

National Center for Advanced Materials Performance
Wichita State University – NIAR
1845 Fairmount Ave., Wichita, KS 67260

TABLE OF CONTENTS

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|---|----|
| TABLE OF CONTENTS | 2 |
| 1. SCOPE | 3 |
| 1.1. TYPE | 3 |
| 1.2. COMPOSITION | 3 |
| 1.3. CLASS | 3 |
| 2. REFERENCES | 3 |
| 3. DEFINITIONS | 4 |
| 4. PROCESS CONTROL DOCUMENT | 5 |
| 4.1. MATERIAL REQUIREMENTS | 5 |
| 4.2. APPROVED MACHINES | 5 |
| 5. QUALIFICATION | 5 |
| 6. FIBER FEEDSTOCK REQUIREMENTS | 6 |
| 6.1. RETENTION OF QUALIFICATION STATUS | 6 |
| 7. MATERIAL TEST METHODS | 7 |
| 7.1. LINE WEIGHT | 7 |
| 7.2. MOISTURE | 7 |
| 7.3. LINE DIAMETER & CROSS-SECTIONAL AREA | 7 |
| 7.4. FIBER DENSITY, TENSILE STRENGTH, & YOUNG'S MODULUS | 7 |
| 8. TEST FAILURE | 7 |
| 9. SPOOL IDENTIFICATION | 7 |
| 9.1. TRACEABILITY | 7 |
| 10. STORAGE AND HANDLING OF FIBER (UN-VERIFIED) | 7 |
| 11. SAFETY – HAZARDOUS MATERIALS | 8 |
| 12. ROUNDING OF VALUES | 8 |
| 13. QUALITY MANAGEMENT SYSTEM | 8 |
| 14. STATISTICAL PROCESS CONTROL | 8 |
| 15. ACKNOWLEDGEMENT | 8 |
| 16. REVISION HISTORY | 9 |
| APPENDIX A - KEY PROCESS VARIABLES | 10 |

1. SCOPE

This specification establishes the requirements for the manufacturing of a Finished Goods Feedstock from receipt of Raw Feedstock Lot and Raw Resin Lot.

This specification does not cover the process of NCAMP Qualification and is limited to establishing requirements only. It does not establish implementation.

The Finished Goods Feedstock detailed in this document is Carbon Fiber FR-A™ (T300 1K tow), a Type 1 Form 1 PACF50FR05 filament. Carbon Fiber FR-A™ cannot be used on its own and is intended to be used with Onyx FR-A™.

1.1. TYPE

The type must specify the predominant resin used in the feedstock. The resin type must use ASTM D4000 abbreviations (a.k.a. standard symbols); if the resin type is not listed in ASTM D4000, abbreviations known in the industry must be used. All material must be Type 1. The resin is placed in and around the fiber. Melt compounding is method by which the additive and polymer were combined in the manufacturing of the final material form performed via MF-PCD-001, Section 6. Melt compounding is also the process of including polyamide in and around the carbon fiber.

Table 1 – Material Types

| Type | Resin Type |
|--------|------------|
| Type 1 | Polyamide |

1.2. COMPOSITION

The composition must specify the type of fillers and/or reinforcements.

Table 2 – Material Composition

| Composition | Filler / Reinforcement Material |
|-------------|---------------------------------|
| CF | Carbon Fiber |
| FR | Flame Retardant |

1.3. CLASS

The Class must specify the amount, to the nearest weight percent, of the filler or reinforcement. The value for the Class must be immediately appended to the Composition abbreviation (e.g. CF30 for 30% carbon fiber and the remaining 70% is a Type 1 and FR blend).

2. REFERENCES

29 CFR 1910.1200

10. STORAGE AND HANDLING OF FIBER

16. REVISION HISTORY

| REV | DESCRIPTION | DATE | WHO |
|-----|---|-----------|-------|
| - | Initial release | 4/21/2021 | NCAMP |
| A | <ol style="list-style-type: none"> 1. Added "Section 6" to referred MF-PCD-001 in section 1.1. 2. Added Line weight requirements of "0.0610 - 0.0694" in Table 4 and Table 7. (Values provided by Markfroged) 3. Incorporated fiber density, tensile strength, and Young's modulus requirements in Table 4 4. Removed filament class, melt and glass transition temperature, and composition requirements was removed from 563.74 Tm0 G(t)-4(em)15(per)-5(at)-5(u)11(r)-3(e),) | | |

APPENDIX A - KEY PROCESS VARIABLES

The following table outlines parameters and characteristics determined to be critical to the quality of a Fiber Spool. A brief description of each parameter, along with SPC requirements, is also included. “Discrete” parameters are a specific value, and do not deviate. “Range” parameters may fall within an allowable range.

Table 8 – Key Process Variables

| Variable | Description | Control Type | SPC Required |
|----------------------------------|--|--------------|--------------|
| Fiber Line Die Design Parameters | Conformance to design of the die used on the fiber line | Range | N/A |
| Fiber Line Temperature(s) | Temperature of various zones in the fiber line die | Range | Yes |
| Melt Flow Ratio | Ratio of coating material to raw fiber | Discrete | N/A |
| Moisture | Moisture of Raw Feedstock Lot, Fiber Lot, or Fiber Spool sample measured in accordance to ASTM D7191 | Range | N/A |
| XX/YY Cross-Sectional Area | Cross-sectional area of the Fiber Spool calculated using a single-axis non-contact micrometer | Range | Yes |
| XY Cross-Sectional Area | Cross-sectional area of the Fiber Spool calculated using a 2-axis non-contact micrometer | Range | Yes |