable of withstanding cure conditions; 1/8 inch (0.32cm) minimum thickness, cut to the same dimensions as prepreg stack-up (do not over-hang edges of lamina).
- 4 - Use any sealant tape capable of withstanding cure conditions making sure to cover with a suitable release film so that there is no transfer to the breather.
- 5 - Optional breather strings can be placed in the corners of the laminate going under the dams and making contact with the breather material.
- 6 - 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.
- 7 - Use any vacuum bagging film that will withstand the cure conditions.
- 8 - Tape down all the bleeders, porous and non-porous PTFE coated fiberglass release film, and all the way around the edge of the part so that no resin is able to flow out except through the breather strings.

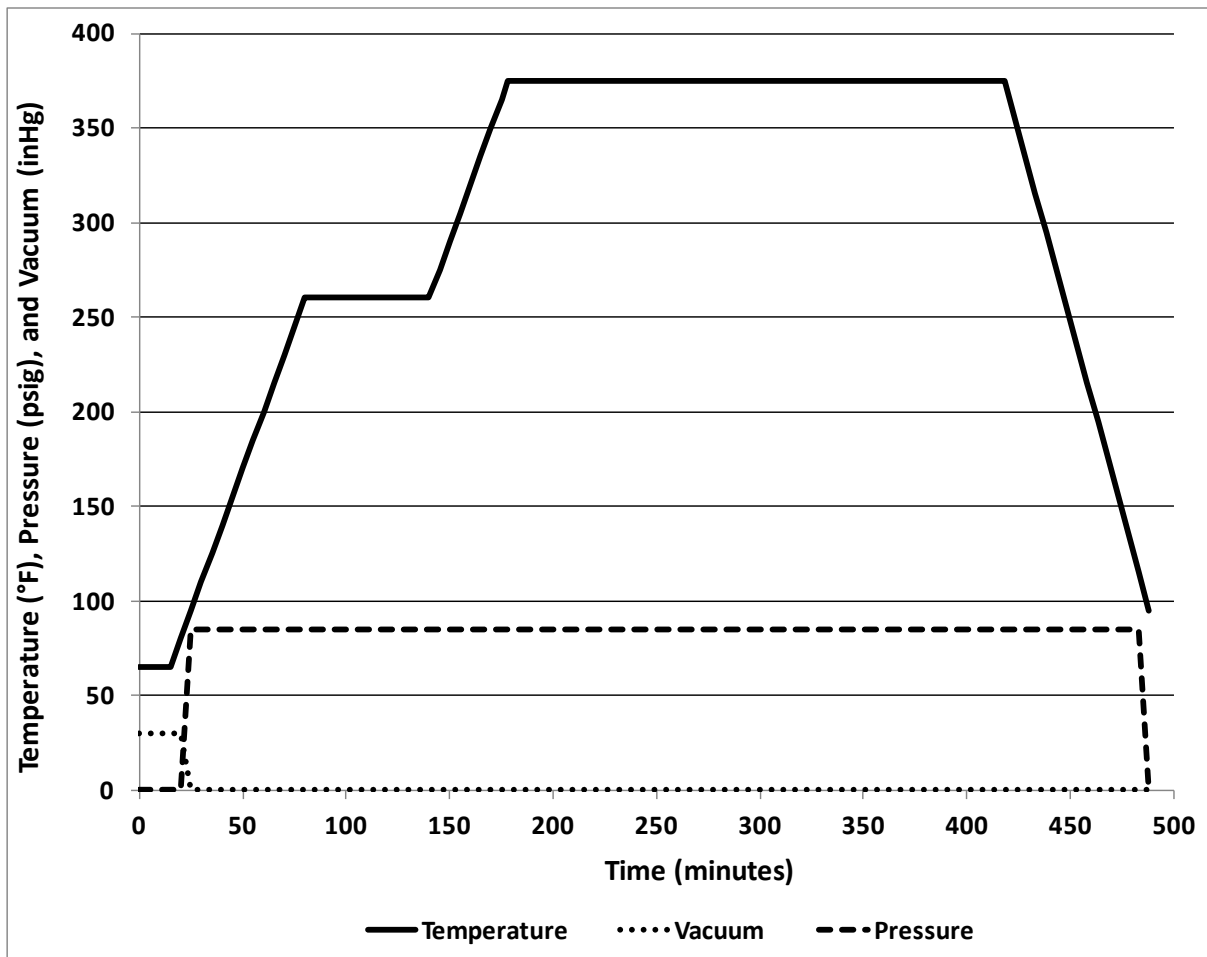
Please contact technical process experts at Renegade Materials, for alternate bagging options suited for your application. Tel: 937-350-5274

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Recommended Cure Cycle for RM-3002

All temperatures and times are based upon the lagging thermocouple unless otherwise specified.

- Step 1: Apply full vacuum
- Step 2: Apply 85 psi (4.1 kPa), vent vacuum at 30 psi (1.4 kPa)
- Step 3: Heat to 260°F±10°F (127°C±5.56°C) at 3°F(1.67°C)/min
- Step 4: Hold 1 hour
- Step 5: Heat to 375°F±10°F (191°C±5.56°C) at 3°F(1.67°C)/min
- Step 6: Hold 4 hours
- Step 7: Cool to 70°F (21°C) at 4°F (2.22°C)/min, vent pressure



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Recommended Post Cure Cycle for RM-3002

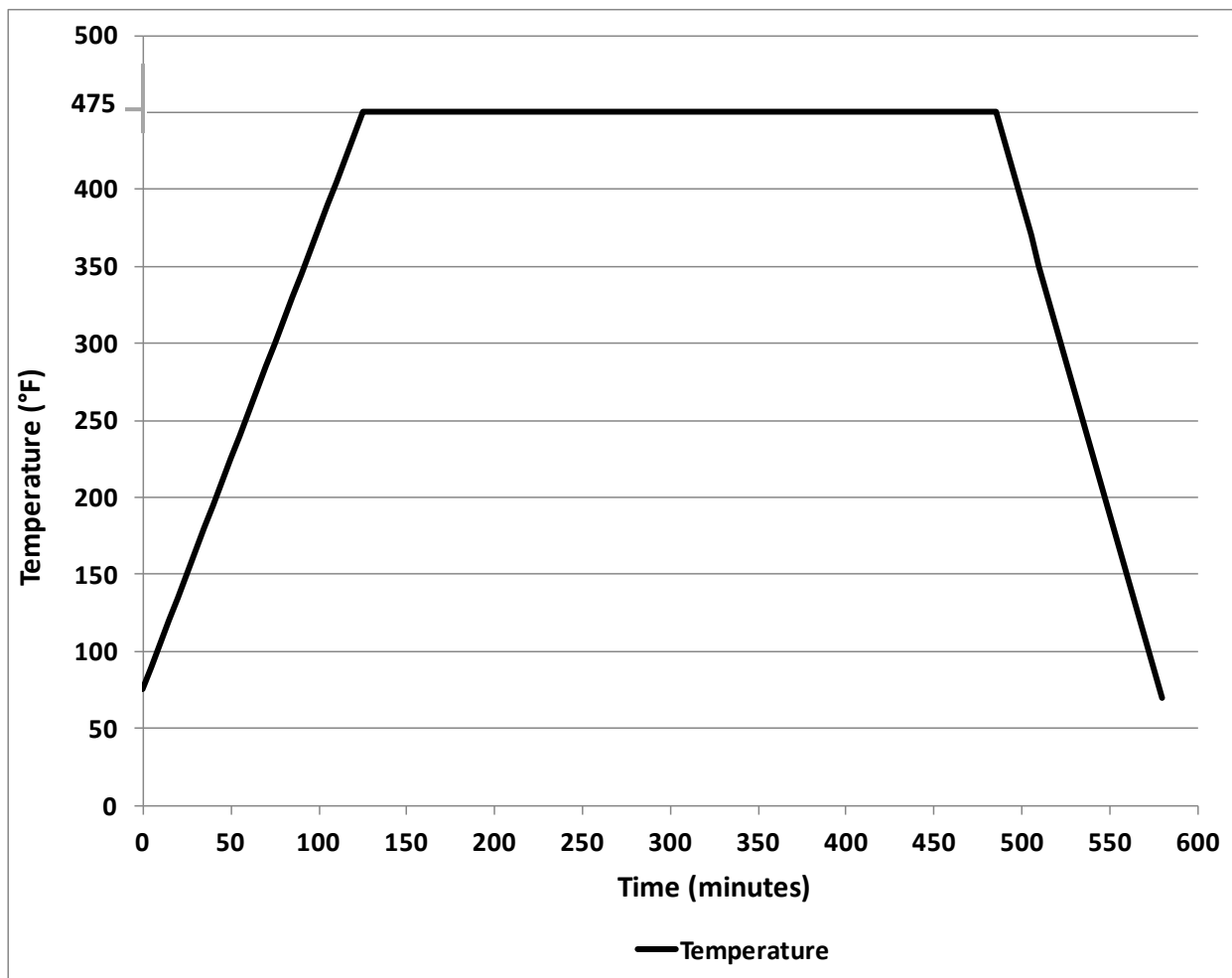
Air Circulating Oven

Wrap panels in 7781 style glass

Step 1: Heat to 475°F ± 10°F (246°C ± 5.56°C) at 2-5°F(1.11-2.78°C)/min. Note: A lower temperature post cure may be more appropriate for your application.

Step 2: Hold 6 hours

Step 3: Cool to 70°F (21°C) at 5°F (2.78°C)/min



Please contact the technical process experts at Renegade Materials for alternate post-cure cycle options for your application. Tel: 937-350-5274

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