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

Tenax™ Dry Reinforcement (Carbon Fiber)
Class 1, Style BD, Grade 380

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REVISIONS:

Rev	By	Date	Pages Revised or Added
N/C	Michelle Man	12/20/2022	Document Initial Release
A	Michelle Man	06/30/2025	Updated Solvay to Syensqo, requirements in Section 2.

1 SCOPE:

1.1 Form:

This detail specification along with the base specification NMS 241F establishes the requirements for Bidiagonal dry reinforcement non-crimp fabric. This detail specification is intended to be used with an NCAMP qualified resin material specification and process specification to produce qualified acceptance specification limits.

This detail specification provide specific material properties called out in the base specification and may contain 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: Class 1, Style BD, Grade 380, Bidiagonal 45°/-45° (and -45°/45°), non-crimp fabric.

1.3 Reinforcement Fabric Construction.

The construction of this reinforcement fabric consists of PB/45°/V/-45°/V; the powder binder, followed by a layer of 45° carbon fibers, a layer of veil, a layer of -45° carbon fibers and another layer of veil . The fabric is stitched with the co-polyamide yarn using a tricot-pillar-loop 4.0 mm stitching pattern. Figure 1 illustrates the detailed construction of the reinforcement.

This specification also governs the construction of PB/-45°/V/45°/V. This construction is illustrated in Figure 2.

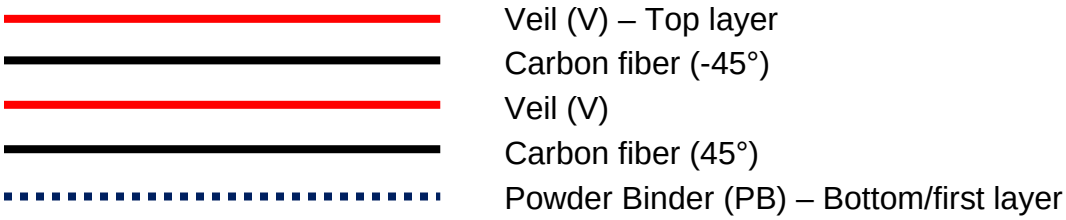

Figure 1 Detail Construction BD 45/-45

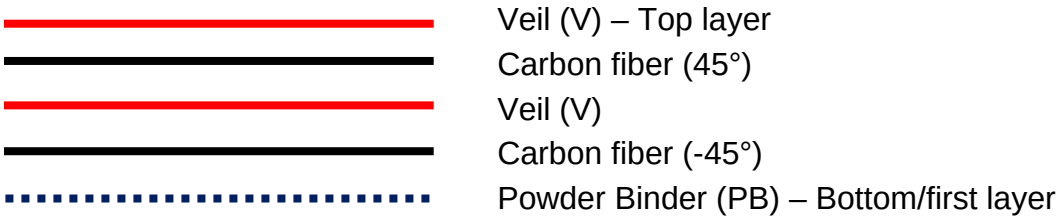

Figure 2 Detail Construction BD -45/45

2 Physical and Chemical Property Requirements:

Dry reinforcement testing to meet the requirements detailed in this specification shall be performed on every lot of material and shall be the responsibility of the material supplier.

Table 2-1 – Reinforcement Physical Properties

Property	Test Method[(1)]	Number of Replicates per lot	Requirements[(2)]
Product Areal Weight (without Binder)	DIN EN 12127 (TAV DRNF 2302-002)	3	392 ± 19 gsm, ind. 392 ± 19 gsm, avg.
Binder Areal Weight	TAV DRNF-PB 2303-002	3	10 ± 3 gsm, ind. 10 ± 3 gsm, avg.
Material Width 50”	DIN EN 1773:1993:1996 (TAV DRNF-WS 2304-002)	3	1270 +10 -30 mm

(1) Specific procedures should be identical to those used in the original material qualification program. Teijin internal standard may be requested from Teijin.

(2) “ind.” refers to individual measurements. “avg.” refers to the average measurements per roll.

The following sampling interval shall be used:

A standard unit of reinforcement fabric (RF) is defined to an area of 175 m², independent of the width and weight of the RF and the actual size of the produced units.

The number of units to be tested in relation to the number of units in a production lot is given in the following table.

The first ten production lots of a newly qualified material shall be tested according to statistical distribution. Further production lots shall be tested in accordance with the normal distributions unless otherwise agreed between the supplier and purchaser.

Number of Standard Units in a production lot (n)	Number of standard units to be tested (x)	
	Normal	Statistical
01 – 03 (0 m² – 525 m²)	1	Each Unit
04 – 15 (525 m² - 2.625 m²)	2	3
16 – 25 (2.625 m² - 4.375 m²)	4	4
26 – 40 (4.375 m² - 7.000 m²)	5	5
>= 41 (>= 7.000 m²)	7	7

The unit number to be sampled shall be in accordance with the following:

- Two units sampled: First and last produced roll
- More than two units sampled: First and every n / (x-1) unit to be tested (to the lowest number)

2.1 Constituent Material Requirements**:**

2.1.1 Reinforcement: The carbon fiber tow is a Tenax™ - E IMS65 E23 24K 830 tex fibers and are manufactured in accordance with NMS 818/15.

3 Related Specifications

The following are NCAMP qualified materials and process specifications that may be used with this material.

Document type	Specification Number	Document Name
Process Specification	NPS 82401	Fabrication of NMS 241 Qualification, Equivalency, and Acceptance Test Panels for Vacuum Assisted Resin Transfer Molding of Carbon Reinforcements with Syensqo PRISM™ EP2400 toughened epoxy resin
Material **Procurement** Specification	NMS 241R/1	Resin Specification: Syensqo PRISM™ EP 2400 Toughened Epoxy Resin (formerly Solvay)
Material **Acceptance** Specification	NMS 241/2	Oven Cure of VARTM Processed Dry Reinforcements with Toughened Epoxy Resin - Tenax™ Bidiagonal DRNF with Syensqo PRISM™ EP2400 Resin (formerly Solvay)

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name and Production Location	Date Qualified	Specification Callout(1)
DRNF IM BD 0380 710089 DRNF IM BD 0380 710090	**Fiber Supplier Name**: Teijin **Production Location**: Teijin Carbon Europe GmbH Vitsstrasse 2 52525 Heinsberg Germany Textile Production Line: 2303	May 2025	NMS 241F/2 Material QPL: Classification callout is optional because Class 1, Style BD, Grade 380, Dry reinforcement non-crimp fabric 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 Process Control Document (PCD) Preparation and Maintenance Guide, NRP 101.

(1) **The proper specification callout for material procurement purpose is "NMS 241F/2".** 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.

Class 1 Product Key (for reference only)

Product Designation	Description	Construction	US Product key	European Product key
DRNF IM BD 0380 710089	PB1_10-V6_04-IMS65-BD21-Y6_TPL40-0380	PB/+45°/V/-45°/V	C710089-50	710089
DRNF IM BD 0380 710090	PB1_10-V6_04-IMS65-BD22-Y6_TPL40-0380	PB/-45°/V/+45°/V	C710090-50	710090