

VTM® 243FRB, VTM® 244FRB

VTM243FRB and VTM244FRB are 65°C to 180°C (149°F to 356°F) curing, black-pigmented, fire-retardant epoxy resins developed for low-cost manufacturing of medium to large composite structures by oven vacuum bag processing.

The two resins differ in rheology and tack, but not in mechanical performance of the cured laminate they produce. VTM243FRB is higher in viscosity and lower in tack, for lightweight reinforcements, and high quality surface plies. VTM244FRB has been formulated for heavy reinforcements and for rapid lay-up of bulk plies. The two resins may be co-cured in the same laminate.

Black pigmentation is recommended for optimum aesthetic appearances. Un-pigmented variants can be produced for special applications.

Features and Benefits

- VTM243FRB - 30 days out life at 21°C (70°F)
- VTM244FRB - 21 days out life at 21°C (70°F)
- 12 months storage at -18°C (0°F)
- Oven vacuum bag curing
- Flexible cure between 65 and 180°C (149 and 356°F)
- Self-extinguishing to FMVSS302/ABD0031/FAR25.853
- High surface quality, particularly with ZPREG formats
- Maximum 177°C (351°F), dry Tg after 180°C (356°C) post cure
- Tack and drape properties ideal for complex part manufacture
- Material formats for rapid oven vacuum bag and autoclave processing
- Service temperatures up to 150°C (302°F) in dry conditions

RELATED DOCUMENTS

- De-bulking guidelines (TDS1036)
- Oven vacuum bag processing – lay-up and bagging guidelines (TDS1041)

RELATED PRODUCTS

- BPS Format 2 (PDS126)



CURE CYCLE

Oven vacuum bag cure

Vacuum bag pressure	Minimum of 980 mbar (29"Hg)*
Ramp rate	1 to 2°C (1.8 to 3.6°F)/minute
Recommended cure cycle	16 hours at 65°C (149°F)
Cool down	Maximum of 3°C (5.4°F)/minute to room temperature

*This is the ideal vacuum level, however, it is recognised that it is not always possible to attain. If in doubt, please contact our technical support staff for advice.

Alternative cure cycles

Temperature	Duration
65°C (149°F)	16 hours
80°C (176°F)	5 hours
100°C (212°F)	2 hours
120°C (248°F)	1 hour
130°C (266°F)	1 hour
150°C (302°F)	1 hour
180°C (356°F)	1 hour

POST-CURE

Laminates cured for the recommended period at elevated temperatures may be used up to 20°C (36°F) below that temperature in service without additional post-cure.

In applications demanding maximum temperature or environmental resistance, it is essential that the component is post-cured to fully develop the glass transition (T_g) temperature.

Ramp rate	0.3°C (0.5°F)/minute
Recommended post-cure cycles	1 hour at 120°C (248°F)
	1 hour at 130°C (266°F)
	1 hour at 150°C (302°F)
	1 hours at 180°C (356°F)
Cool down	Maximum of 3°C (5.4°F)/minute to 60°C (140°F)

* Temperature must be measured by the lagging thermocouple attached to the part.

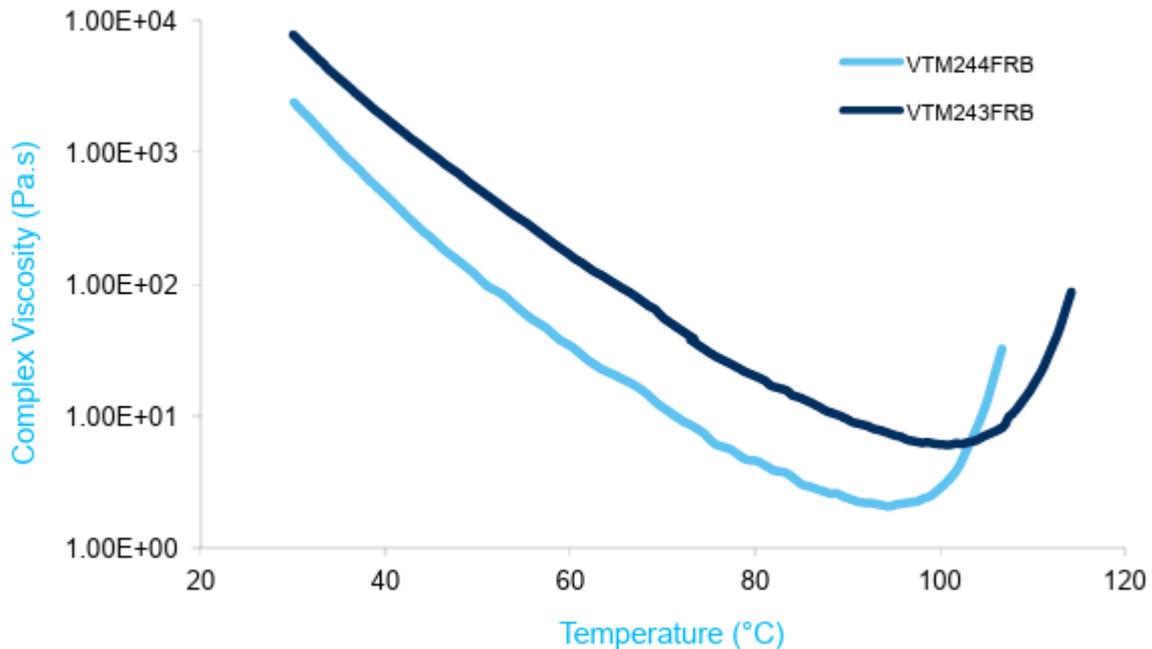
Notes:

Parts may be loaded into a pre-heated oven or heated at 3°C (5.4°F)/minute to the initial cure temperature. Large components should be adequately supported to avoid distortion.



PHYSICAL PROPERTIES

Test	Sample conditions	Results
Cured resin density	1 hour at 120°C (248°F)	1.27 g/cm ³
DMA E' onset Tg	16 hours at 65°C (149°F)	69°C (156°F)
	5 hours at 80°C (176°F)	92°C (198°F)
	2 hours at 100°C (212°F)	112°C (234°F)
	1 hour at 120°C (248°F)	130°C (266°F)
	1 hour at 130°C (266°F)	148°C (298°F)
	1 hour at 150°C (302°F)	162°C (324°F)
	1 hour at 180°C (356°F)	177°C (351°F)
	16 hours at 65°C (149°F) + 1 hour at 120°C (248°F)	130°C (267°F)
	16 hours at 65°C (149°F) + 1 hour at 130°C (266°F)	148°C (298°F)
	16 hours at 65°C (149°F) + 1 hour at 150°C (302°F)	162°C (324°F)
16 hours at 65°C (149°F) + 1 hour at 180°C (356°F)	177°C (351°F)	

Dynamic viscosity curve at 2°C per minute

MECHANICAL PROPERTIES

Material: VTM243FRB/GF2302 – 290 g/m² 2 x 2 twill glass
 Cure cycle: 16 hour at 65°C (248°F), 6.2 bar (90 psi)
 Post cure: 2 hours at 180°C (356°C)
 Test conditions: Room temperature, dry



Test	Test method	Units	
0° Tensile strength	ASTM D3039	MPa (ksi)	563 (81.64)
0° Tensile modulus		GPa (msi)	23.9 (3.47)
0° Tensile ultimate strain		%	2.36
0° Tensile poisson's ratio		-	0.14
90° Tensile strength		MPa (ksi)	504 (73.08)
90° Tensile modulus		GPa (msi)	24.0 (3.48)
90° Tensile ultimate strain		%	2.11
90° Tensile poisson's ratio		-	0.14
0° Compressive strength	ASTM D3410	MPa (ksi)	519 (75.56)
0° Compressive modulus		GPa (msi)	27.6 (4.00)
0° Compressive strain		%	1.88
0° Compressive poisson's ratio		-	0.14
90° Compressive strength		MPa (ksi)	427 (61.92)
90° Compressive modulus		GPa (msi)	28.1 (4.07)
90° Compressive strain		%	1.52
90° Compressive poisson's ratio		-	0.14
0° Flexural strength	CRAG 200	MPa (ksi)	891 (129.2)
0° Flexural modulus		GPa (msi)	27.6 (4.00)
0° Interlaminar shear strength (ILSS)	ASTM D2344	MPa (ksi)	57.6 (8.35)

Data normalised to 55%Vf except for ILSS and IPSS & IPSM.

AVAILABILITY

VTM243FRB and VTM244FRB prepregs are available on a wide range of fabrics and unidirectional tapes. Materials can also be supplied in a range of formats, including fully and partially-impregnated prepregs.

STORAGE

Out life* at 21°C (70°F)	VTM243FRB - 30 days
	VTM244FRB - 21 days
Storage at -18°C (0°F)	12 months from date of manufacture

*Out life refers to accumulated time out of the freezer before the part is cured.

** ZPREG formats may vary.

Note:

The actual freezer storage life and out life are dependent on a number of factors, including; fibre type, format and application. For certain formats, it may be possible for the storage life and out life to be longer than stated. Please contact our technical support staff for advice.



EXOTHERM

VTM® 243FRB and VTM244FRB prepregs are reactive formulations which can undergo severe exothermic heat up during the initial curing process if incorrect curing procedures are followed.

Great care must be taken to ensure that safe heating rates, dwell temperatures and lay-up/bagging procedures are adhered to, especially when moulding solid laminates in excess of 10mm (0.4in) thickness. The risk of exotherm increases with lay-up thickness and increasing cure temperature. It is strongly recommended that trials, representative of all the relevant circumstances, are carried out by the user to allow a safe cure cycle to be specified. It is also important to recognise that the model or tool material and its thermal mass, combined with the insulating effect of breather/bagging materials can affect the risk of exotherm in particular cases.

HEALTH & SAFETY

Please refer to the product SDS for safe handling, personal protective equipment recommendations and disposal considerations.

