

Insulation Sleeving, Electrical, Heat Shrinkable,
Polyolefin, Dual-Wall, Outer Wall Crosslinked

FSC 5970

RATIONALE

Revise to include comments received by the government and industry, update references, align specification with SAE guidelines, and review specification for known technical problems

The requirements for acquiring the sleeving described herein shall consist of this specification sheet and the issue of the following specification listed in that issue of the Department of Defense Index of Specifications and standards (DODISS) specified in the solicitation: MIL-DTL-23053

REQUIREMENTS:

Polymer type: The base polymer used in formulating the outer wall of this sleeving shall be polyolefin.

Continuous operating temperature range: -67 °F (-55 °C) to +230 °F (+110 °C).

Composition: The heat shrinkable sleeving shall consist of a crosslinked outer wall which shrinks and an inner wall which flows upon the application of heat.

Color: The heat shrinkable sleeving shall be furnished in the color specified by the acquisition activity (See 6.4b and 6.8); however, black shall be considered standard. Colors shall conform to the requirements of Class 1 of MIL-STD-104 (See 1.2.1 and 3.4.2.1).

Classification: The heat shrinkable sleeving shall be furnished in the following classes, as specified (See 6.4a and 6.8):

- Class 1 - Semi-rigid, non-flame retardant
- Class 2 - Flexible, flame retardant
- Class 3 - Flexible, flame retardant, high expansion

Longitudinal change:

- Class 1 - +1, -10 percent
- Class 2 - +1, -5 percent
- Class 3 - +1, -15 percent

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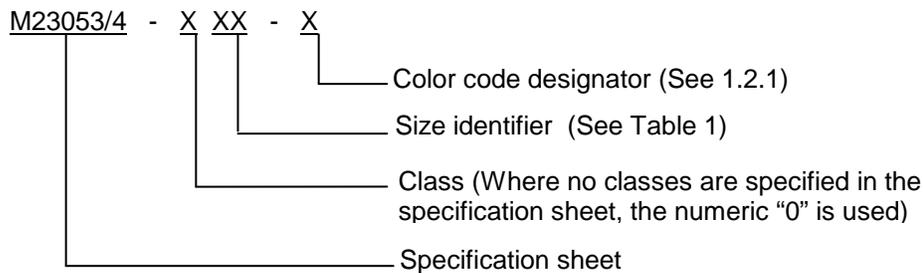
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Military part number: The Military part number shall consist of the basic number of this specification sheet and dash numbers as follows:



Example: Class 1, black sleeving 0.750 inch (19.1 mm) as supplied ID sleeving shall be identified as M23053/4-106-0.

Unrestricted shrinkage: Test method 4.6.5.2; 392 °F ± 4 (200 °C ± 2) for 10 minutes.

TABLE 1 - CONSTRUCTION DETAILS, INCHES (MM) ^{1/}

Military part number ^{3/}	As supplied ID minimum	After unrestricted shrinkage		Inner meltable wall thickness nominal
		ID maximum	Total wall thickness ^{1/ 2/}	
Class 1				
M23053/4-101-*	0.125 (3.18)	0.023 (0.58)	0.038 ± 0.006 (0.97 ± .152)	0.020 (0.508)
M23053/4-102-*	0.187 (4.75)	0.060 (1.52)	0.043 ± 0.006 (1.09 ± .152)	0.025 (0.635)
M23053/4-103-*	0.250 (6.35)	0.080 (2.03)	0.047 ± 0.007 (1.19 ± .178)	0.027 (0.686)
M23053/4-104-*	0.375 (9.53)	0.135 (3.43)	0.050 ± 0.007 (1.27 ± .178)	0.030 (0.762)
M23053/4-105-*	0.500 (12.70)	0.195 (4.95)	0.055 ± 0.007 (1.40 ± .178)	0.035 (0.889)
M23053/4-106-*	0.750 (19.05)	0.313 (7.95)	0.065 ± 0.007 (1.65 ± .178)	0.040 (1.016)
M23053/4-107-*	1.000 (25.40)	0.400 (10.16)	0.075 ± 0.007 (1.91 ± .178)	0.040 (1.016)
M23053/4-108-*	0.300 (7.62)	0.050 (1.27)	0.100 ± 0.008 (2.54 ± .203)	0.065 (1.651)
Class 2				
M23053/4-201-*	0.238 (6.05)	0.125 (3.18)	0.029 ± 0.005 (0.74 ± 0.127)	0.004 (0.102)
M23053/4-202-*	0.355 (9.02)	0.187 (4.75)	0.029 ± 0.005 (0.74 ± 0.127)	0.004 (0.102)
M23053/4-203-*	0.475 (12.07)	0.250 (6.35)	0.030 ± 0.005 (0.76 ± 0.127)	0.005 (0.127)
M23053/4-204-*	0.712 (18.08)	0.375 (9.53)	0.035 ± 0.005 (0.89 ± 0.127)	0.005 (0.127)
M23053/4-205-*	0.950 (24.13)	0.500 (12.70)	0.042 ± 0.007 (1.07 ± 0.178)	0.007 (0.178)
M23053/4-206-*	1.425 (36.20)	0.750 (19.05)	0.047 ± 0.008 (1.19 ± 0.203)	0.007 (0.178)
Class 3				
M23053/4-301-*	0.120 (3.05)	0.040 (1.02)	0.040 ± 0.010 (1.02 ± .254)	0.020 (0.508)
M23053/4-302-*	0.240 (6.10)	0.080 (2.03)	0.070 ± 0.014 (1.78 ± .356)	0.020 (0.508)
M23053/4-303-*	0.470 (11.94)	0.160 (4.06)	0.070 ± 0.014 (1.78 ± .356)	0.030 (0.762)
M23053/4-304-*	0.940 (23.88)	0.320 (8.13)	0.100 ± 0.020 (2.54 ± .508)	0.040 (1.016)
M23053/4-305-*	1.570 (39.88)	0.510 (12.95)	0.100 ± 0.020 (2.54 ± .508)	0.040 (1.016)

^{1/} Diameter limits for object to be enclosed shall be as recommended in technical data.

^{2/} Wall thickness values are less when shrinkage is restricted.

^{3/} The asterisk in the part number shall be replaced by color code designations (See 1.2.1).

TABLE 2 - PHYSICAL PROPERTIES

Characteristic	Requirement	Test procedure and condition
<u>As supplied:</u>		
ID, minimum	Table 1	4.6.3.1.1
Cold impact	No cracking	4.6.7.2 ASTM D 746, -67 °F ± 4 (-55 °C ± 2)
Heat shock	No cracks, flowing or dripping of outerwall	4.6.8 482 °F ± 6 (250 °C ± 3) 1/
Sealing efficiency (Classes 1 and 3 only)	No openings on reheat	2/
Secant modulus, psi (MPa)	Class 1 – 25,000 (172) minimum Classes 2 & 3 – 25,000 (172) maximum	4.6.12.1, ASTM D 882, 2 percent strain
Color stability	Pass	4.6.15 347 °F ± 4 (175 °C ± 2), 24 hours
<u>After unrestricted shrinkage:</u>		
ID, maximum	Table 1	4.6.3.1.2
Wall thickness	Table 1	4.6.3.2
Tensile strength, psi (MPa), minimum	Classes 1 & 2 – 1500 (10.3) Class 3 – 1300 (9.0)	4.6.13, ASTM D 638 Class 1 – 2 inches/minute Classes 2 & 3 – 20 inches/minute
Ultimate elongation, percent minimum	Classes 1 & 2 – 200 Class 3 – 250	4.6.13, ASTM D 638 Class 1 – 2 inches/minute Classes 2 & 3 – 20 inches/minute
Dielectric strength, volts/mil (Kv/mm), minimum	Classes 1 & 2 – 500 (19.7) Class 3 – 300 (11.8)	4.6.2 ASTM D 2671
Volume resistivity, Ohm-cm, minimum	Class 1 – 1×10^{15} Classes 2 & 3 – 1×10^{12}	4.6.2 ASTM D 876
Flammability	Class 1 – N/A; Class 2 & 3 – jacket self-extinguishing within one minute, no more than 25 percent of indicator flag burned or charred	4.6.13 Procedure B ASTM D 2671
Corrosion	No corrosion	4.6.10.1 and 4.5.10.2, 250 °F ± 4 (121 °C ± 2) for 16 hours

TABLE 2 - PHYSICAL PROPERTIES (CONT.)

Characteristic	Requirement	Test procedure and condition
Water absorption, percent, maximum	Class 1 - 0.5 Class 2 - 0.5 Class 3 - 1.0	4.6.2 ASTM D 570, 24 hrs at 73 °F (23 °C)
Heat resistance, properties after:		4.6.9 <u>3/</u>
Visual inspect and bend test	No dripping, flowing of outer wall. No cracks	
Fluid resistance, properties after:		4.6.11
Tensile strength, psi (MPa), minimum	Classes 1 & 2 - 1000 (6.9) Class 3 - 900 (6.2)	
Dielectric strength, volts/mil (Kv/mm), minimum	Classes 1 & 2 - 400 (15.8) Class 3 - 200 (7.9)	
Fungus resistance <u>4/</u>	No growth	4.6.2, ASTM G 21
properties after:	or	4.6.17
Tensile Strength, psi (MPa), minimum	Classes 1 & 2 - 1500 (10.3) Class 3 - 1300 (9.0)	
Ultimate elongation, percent, minimum	Classes 1 & 2 - 200 Class 3 - 250	
Dielectric strength, volts/mil (Kv/mm), minimum	Classes 1 & 2 - 500 (19.7) Class 3 - 300 (11.8)	

1/ Use mandrel sizes specified in footnote 3/

2/ Sealing Efficiency: A 6-inch length of sleeving shall be heated in an oven at 392 °F ± 4 (200 °C ± 2) for 3 minutes. A pair of pliers shall be pre-conditioned in an oven at 392 °F ± 4 (200 °C ± 2) for 10 minutes. Within 5 seconds after removal from the oven, approximately 0.25 inch (6.35 mm) of one end of the sleeving shall be pressed together with sufficient pressure from the pair of pliers so the surfaces are in full contact and the pressure held for 20 to 40 seconds. Allow the sleeving to condition at room temperature for 10 minutes. Reheat the sleeving in a 302 °F (150 °C) oven for 5 minutes. Remove from the oven and allow the sleeving to condition to room temperature for a minimum of 10 minutes. Submerge the pressed together portion of the sleeving 1 inch (2.5 mm) minimum in room temperature water and pressurize the open end of the sleeving at 3 psi minimum for no less than 5 seconds. Any emanating air bubbles through the pressed together portion of the sleeving shall constitute a failure.

3/ 347 °F ± 4 (175 °C ± 2) for 168 hours followed by a mandrel bend test at room temperature. The sleeving shall be bent through 360 degrees in 10 seconds ± 2. Mandrel size shall be as follows:

<u>Nominal sleeving ID, inch (mm)</u> <u>Minimum, as supplied</u>	<u>Mandrel diameter,</u> <u>inch (mm)</u>
0.125 to 0.250 (3.18 to 6.35)	0.438 (11.13)
Over 0.250 to 0.750 (6.35 to 19.05)	0.500 (12.70)
Over 0.750 (19.05)	0.563 (14.30)

4/ MIL-I-23053/4 materials do not normally support fungus growth. Performance of this requirement is only when specified by the acquisition activity (See 6.2).