Designation: D922 – 23

Standard Specification for Nonrigid Vinyl Chloride Polymer Tubing[1]

This standard is issued under the fixed designation D922; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers nonrigid tubing of vinyl chloride polymer or its copolymers with other materials for use in electrical insulation in three grades, as follows:

1.1.1 *Grade A*—General-purpose.

1.1.2 *Grade B*—Low-temperature.

1.1.3 *Grade C*—High-temperature.

1.2 This standard and IEC-60684-3-100 to -105 address the same subject matter but differ in technical content.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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, 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]

D876 Test Methods for Nonrigid Vinyl Chloride Polymer Tubing Used for Electrical Insulation

D1711 Terminology Relating to Electrical Insulation

D3636 Practice for Sampling and Judging Quality of Solid Electrical Insulating Materials

E176 Terminology of Fire Standards

2.2 *IEC Standards:*

IEC-60684-3-100 to -105 Flexible insulating sleeving, Part 3, Sheets 100 to 105: Extruded PVC sleeving[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions pertaining to electrical insulation, refer to Terminology D1711.

3.1.2 For definitions pertaining to fire standards, refer to Terminology E176.

4. Ordering Information

4.1 Orders for material covered by this specification shall include the following:

4.1.1 Grade of tubing,

4.1.2 Size and color,

4.1.3 Total length in feet [or meters],

4.1.4 Length of cut pieces in inches [or centimeters], if any, and

4.1.5 Amount of tubing on each spool or in each coil, if not standard packaging with the supplier.

5. Color

5.1 Clear transparent, black, white, yellow, green, blue, and red shall be considered standard colors. Other colors shall be considered special. The color desired shall be specified in the purchase order.

5.2 *Conditioning:*

5.2.1 Unless otherwise specified, all testing for this standard shall be conducted at 23 °C ± 5 °C (73 °F ± 9 °F) and a relative humidity of 50 % ± 10 % RH. All samples shall be preconditioned at 23 °C ± 5 °C (73 °F ± 9 °F) and a relative humidity of 50 % ± 10 % RH for a minimum of 30 minutes prior to test.

6. Dimensional Requirements

6.1 *Inside Diameter*—The inside diameter of the tubing shall conform to the requirements prescribed in Table 1 or Table 2.

[1] This specification is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.07 on Electrical Insulating Materials.

Current edition approved Feb. 1, 2023. Published February 2023. Originally approved in 1947. Last previous edition approved in 2018 as D922 – 18. DOI: 10.1520/D0922-23.

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

***A Summary of Changes section appears at the end of this standard**

TABLE 1 Dimensional Tolerances of Tubing[A,B]

Specified Size	Inside Diameter, in.		Wall Thickness	
	max	min	Wall Thickness, in.	Tolerances, plus or minus, in.
No. 24 [0.022 in.]	0.027	0.020	0.012	0.002
No. 22 [0.027 in.]	0.032	0.025	0.012	0.002
No. 20 [0.034 in.]	0.039	0.032	0.016	0.003
No. 18 [0.042 in.]	0.049	0.040	0.016	0.003
No. 16 [0.053 in.]	0.061	0.051	0.016	0.003
No. 14 [0.066 in.]	0.074	0.064	0.016	0.003
No. 12 [0.085 in.]	0.091	0.081	0.016	0.003
No. 11 [0.095 in.]	0.101	0.091	0.016	0.003
No. 10 [0.106 in.]	0.112	0.102	0.016	0.003
No. 9 [0.118 in.]	0.124	0.114	0.020	0.003
No. 8 [0.133 in.]	0.141	0.129	0.020	0.003
No. 7 [0.148 in.]	0.158	0.144	0.020	0.003
No. 6 [0.166 in.]	0.178	0.162	0.020	0.003
No. 5 [0.186 in.]	0.198	0.182	0.020	0.003
No. 4 [0.208 in.]	0.224	0.204	0.020	0.003
No. 3 [0.234 in.]	0.249	0.229	0.020	0.003
No. 2 [0.263 in.]	0.278	0.258	0.020	0.003
No. 1 [0.294 in.]	0.311	0.289	0.020	0.003
No. 0 [0.330 in.]	0.347	0.325	0.020	0.003
5/16 in.	0.334	0.312	0.025	0.003
3/8 in.	0.399	0.375	0.025	0.003
7/16 in.	0.462	0.438	0.025	0.003
1/2 in.	0.524	0.500	0.025	0.003
5/8 in.	0.655	0.625	0.030	0.003
3/4 in.	0.786	0.750	0.035	0.005
7/8 in.	0.911	0.875	0.035	0.005
1 in.	1.036	1.000	0.035	0.005
1 1/4 in.	1.290	1.250	0.040	0.005
1 1/2 in.	1.550	1.500	0.045	0.006
1 3/4 in.	1.812	1.750	0.055	0.008
2 in.	2.070	2.000	0.060	0.010

[A] Multiply inches by 25.4 to get millimeters.
[B] For tubing sizes not listed in this table, the wall thickness of the nearest larger diameter shall apply.

6.2 *Wall Thickness*—The wall thickness of the tubing shall conform to the requirements prescribed in Table 1 or Table 2.

6.3 *Commercial Lengths*—The tubing shall be supplied in continuous lengths.

7. Workmanship, Finish, and Appearance

7.1 The surface shall be smooth, free of blisters, cracks, or any other defects that have the potential to detrimentally affect its suitability for the service intended. It shall not be subject to peeling, scaling, or flaking.

8. Physical and Electrical Requirements

8.1 Tubing shall conform to the following requirements for physical and electrical properties, enumerated below, using the tests contained in Test Methods D876:

8.1.1 *Flammability*—The average duration of burning shall not exceed 15 s and the paper indicator shall show no evidence of being affected.

8.1.2 *Tensile Strength*—The average tensile strength shall be not less than 2000 psi [15 MPa] for Grades A and C, and not less than 1800 psi [13 MPa] for Grade B. The average ultimate elongation shall be not less than 200 % for Grades A and C and not less than 250 % for Grade B.

8.1.3 *Effect of Elevated Temperatures*—When Method A is used, the average loss of ultimate elongation after exposure to elevated temperatures shall be not greater than 35 % for Grades A, B, and C. When Method B is used, the loss of weight after exposure to elevated temperatures shall be not greater than 15 % of the original weight for Grades A and B, and not greater than 10 % for Grade C.

8.1.4 After immersion in oil, the average ultimate elongation shall be within the following limits based on the average test value for the un-immersed tubing:

Grades A and B	+ 5 % to – 20 %
Grade C	± 20 %

TABLE 2 Metric Dimensional Tolerances of Tubing[A]

Specified Size	Inside Diameter, mm		Thin Wall		Standard Wall		Thick Wall	
	max	min	Wall Thickness, mm	Tolerances, ± mm	Wall Thickness, mm	Tolerances, ± mm	Wall Thickness, mm	Tolerances, ± mm
0.3	0.4	0.2	0.3	0.1	0.4	0.1	0.5	0.1
0.5	0.6	0.4	0.3	0.1	0.4	0.1	0.5	0.1
0.8	0.9	0.7	0.3	0.1	0.4	0.1	0.5	0.1
1.0	1.15	0.85	0.3	0.1	0.4	0.1	0.5	0.1
1.5	1.65	1.35	0.3	0.1	0.4	0.1	0.5	0.1
2.0	2.15	1.85	0.3	0.1	0.4	0.1	0.5	0.1
2.5	2.65	2.35	0.3	0.1	0.4	0.1	0.5	0.1
3	3.15	2.85	0.3	0.1	0.4	0.1	0.5	0.1
4	4.25	3.75	0.3	0.1	0.5	0.1	0.6	0.1
5	5.25	4.75	0.3	0.1	0.5	0.1	0.6	0.1
6	6.25	5.75	0.3	0.1	0.5	0.1	0.6	0.1
8	8.25	7.75	0.5	0.1	0.7	0.1	0.8	0.15
10	10.5	9.5	0.5	0.1	0.7	0.1	0.8	0.15
12	12.5	11.5	0.5	0.1	0.7	0.1	0.8	0.15
16	16.5	15.5	0.5	0.1	0.85	0.15	1.2	0.2
20	20.5	19.5	0.5	0.1	0.85	0.15	1.2	0.2
25	25.5	24.5	0.5	0.1	0.85	0.15	1.2	0.2
30	30.5	29.5	0.5	0.1	0.85	0.15	1.2	0.2
40	41	39	0.5	0.1	0.85	0.15	1.35	0.15
50	51	49	0.5	0.1	0.85	0.15	1.55	0.25

[A] For tubing sizes not listed in this table, the wall thickness of the nearest larger diameter shall apply.