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

High Performance, Low Melt Polyaryletherketone Thermoplastic VICTREX LMPAEK™ UDT, Hexcel AS7 12k Unidirectional 192 gsm 34% RC Type 34, Class 1, Form 3, Grade 192

Prepared by: Royal Lovingfoss (NCAMP/NIAR), Michelle Man (NCAMP/NIAR)

Reviewed by: John Tomblin (NIAR), Claire Steggall-Murphy (Victrex), Petros Karapapas (Victrex), Lauren Rezac (NCAMP AER)

REVISIONS:

Rev	By	Date	Pages Revised or Added
-	Michelle Man	07/03/2023	Document Initial Release
A	Michelle Man	09/23/2025	Updated Specification limits in Table 1, 2, and 3

1. SCOPE:

1.1 Form:

This detail specification along with the base specification NMS 125 establishes the requirements for continuous unidirectional carbon fiber impregnated with a Low Melt Polyaryletherketone (LMPAEK) thermoplastic polymer ("unidirectional tape prepreg").

This detail specification follows the 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.

1.2 Classification:

All products qualified to this detail specification have the following classification: Type 34, Class 1, Form 3, Grade 192

2. TECHNICAL REQUIREMENTS:

Table 1 – Prepreg Physical and Chemical Properties (Class 1, Form 3)[4]

Property	Test Method[1]	Number of Replicates	Requirements[3]
Resin/Polymer Content	ASTM D3171 Proc B	Each Batch[2]	34±3% ind. 34±3% avg.
Fiber Areal Weight	ASTM D3529	Each Batch[2]	192±7 gsm ind. 192±5 gsm avg.
Differential Scanning Calorimetry (DSC)	ASTM D3418 or SACMA SRM 25R-94	Each Batch[2]	
Melt Temp. (Peak)[5]			556 to 592 ºF, avg.
Hot Crystallization Temp. (Peak) [5]			465 to 501 ºF, avg.

[1] Specific procedures should be identical to those used in the original material qualification program.
[2] Three specimens minimum should be taken for each prepreg batch.
[3] "ind." refers to individual measurements. "avg." refers to the average measurements per roll.
[4] Batch release testing - performed in master roll form. Material supplier is not conducting batch release testing in slit tape form.
If the purchaser wishes to conduct receiving inspection tests, they should coordinate with the supplier to obtain the materials, as needed.
[5] Limits set to ±18°F.

2.1 Constituent Material Requirements:

2.1.1 Reinforcement:

The carbon fiber tow product manufacturer shall establish control factors which will yield product meeting the technical requirements of this specification. The factors which are used in the production of fiber tow used in the prepreg material qualification shall constitute the approved factors; they shall be used for manufacturing production carbon fiber tow product. Control factors are Controlled Process Equipment and Controlled Process Parameters for producing the product. Control factors include, but are not limited to, the following:

a) PAN Precursor formulation (raw ingredients and ratios),
b) PAN Precursor manufacturing process, equipment, line, or site,
c) PAN Precursor acceptance requirements,
d) Carbon fiber tow processing parameters (e.g. temperature and speed),
e) Carbon fiber tow manufacturing equipment, line, or site,
f) Carbon fiber tow acceptance requirements,
g) Carbon fiber tow acceptance test methods,
h) Carbon fiber tow acceptance sampling plan,
i) Carbon fiber tow surface treatment methods and levels,
j) Carbon fiber tow sizing formulation and sizing level, and
k) Carbon fiber tow sizing application and drying methods, including equipment.

If it is necessary to make any change in the above control factors, the carbon fiber tow product manufacturer shall submit for re-approval to NCAMP through the prepreg manufacturer in accordance with NRP 101 Prepreg Process Control Document (PCD) Preparation and Maintenance Guide. NRP 102 Polyacrylonitrile-based Carbon Fiber Process Control Document (PCD) Preparation and Maintenance Guide may be used as a reference. The change shall not be incorporated prior to the receipt of re-approval notice, typically in the form of a signed Advanced Change Notice (ACN).

2.1.2 Matrix:

The thermoplastic polymer used to manufacture the prepreg must be Low Melt Polyaryletherketone with the commercial designation VICTREX LMPAEK™ . Shear viscosity measured at 752°F (400°C) is 100-200 Pa-s.

2.2 Visual and Dimensional Requirements:

2.2.1 Roll characteristics

The standard width for this product is 54 mm (2.13 inches). Other widths may be supplied only if it is specifically requested by the purchaser.

2.3 Consolidated Laminate Requirements:

2.3.1 Consolidated Laminate Physical Properties:

TABLE 2 – Consolidated Laminate Physical Properties
(Class 1, Form 3) [8]

Property	Test Method[1]	Requirements[2]
Consolidated Ply Thickness[3][4]	ASTM D3171	0.0065 to 0.0079 inch, avg.
Laminate Density[5]	ASTM D792	1.408 to 1.757 g/cc, avg.
Fiber Volume, by Volume[4][7]	ASTM D3171	55.3 to 61.8 %, avg.
Polymer Content, by Weight[5][7]	ASTM D3171	33.3 to 35.5 %, avg.
Void Content, by Volume[7]	ASTM D3171	≤ 2%, avg.
Differential Scanning Calorimetry (DSC)[9]	ASTM D3418 or SACMA SRM 25R-94	
Melt Temp. (Peak)		572 to 608 ºF, ind.
Cold Crystallization Temp. (Peak)		none[6]
Hot Crystallization Temp. (Peak)		464 to 499 ºF, 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. Required only on one of the panels listed in Table 3.
[3] Consolidated Ply Thickness of the Laminates in Table 3. Theoretical Consolidated Ply Thickness of 0.0072 in. is the nominal used for the purpose of normalization.
[4] Limits are based on theoretical RC and FAW ranges.
[5] Limits computed at α=0.01.
[6] Cold Crystallization should not be observed.
[7] Method II of ASTM D3171 used. Fiber Density Nominal: 1.790 g/cc and Polymer Density Nominal: 1.30 g/cc. (Observed void content from acid digestions tests of limited population was <1%.)
[8] Batch release testing is performed either in master roll form in accordance with NPS 81250 or in slit-tape form in accordance with NPS 81253AFP. If the purchaser wishes to conduct receiving inspection tests, they should coordinate with the supplier to obtain the materials, as needed.
[9] Limits set to ±18°F.

2.3.2 Consolidated Laminate Mechanical Properties:

TABLE 3 - Consolidated Laminate Mechanical Properties
(Class 1, Form 3) [5]

Property	Test Method[1]	Requirements[3]
0° Tension Strength and Modulus Room Temperature, Ambient Layup: $[0]_8$	ASTM D3039	Strength[2]: Min. Ind. $\geq$ 298 ksi Strength[2]: Average $\geq$ 341 ksi Modulus[2]: 18.8 to 22.3 Msi, avg.
Compression Strength and Modulus Room Temperature, Ambient Layup: $[45/0/-45/90]_{3S}$	ASTM D6641[6]	Strength[2]: Min. Ind. $\geq$ 69.4 ksi Strength[2]: Average $\geq$ 79.6 ksi Modulus[2]: 6.6 to 7.9 Msi, avg.
Open Hole Compression Strength Room Temperature, Ambient Layup: $[45/0/-45/90]_{3S}$	ASTM D6484[6]	Strength[2]: Min. Ind. ≥ 37.2 ksi Strength[2]: Average ≥ 42.5 ksi
In-Plane Shear at 0.2% offset Room Temperature, Ambient Layup: $[+45/-45°]_{4s}$	ASTM D3518	Strength[4]: Min. Ind. ≥ 4.80 ksi Strength[4]: Average ≥ 5.50 ksi Modulus[2,4]: 0.53 to 0.63 Msi, avg.

[1] Specific procedures should be identical to those used in the original material qualification program.

[2] Normalize the properties to a consolidated ply thickness value of 0.0072 inch, based on theoretical nominal CPT, using the following equation:
Normalized_Value = Measured_Value x Measured_CPT / Nominal_CPT

[3] "ind." refers to individual measurements. "avg." refers to the average of 5 replicates. Limits computed at α=0.01 and modified CV. All modulus range is 1000-3000 με.

[4] IPS properties are not normalized. Strain range for offset is 1000-3000 με.

[5] Batch release testing is performed either in master roll form in accordance with NPS 81250 or in slit-tape form in accordance with NPS 81253AFP.

[6] Either CLC or OHC needs to be completed to fulfill specification requirements. It is not necessary to complete both methods, but at least one must be done.

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name and Production Location	Date Qualified	Specification Callout(1)
VICTREX LMPAEK™ UDT AS7-192-34	Supplier Name: Victrex, Manufacturing Ltd. Production Location: Hillhouse International, Thornton-Cleveleys Lancashire, UK FY5 4QD Line: UD2 (2” tape UD-PCD-T-083-50)	May 2025	NMS 125/3 Classification callout is optional because Type 34, Class 1, Form 3, Grade 192 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 125/3.” 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.