



Document No.: NMS 818/11

Carbon Fiber Tow, 670 Tensile Strength, 34.7 Tensile Modulus

(Supplier Product Designation: Tenax-E HTS40 F13 12K 800tex)  
(Old Designation: Tenax-E HTS 5631 800tex f12000 t0)

(for NMS 451/14 MTM45-1 12K HTS40 F13 Prepreg)

NCAMP Material Specification

Prepared by: Yeow Ng, John Tomblin

Reviewed by: Mike Kinsella (Toho Tenax), Joel Payne (Toho Tenax), Bob Varga (Toho Tenax)

### 3 TECHNICAL REQUIREMENTS

#### 3.2.5 Splices

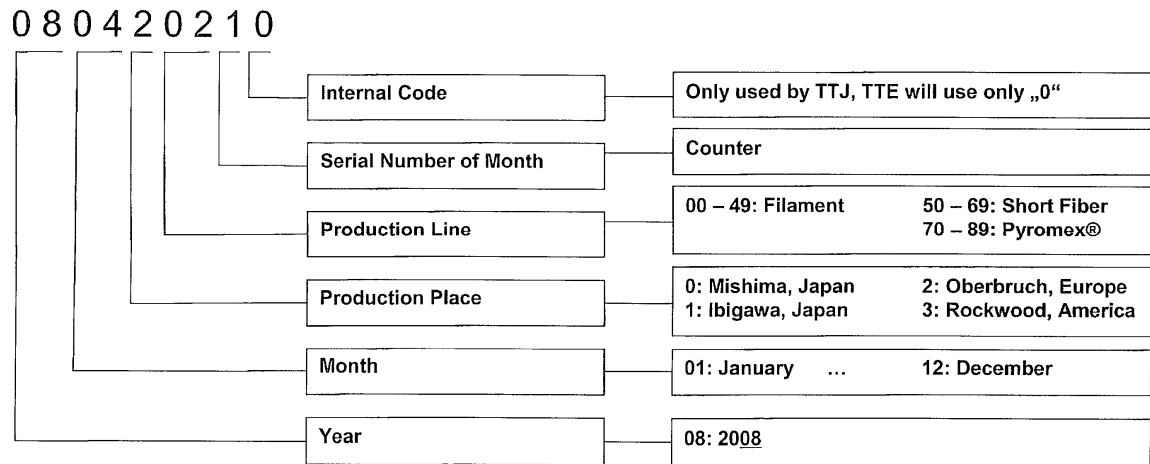
Splices are allowed for twisted tow (Style TT) only. UT and NT styles shall not be spliced. The frequency of carbon fiber tow splice shall be no more than two per pound.

#### 3.2.9 Storage Life

Ambient storage life shall be 3 years from the date of fiber manufacture. The manufacturer shall not ship any material with less than 12 months of remaining storage life, unless specifically allowed by the purchaser.

Date of fiber manufacture (month and year) can be determined from the fiber lot number as follows:

#### Lot-Nummern-System



For example, lot number 080420210 indicates that the fiber is manufactured in April 2008.

#### 3.2.10 Carbon Fiber Lot (definition)

Carbon fibers formed during one essentially continuous, uninterrupted production run under the same steady-state process conditions using unlimited PAN precursor lots. Individual carbon fiber spools must be traceable to the PAN precursor lot. An interruption in the process of up to 72 hours is permitted, provided that another material was not produced on the equipment during the interruption. Production equipment setting may be fine-tuned by the

manufacturer during the production of a fiber lot only if the manufacturer is familiar with the effects of the setting on the carbon fiber properties, and for the purpose of meeting the requirements of this specification and corresponding PCD only. The fine-tuned process set-points and as-measured values must be within PCD limits.

### 3.3 Properties

The carbon fiber tow product shall conform to the requirements of Table 1.

Table 1 – Carbon Fiber Tow Properties

Paragraph	Property	Requirements, Lot average or individual spool (see Note 1)	Test Method
3.3.1	Tow Tensile Strength (ksi)	580 (min. lot average) 507 (min. ind. spool)	4.5.1
3.3.2	Tow Tensile Modulus (Msi)	33.8 to 35.8 (lot average)	4.5.1 (see Note 3)
3.3.3	Percent Elongation	1.60 (min. lot average)	4.5.1 (See Note 3)
3.3.4	Density (g/cm <sup>3</sup> ) (see Note 2)	1.74 to 1.78 (lot average)	4.5.2
3.3.5	Mass Per Unit Length (tex or g/km), without size	788 to 812 (lot average)	4.5.3
3.3.6	Twist (turns/m)	NT 0.8 per inch maximum	Not required for lot acceptance
3.3.7	Sizing Content (wt. %)	0.85 to 1.15 (lot average)	4.5.5

Note 1: Individual spool requirements are specification limits used with AQL=1%. Lot acceptance test result report may contain lot average values only; supplier shall ensure that individual spool requirements are met. Additional individual spool requirements are listed in supplier PCD.

Note 2: Density test is on reduced sampling plan and exempted from AQL of 1 percent

Note 3: Calculation of tensile modulus/elongation according to Toho Tenax specification LAB A6.1

#### 4.4 Change Control Approval (additional requirement)

To participate in change control management and be notified when changes occur to this specification and/or PCD, end-users must provide the appropriate contact details (name, title, company, address, e-mail, and phone) to NCAMP, Wichita State University – NIAR, 1845 Fairmount, Wichita, KS 67260-0093.

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name, Location, and Line Number	Date Qualified	Specification Callout
<p>Tenax-E HTS40 F13 12K 800tex</p> <p>(Old designation: Tenax-E HTS 5631 800tex f12000 t0)</p>	<p>Supplier Name: Toho Tenax America, Inc.</p> <p>Production Location: Toho Tenax Europe GmbH Industriepark Oberbruch Boos-Fremery-Straße 52525 Heinsberg Germany</p> <p>Line Number: 2 Only</p>	<p>July 2, 2009</p>	<p>NMS 818/11, Style NT, Grade 12K</p>