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Standard Specification for Glass Fiber Cord and Sewing Thread[1]

This standard is issued under the fixed designation D4030/D4030M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the requirements for continuous glass filament sewing thread; and continuous filament cord, untreated and neoprene treated.

1.2 This specification is intended to assist ultimate users by designating the types of these products that are typical in the industry.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system ~~may~~are not ~~be~~ exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems ~~may~~will result in nonconformance with the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate ~~safety and health~~safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles
D204 Test Methods for Sewing Threads
~~D578~~D578/D578M Specification for Glass Fiber Strands
~~D1423~~D1423/D1423M Test Method for Twist in Yarns by Direct-Counting
~~D1776~~D1776/D1776M Practice for Conditioning and Testing Textiles
~~D4963~~D4963/D4963M Test Method for Ignition Loss of Glass Fiber Strands and Fabrics
~~D7018~~D7018/D7018M Terminology Relating to Glass Fiber and Its Products (Withdrawn 2021)[3]

2.2 *ANSI Standard:*

ANSI/ASQC Z1.4 Sampling Procedures for Inspection by Attributes[4]

[1] This specification is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.18 on Glass Fiber and its Products.
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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

3. Terminology

3.1 For all terminology under the jurisdiction of Subcommittee D13.18 (cord, neoprene treated, sewing thread, twist balance, untreated), refer to Terminology ~~D7018~~D7018/D7018M.

3.2 For definitions of other textile terms used in this specification, refer to Terminology D123.

4. Designation of Construction

4.1 The yarn designations of fiber glass cords and sewing threads are specified as directed in Specification ~~D578~~D578/D578M except that for the cords either the letter "U" or the letter "N" is added to the last segment of the designation.

4.1.1 Cord designations ~~may~~ include a type number that describes the relative diameter of the cords and treatment. The first character of this designation is a numeral from 1 to 10 that indicates the relative diameter of the cord to other cords, that is, 2 is larger than 1, 3 is larger than 2, etc. The second character of this designation is the letter "U" or the letter "N". The "U" indicates that the cord is untreated, and the "N" indicates that the cord is neoprene treated. The type number for cord is included in Tables 1 and 2 to show its relationship to designation.

4.1.2 Sewing thread construction includes a type number that describes a manufacturer's code and the size. The second character is a numeral and indicates the relative diameter of the sewing threads, that is, 4 is larger than 2, 6 is larger than 4, etc. This type number for sewing thread is included in Table 3 to show its relationship to designation.

REQUIREMENTS

5. Material

5.1 The fiber shall be electrical grade, free of any free alkali metal oxides, such as soda or potash, and foreign particles, dirt, and other impurities.

6. Designation

6.1 The nominal designation of glass fibercords listed in Table 1 or Table 2 shall conform to the requirements of Table 1 or Table 2. The nominal designation of glass fiber sewing threads listed in Table 3 shall conform to the requirements of Table 3. The nominal designations of other lass fibercords or sewing threads shall be agreed upon between the purchaser and the supplier. The requirements of the individual elements of the designation are specified in Sections 7 – 9.

7. Filament Diameter

7.1 The nominal filament diameter of glass fiber cords shall be designated by the letter designation "G". The nominal filament diameter of r glass fiber sewing threads shall be designated by the letter designation "B" to "DE", as applicable. The numerical values associated with letter designations are specified in Specification ~~D578~~D578/D578M. The average filament diameter for the yarns in the cord or sewing thread shall conform to Specification ~~D578~~D578/D578M for the specified filament diameter.

TABLE 1 Physical Properties of Typical Continuous Filament Glass Cords, Untreated

Type[A]	Designation		Nominal Yarn Number		Breaking Strength, min		Nominal Yarn Diameter	
	tex	inch-pound units	tex	yd/lb	N	lbf	mm	in.
1U	EC9 33 2 × 2U	ECG 150 2/2U	137	3620	44	10	0.25	0.010
2U	EC9 33 4 × 5U	ECG 150 4/5U	710	700	249	56	0.66	0.026
3U	EC9 33 4 × 8U	ECG 150 4/8U	1165	425	418	94	0.86	0.034
4U	EC9 33 4 × 16U	ECG 150 4/16U	2400	210	827	186	1.32	0.02
5U	EC9 33 4 × 10 × 3U	ECG 150 4/10/3U	4700	105	1277	287	1.93	0.06
6U	EC9 33 4 × 12 × 3U	ECG 150 4/12/3U	5500	90	1401	315	2.11	0.083
7U	EC9 33 4 × 12 × 4U	ECG 150 4/12/4U	7400	67	1601	360	2.41	0.095
8U	EC9 33 4 × 24 × 3U	ECG 150 4/24/3U	11000	45	2571	578	3.02	0.119
10U	EC9 33 4 × 36 × 3U	ECG 150 4/36/3U	17100	29	3363	756	3.78	0.149

[A] Commercial designation.

TABLE 2 Physical Properties of Typical Continuous Filament Glass Cords, Treated

Type[A]	Designation		Nominal Yarn Number		Breaking Strength, min		Nominal Yarn Diameter	
	tex	inch-pound units	tex	yd/lb	N	lbf	mm	in.
1N	EC9 33 2 × 2N	ECG 150 2/2N	153	3240	53	12	0.27	0.0105
2N	EC9 33 4 × 5N	ECG 150 4/5N	775	638	285	64	0.81	0.032
3N	EC9 33 4 × 8N	ECG 150 4/8N	1280	387	449	101	0.99	0.039
4N	EC9 33 4 × 16N	ECG 150 4/16N	2600	193	867	195	1.57	0.062
5N	EC9 33 4 × 10 × 3N	ECG 150 4/10/3N	5100	98	1290	290	2.13	0.084
6N	EC9 33 4 × 12 × 3N	ECG 150 4/12/3N	5900	84	1379	310	2.39	0.094
7N	EC9 33 4 × 12 × 4N	ECG 150 4/12/4N	8100	61	1512	340	2.79	0.110
8N	EC9 33 4 × 24 × 3N	ECG 150 4/24/3N	11800	42	2473	556	3.25	0.128
10N	EC9 33 4 × 36 × 3N	ECG 150 4/36/3N	18400	27	2998	674	4.19	0.165

[A] Commercial designation.

TABLE 3 Physical Properties of Typical Continuous Filament Glass Sewing Threads

Type[A]	Designation		Nominal Yarn Number		Breaking Strength, min		Nominal Yarn Diameter	
	tex	inch-pound units	tex	yd/lb	N	lbf	mm	in.
B-4	EC3.5 33 1 × 2	ECB 150 1/4	140	3550	58	13	0.36	0.014
B-6	EC3.5 33 2 × 3	ECB 150 2/3	213	2330	89	20	0.43	0.017
B-8	EC3.5 33 2 × 4	ECB 150 2/4	287	1730	111	25	0.51	0.020
T-12	EC6 33 1 × 4	ECDE 150 1/4	140	3550	58	13	0.36	0.014
T-18	EC6 33 2 × 4	ECDE 150 2/3	213	2330	89	20	0.43	0.017
T-24	EC6 33 2 × 4	ECDE 150 2/4	287	1730	111	25	0.51	0.020
E-12[B]	EC 4.0 33 2 × 2	ECBC 150 2/2	140	3550	54	12	.36	.014
E-18[B]	EC 4.0 33 2 × 3	ECBC 150 2/3	213	2330	80	18	.43	.017
E-24[B]	EC 4.0 33 2 × 4	ECBC 150 2/4	287	1730	111	25	.051	.020

[A] Commercial designation.
[B] Finished PTFE (Teflon) coated sewing thread

NOTE 1—Because of the application of glass fiber sewing threads, it is desirable to utilize somewhat finer filament sizes.

8. Yarn Number

8.1 Since the yarn number in the designation does not include size, the nominal yarn number for strands including size is stated separately for strands listed in Table 1, Table 2, or Table 3. For strands not listed in those tables, the nominal yarn number including size shall be agreed upon between the purchaser and the supplier. The average yarn number for the lot shall be within the interval: nominal yarn number ±10 % of the nominal yarn number.

9. Strand Construction

9.1 For strands listed in Table 1, Table 2, or Table 3, the strand construction shall conform to the requirements of Table 1, Table 2, or Table 3. For strands not listed in Table 1, Table 2, or Table 3, the strand construction shall be agreed upon between the purchaser and the supplier.

10. Direction of Twist

10.1 For glass fiber cords the primary twist shall be“ Z” twist and the final twist shall be “S” twist unless otherwise agreed upon between the purchaser and the supplier. For glass fiber sewing threads the primary twist shall be “S” twist and the final twist shall be “Z” twist unless otherwise agreed upon between the purchaser and the supplier.

11. Twist Level

11.1 The nominal twist of glass fiber cords and sewing threads shall be agreed upon between the purchaser and the supplier. The tolerances for the primary twist and for the final twist shall conform to Table 4.

12. Breaking Strength

12.1 The minimum breaking strength for glass fibercords listed in Table 1 or Table 2 shall conform to the requirements of Table 1 or Table 2. The minimum breaking strength of glass fiber sewing thread listed in Table 3 shall conform to the requirements of Table 3. The minimum breaking strength of other r glass fiber cords or sewing threads shall be agreed upon between the purchaser and the supplier. No individual break shall be less than the specified minimum breaking strength.

TABLE 4 Twist Tolerances

	Tolerances
Turns per Centimetre:	
~~From zero to 0.4, incl~~	~~±0.1 turn per centimetre~~
From zero up to and including 0.4	±0.1 turn per centimetre
Over 0.4 and up to and including 4.0	±0.2 turn per centimetre
Over 4	±5.0 % of the specified average twist
Turns per Metre:	
~~From zero to 40, incl~~	~~±10 turns per metre~~
From zero up to and including 40	±10 turns per metre
Over 40 and up to and including 400	±20 turns per metre
Over 400	±5.0 % of the specified average twist
Turns per Inch:	
~~From zero to 1, incl~~	~~±0.25 turn per inch~~
From zero up to and including 1	±0.25 turn per inch
Over 1 and up to and including 10	±0.5 turn per inch
Over 10	± 5.0 % of the specified average twist

13. Yarn Diameter

13.1 The nominal yarn diameter for some generally available glass fiber cords are listed in Table 1 or Table 2, and the nominal yarn diameter for some generally available glass fiber sewing threads are listed in Table 3. The nominal yarn diameters are included for information only and are not considered a cause for rejection unless otherwise agreed upon, as when specified in an applicable material specification. In that case, the yarn diameter tolerances shall be agreed upon between the purchaser and the supplier.

14. Twist Balance

14.1 The average twist balance shall not exceed one half of the complete rotation.

15. Ignition Loss

15.1 The nominal organic content of sewing threads and untreated cords shall be not less than ~~1.3 %~~1.3 weight % and no more than ~~2.0 %~~2.0 weight % unless otherwise agreed upon between the purchaser and the supplier. The nominal organic content of neoprene-treated cords shall be no less than ~~4.0 %~~ 4.0 weight % unless otherwise agreed upon between the purchaser and the supplier.

16. Visual Appearance

16.1 The cord or sewing thread shall be generally uniform in quality and condition, clean, smooth, and free of foreign particles and defects detrimental to appearance or performance.

16.2 The cord or sewing thread in the laboratory sample for the visual appearance shall be examined for the defects listed in Table 5, and the acceptable quality levels (AQLs) shall be 1.5 total (major and minor combined) defects per hundred units unless otherwise agreed upon between the purchaser and the supplier.

TABLE 5 Visual Examination of Cord and Sewing Thread

Examine	Defect
Appearance and workmanship	any cut finish, other than as specified spot or stain[A] embedded foreign matter[A]
Put-up	any defect affecting the free unhampered unwinding of yarn or affecting the secure holding of yarn winds on the package not put-up on spool specified

[A] Clearly visible at normal inspection distance of approximately 1 m [3 ft].

17. Put-Up

17.1 Glass fiber cord or sewing thread shall be wound on tubes, spools, or cones as agreed upon between the purchaser and the supplier. The ~~supplier~~supplier's may use his standard practice may be used unless otherwise agreed upon between the purchaser and the supplier.

18. Packaging

18.1 Each tube, spool, or cone, put-up as specified, shall be packaged to afford adequate protection against physical damage during shipment from the supply source to the receiving activity. The ~~supplier may use his standard practice~~supplier's standard practice may be used when it meets this requirement.

19. Marking

19.1 Each package shall be marked to show the following information unless otherwise specified by the purchaser and the supplier. Characters shall be of such size as to be clearly legible and shall not be obliterated by normal handling:

~~Product, Type Cord or Sewing Thread, as applicable~~	
Product, Type, Cord or Sewing Thread	as applicable
Construction	
Treatment	
Size	
~~Glass Type (for example, "E" Glass~~	
Glass Type (for example, "E") Glass	
Lot Number	
Number of Units	
Purchase Order Number	

SAMPLING AND CONDITIONING

~~**SAMPLING AND CONDITIONING**~~

20. Sampling

20.1 *Lot Size*—A lot is defined as a single shipment of a single type of cord or sewing thread. A lot may constitute all or part of a single customer order.

20.2 *Lot Sample*—As a lot sample, take at random the number of tubes, spools, cones, or other yarn holding units specified in ANSI/ASQC Z1.4 and a single sampling plan.

20.3 *Laboratory Sample*—As a laboratory sample, take the following samples:

20.3.1 For visual appearance of the outer surface of packages, the tubes, spools, cones, or other yarn holding units in the lot sample serve as the laboratory sample.

20.3.2 For other properties, take at random from the packages in the lot sample the number of packages specified in ANSI/ASQC Z1.4.

20.4 *Test Specimens*—For package appearance, the packages in the lot sample serve as test specimens. For other properties, take skeins from the outside of each package in the laboratory sample as a source of test specimens required in the respective test methods in this specification after first discarding a minimum of 110 m [120 yd] from the very outside of the package.

21. Condition

21.1 Condition the laboratory samples for a period of at least 5 h in the atmosphere as specified in Practice ~~D1776~~D1776/D1776M. Test under the same conditions. Preconditioning is not required.