Description

RDN-112 is a high-performance flame retardant, 130°C curing, toughened epoxy resin system designed for the production of unmanned air vehicles (UAVs), urban air mobility (UAM's) and General Aviation aircraft structures. RDN-112 can also be used in automotive, industrial and recreational applications.

RDN-112 exhibits excellent Tg much higher than curing temperature, which allows you to achieve low leashes and bending of the part.

RDN-112 can be processed via Out-of-Autoclave or autoclave moulding with porosity level of <1%.

RDN-112 can also be cured at temperatures as low as 90°C, which allows the use of low-cost tooling and reduces manufacturing time.

Features & Benefits

60 days out life at 21°C

- Flame retardant: FAR 23-25 compliant (12s & 60s vertical burn)
- Up to 164°C dry Tg, 146°C wet Tg following 130°C cure
- 90 to 130°C flexible curing cycle with curing time from 1 hour
- Toughened formulation
- Controlled flow of the resin
- Excellent tack and drape characteristics

Neat Resin & Matrix properties

Uncured Tg: (-5) – 0°C

Density: 1.222 g/cm^3

Tack: Moderate

Cured Dry Tg (DMA, following a 3h cure @130°C):

- ✓ $T_{g,\ Onset}$ 144°C
- ✓ $T_{g,\ Peak}$ 164°C

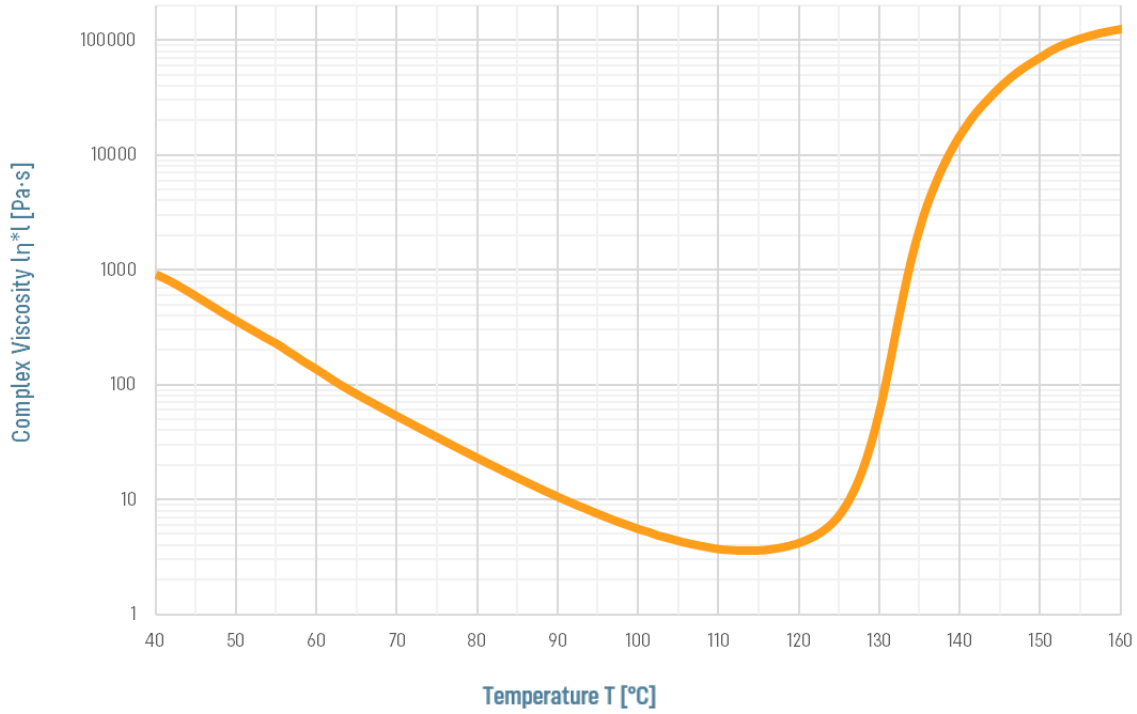
Cured Wet Tg (DMA, following a 3h cure @130°C) [1]:

- ✓ $T_{g,\ Onset}$ 112°C
- ✓ $T_{g,\ Peak}$ 146°C

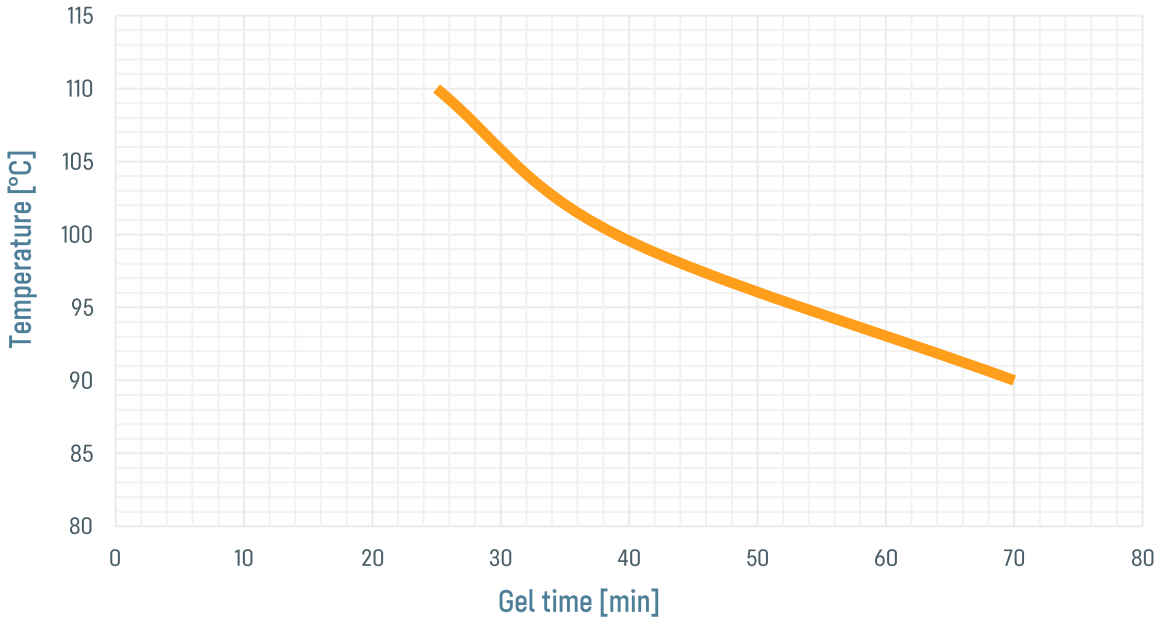
(1) Wet – 14 days immersion in water at 70°C

Viscosity profile

Dynamic Complex Viscosity of RDN-112 @ 2°C/min



Gel Time



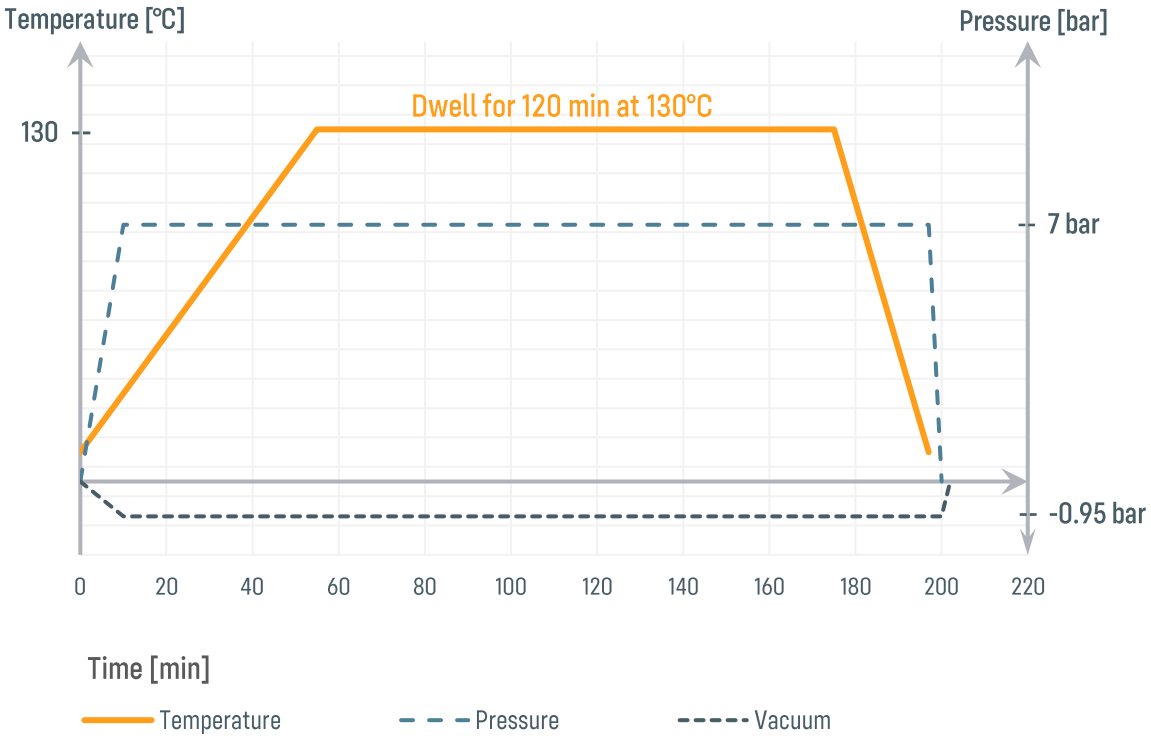
Cure Cycles & Properties

	POSSIBLE CURE CYCLES (2)			
	130°C– 3 hours	130°C – 2 hours	130°C – 1 hour	90°C – 6 hours
$T_{g\ dry,\ Onset}$ °C (DMA)	144	142	132	98
$T_{g\ dry,\ Peak}$ °C (DMA)	164	162	158	123

(2) Temperature must be measured by the lagging thermocouple attached to the part.

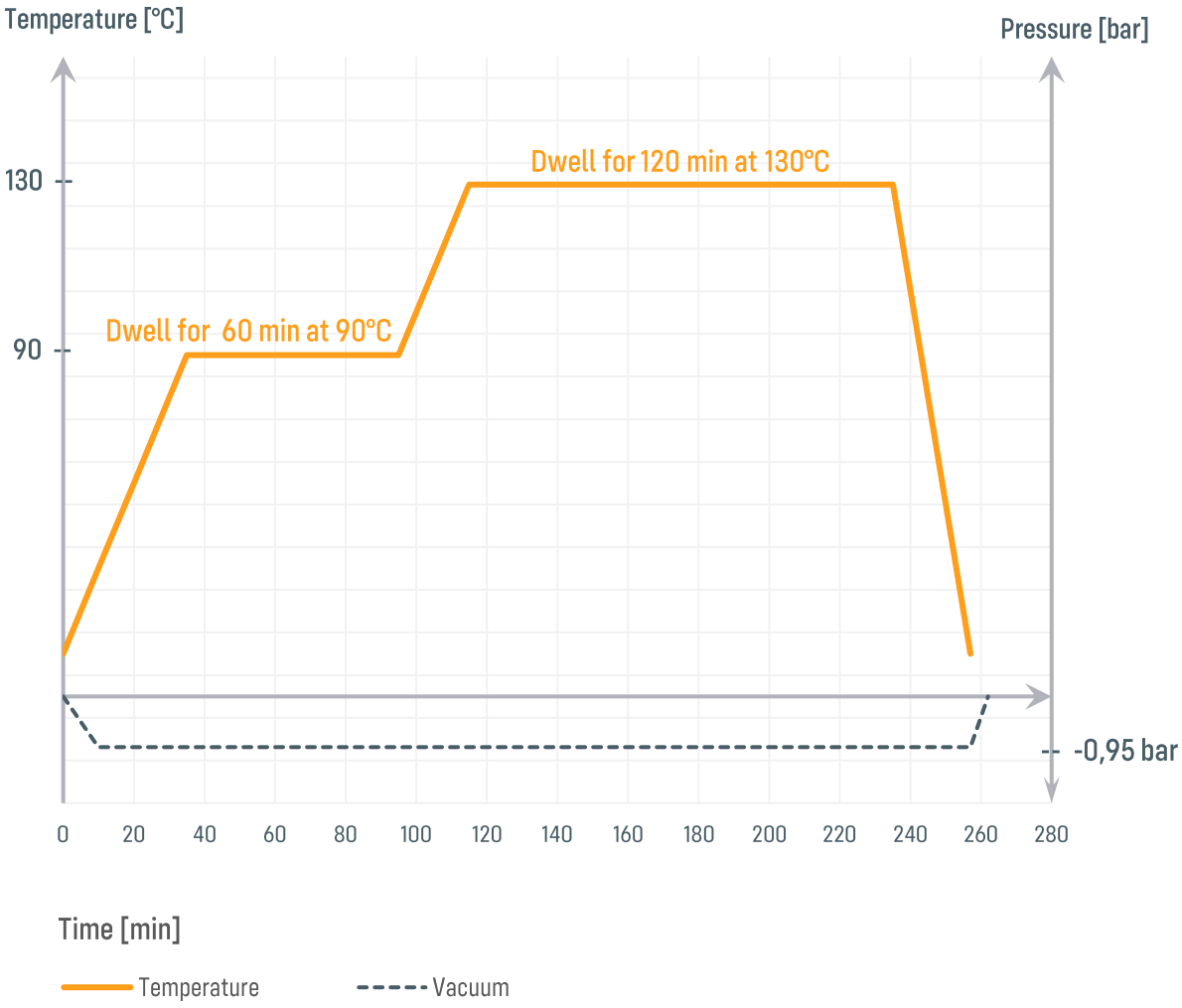
Recommended autoclave cure cycle

Vacuum bag pressure Minimum of 950mbar
Autoclave pressure 2-7 bar
Ramp rate 1 to 3°C/minute
Recommended cure cycle 120 minutes at 130°C
Cool down Maximum of 5°C/minute to 60°C



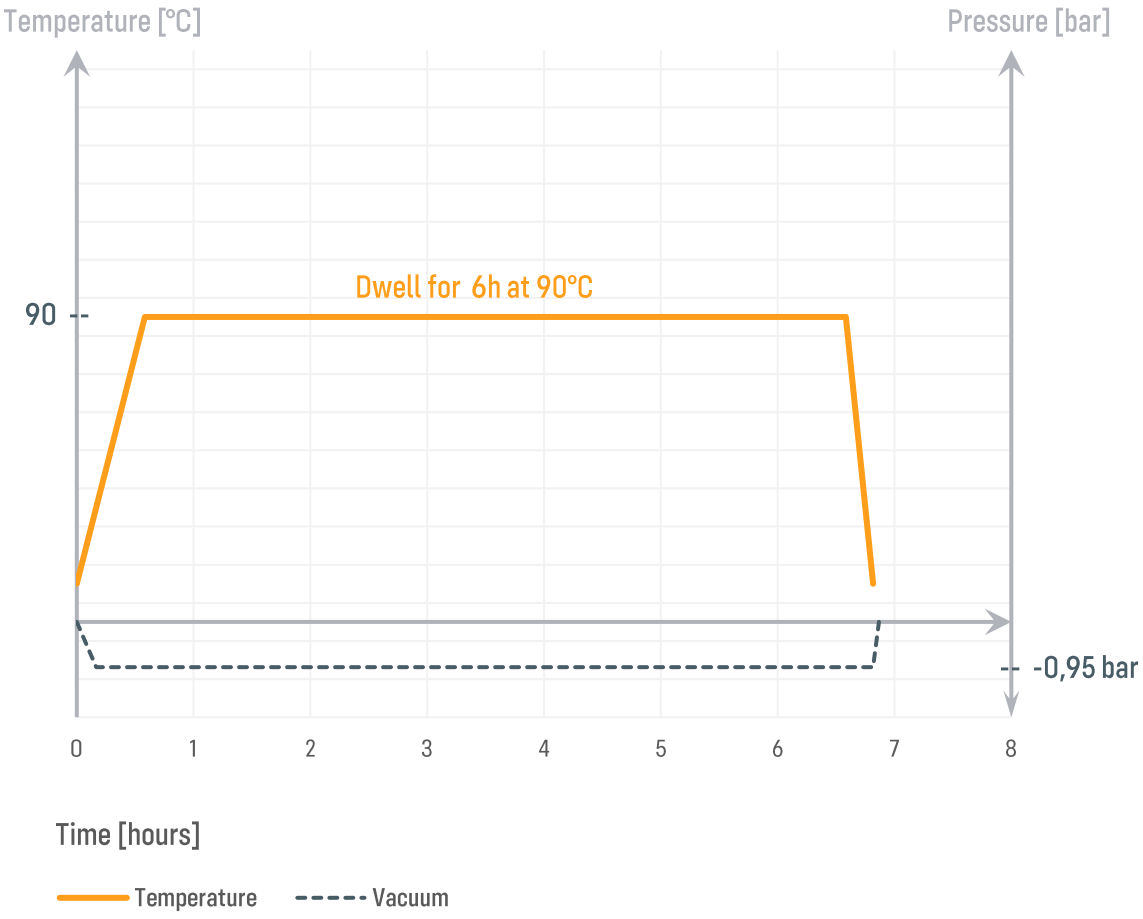
Recommended oven cure cycle

Vacuum bag pressure Minimum of 950mbar
Ramp rate 0.3 to 2°C/minute
Recommended cure cycle 60 minutes at 90°C + 120 minutes at 130°C
Cool down Maximum of 5°C/minute to 60°C



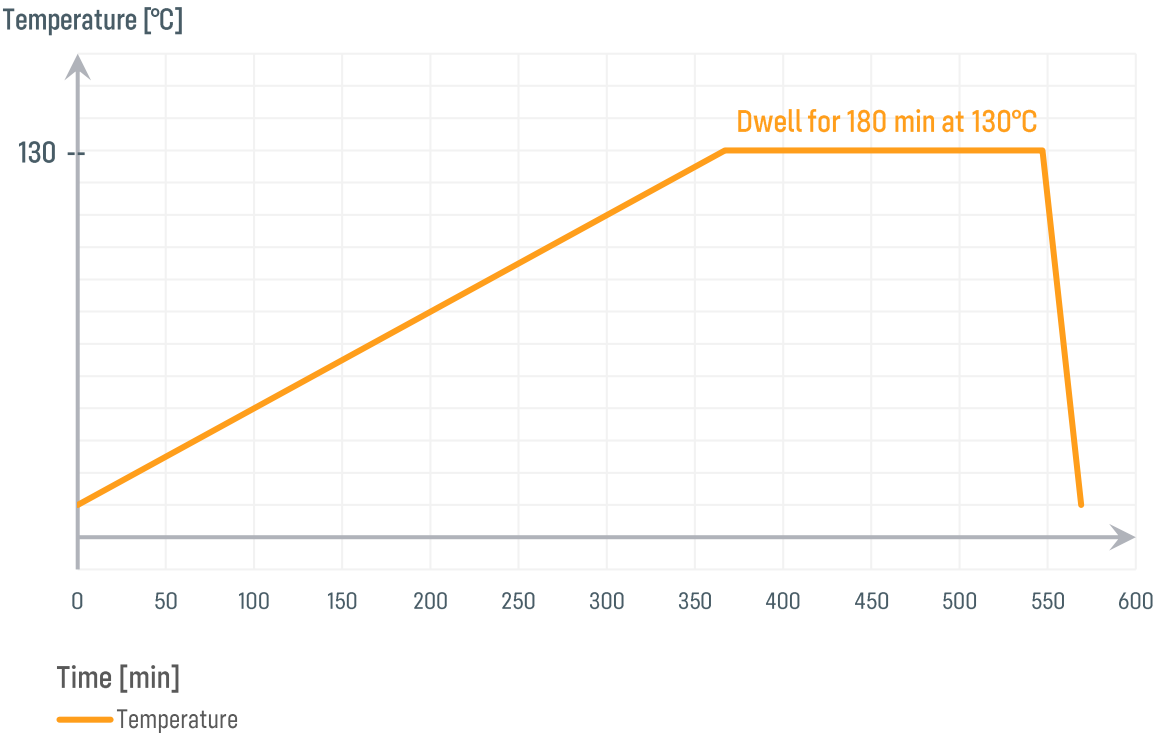
Alternative oven cure cycle

Vacuum bag pressure Minimum of 950mbar
Ramp rate 0.3 to 2°C/minute
Recommended cure cycle 6 hours at 90°C
Cool down Maximum of 5°C/minute to 60°C



Post-cure

When curing at temperatures below 130°C, it is recommended to carry out post-curing to obtain maximum properties.
Heat the parts to the temperature at which the initial curing was carried out at a speed of no more than 3°C/minute.
Ramp rate 0.3°C/minute
Recommended post-cure cycle 60-180 minutes at 130°C
Cool down Maximum of 5°C/minute to 60°C



Cured Woven Prepreg Properties

Physical Properties	Units	RDN-112.200PSC
Weave/Fiber		Plain/200 gsm/ 12K-HS
Nominal Resin content	wt%	38
Theoretically Calculated Cured Ply Thickness	mm	0.211

Mechanical Properties

All tensile and compression data are normalized to Vf = 55%

Cure Cycle: 180 min at 130°C; Vacuum 0.95 bar; Pressure 6 bar (Autoclave)

Mechanical Properties	Units	Method	RDN-112.200PSC		
			RTD (23°C)	ETD (80°C)	ETW[3](80°C)
Glass Transition Temperature Tg Dry, DMA (Onset/Peak) Tg Wet[3] DMA (Onset/Peak)	°C	ASTM D7028	152/169 138/158	-	-
Water uptake [3]	%		0.86		
Tensile strength [0°]	MPa	ASTM D3039	1250	-	-
Tensile modulus [0°]	GPa		68	-	-
Tensile strength [90°]	MPa		1070	-	-
Tensile modulus [90°]	GPa		65	-	-
Compression strength [0°]	MPa	ASTM D6641	765	701	702
Compression modulus [0°]	GPa		63	62	61
Compression strength [90°]	MPa		730	703	630
Compression modulus [90°]	GPa		55	55	52
In-plane Shear Strength	MPa	ASTM D3518	65	-	42
In-plane Shear Strength (Ultimate)	MPa		110	-	-
In-plane Shear Modulus	GPa		3.3	-	2.81
ILSS	MPa	ASTM D2344	55	47	42
Open Hole Tension [QI]	MPa	ASTM D 5766	410	-	-
Open Hole Compression [QI]	MPa	ASTM D 6484	297	-	-
CAI (6.67 J/mm)	MPa	ASTM D 7137	196	-	-

(3) Wet – 14 days immersion in water at 70°C

Flame Properties

Cure Cycle: 180 min at 130°C; Vacuum 0.95 bar; Pressure 6 bar (Autoclave)

Thickness: 2,5 mm

Flame Properties	Units	Method	RDN-112.200PSC		
			Standard requirements	Result	
After flame time	s	Vertical Bunsen Burner Test (60s) - AITM 2.0002 A [NADACP]	≤15	11	Pass
Drips	#		≤3	0	
Time of drip (s)	s		-	0	
Burn length (mm)	mm		≤152	17	
After flame time	s	Vertical Bunsen Burner Test (12s) - AITM 2.0002 A [NADACP]	≤15	0	Pass
Drips	#		≤5	0	
Time of drip (s)	s		-		
Burn length (mm)	mm		≤203	1	

Outgassing Properties

Cure Cycle: 180 min at 130°C; Vacuum 0.95 bar; Pressure 6 bar (Autoclave)

Thickness: 2.5 mm

Properties	Units	Method	RDN-112.200PSC		
			Standard requirements	Result	
TML	%	ECSS-Q-ST-70-02C	-	0.130	Pass
RML	%		≤1.000	0.045	
CVCM	%		≤0.100	0.002	

AVAILABILITY

RDN-112 is available as a fabric prepreg or unidirectional prepreg:

- Based on glass or carbon fiber
- Based on UD and standard woven fabrics
- Based on lightweight fabrics with spread yarn
- Semi-pregs (prepregs impregnated on one side) for vacuum molding

STORAGE

Out life at 21°C – 60 days [4]
Storage at -18°C – 12 months [5]

Handling: Prepregs must be kept sealed in a polythene bag which must not be opened until thawed to room temperature.

Safety: Refer to Material Safety Data Sheet (MSDS) for complete handling instructions

(4) Accumulated time out of the freezer before the part is cured
(5) Prepregs must be kept sealed in a polythene bag which must not be opened until thawed.