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NCAMP Material Specification

This specification is generated and maintained in accordance with NCAMP Standard Operating Procedures, NSP 100

Glass Fiber Reinforced Epoxy Resin Prepregs, Type 33, Class 3, Grade 284 (TenCate Advanced Composites BT250E-6 S2 Unidirectional Tape)

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1. SCOPE:

1.1 Form:

This detail specification along with the base specification NMS 250 establishes the requirements for continuous unidirectional glass fiber impregnated with a modified B-staged epoxy resin ("unidirectional tape prepreg"). The prepreg is produced using a hot-melt process.

This detail specification follows the section and table numbering scheme of the base specification. It contains additional or superseding requirements. The base specification shall govern where no additional requirement is specified; in such cases, the applicable sections are omitted from this detail specification.

1.3 Classification: All products qualified to this detail specification have the following classification: Type 33, Class 3, Grade 284.

3 TECHNICAL REQUIREMENTS:

Table 1 – Prepreg Physical and Chemical Properties

Property	Test Method(1)	Number of Replicates	Requirements(3)
Resin Content	ASTM D3529	Every roll(2)	33±5% ind 33±3% avg
Fiber Areal Weight	SACMA SRM 23R-94	Every roll(2)	284±15 gsm ind 284±13 gsm avg
Volatile Content	ASTM D3530	First and last rolls of every batch(2)	2% max, avg
Flow	ASTM D3531	First and last rolls of every batch(2)	5 to 30
Gel Time	ASTM D3532	First and last rolls of every batch(2)	8 to 16
Tack	See 4.6.1	First and last rolls of every batch	Level IV or V
Drape	See 4.6.2	First and last rolls of every batch	Pass
HPLC (Optional)	SACMA SRM 20R-94	First and last rolls of a batch	See QPL
FTIR	ASTM E168 ASTM E1252	First and last rolls of every batch, one test per roll	See QPL
Differential Scanning Calorimetry (DSC) exotherm peak temperature total heat of reaction	SACMA SRM 25R-94	First and last rolls of every batch	See QPL

(1) Specific procedures should be identical to those used in the original material qualification program.
(2) Three specimens should be taken across the width of the prepreg; left, center, right
(3) "ind" refers to individual measurements. "avg" refers to the average measurements per roll. Limits computed at α=0.01 and modified CV.

3.2 Constituent Material Requirements:

3.2.2 Reinforcement: Specific glass fiber yarn producer and production location is controlled by the prepreg process control document (PCD) and NRP 101. The fabric shall meet the requirements in the table below. In addition, the fabric weaver and weaving location is controlled through prepreg PCD and NRP 101. This product does not contain tracer yarn. Tracer yarn may be included only if it is specifically requested by the purchaser. The inclusion of tracer yarn might alter the material properties.

Specification	MIL-R-60346 Type IV, Class 1
Approved Supplier	Advanced Glass Yarn. Aiken, SC
Prepregger's fiber procurement specification	TCRMS 03-02-003 Rev B

Property	Units	Requirement
Catenary	Inches	1.000 max
Moisture	%	0.050% max
Hardness (Shore 0)	Shore 0	50.000 – 90.000
Package Density	Lb/Cu.in	0.045 – 0.063
Shear	Psi	6,600.000 minimum
Yield	Yds/lb	703.000 – 767.000
End Count	-	10.000
Tensile Strength	Psi	515,000.000 minimum
TEX	G/1000meter	647.000 – 706.00
Twist	-	0 nominal
% LOI	%	0.55 – 0.75

3.5 Laminate (Cured Prepreg) Requirements:

3.5.2 Cured Laminate Physical Properties:

TABLE 3 - Cured Laminate Physical Properties

Property	Test Method(1)	Requirements(2)
Cured Ply Thickness(3)	ASTM D3171	0.0087 to 0.0098 inch, avg
Dry Glass Transition Temperature, Tg by DMA(4)	by flexural loading per ASTM D7028	273.70 to 309.70 F, ind

(1) Specific procedures should be identical to those used in the original material qualification program.
(2) "ind" refers to individual measurements. "avg" refers to the average measurements per panel.
(3) Based on actual qualification panel thicknesses.
(4) Limits computed from average qualification data ± 18 ºF.

3.5.3 Cured Laminate Mechanical Properties:

TABLE 5 - Required Cured Laminate Tests for Mechanical Properties (Class 3)

Property	Test Method(1)	Requirements(3)
0° Tension Strength and Modulus, Room Temperature, Ambient Layup: $[0]_5$	ASTM D3039	Strength(2): Min. Ind. $\geq$ 166.90 ksi Strength(2): Average $\geq$ 198.30 ksi Modulus(2): Between 6.40 and 7.00 msi, avg
90/0° Compression Strength, Room Temperature, Ambient Layup: $[90/0/90]_5$	ASTM D6641	Strength(2): Min. Ind. $\geq$ 47.20 ksi Strength(2): Average $\geq$ 55.50 ksi Modulus(2): Between 2.79 and 3.55 msi, avg
0° Short Beam Strength, Room Temperature, Ambient Layup: $[0]_{27}$	ASTM D2344	Strength: Min. Ind. $\geq$ 6.30 ksi Strength: Average $\geq$ 8.00 ksi

(1) Specific procedures should be identical to those used in the original material qualification program.
(2) Normalize the properties to a cured ply thickness value of 0.0092 inch**,** based on actual qualification panel thicknesses.
(3) "ind" refers to individual measurements. "avg" refers to the average of 5 replicates. Limits computed at α=0.01 and modified CV.

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name and Production Location	Date Qualified	Specification Callout[1]
TenCate Advanced Composites S2 Unidirectional Tape	Supplier Name: TenCate Advanced Composites Production Location: 18410 Butterfield Blvd Morgan Hill, CA 95037	October 20, 2017	NMS 250/3 Classification callout is optional because Type 33, Class 3, Grade 284 is the only classification allowed in this QPL.

[1] In accordance with NCAMP Standard Operating Procedures, NSP 100, this QPL shall not contain alternate materials/products. Additional production location may be included in the QPL only after successful equivalency demonstration and approval per NCAMP Prepreg Process Control Document (PCD) Preparation and Maintenance Guide, NRP 101.

[1] The proper specification callout for material procurement purpose is “NMS 250/3.” This specification is developed based on the material properties that are available publicly. The purchaser may specify additional requirements beyond those specified in this specification, especially when the purchaser has generated additional material properties beyond those available publicly or when the application requires additional requirements. The additional requirements are subject to supplier review and approval.