

INCH-POUND

MIL-DTL-23053/4D

17 June 1996

SUPERSEDING

MIL-I-23053/4C

01 May 1986

## DETAIL SPECIFICATION SHEET

INSULATION SLEEVING, ELECTRICAL, HEAT SHRINKABLE,  
POLYOLEFIN, DUAL-WALL, OUTER WALL CROSSLINKED

This specification is approved for use by all  
Departments and Agencies of the Department of Defense.

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: -55°C (-67°F) to +110°C (+230°F).

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 6.2b); however, black shall be considered standard. Colors shall conform to the requirements of Class 1 of MIL-STD-104.

Classification: The heat shrinkable sleeving shall be furnished in the following classes, as specified (see 6.2a):

- 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

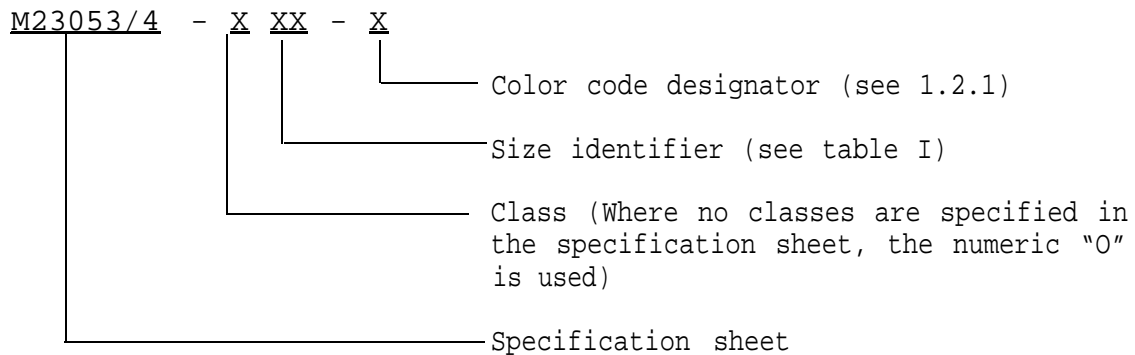
AMSC N/A

FSC 5970

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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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 .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; 200° ± 2°C (392° ± 4°F) for 10 minutes.

TABLE I. Construction details, inches (mm). 1/

Military part number 3/	As supplied ID minimum	After unrestricted shrinkage		Inner melttable wall thickness nominal
		ID maximum	Total wall thickness 1/	
Class 1				
M23053/4-101-*	.125 (3.2)	.023 (.58)	.038 ± .006 (.97 ± .152)	.020 (.508)
M23053/4-102-*	.187 (4.7)	.060 (1.52)	.043 ± .006 (1.09 ± .152)	.025 (.635)
M23053/4-103-*	.250 (6.4)	.080 (2.03)	.047 ± .007 (1.19 ± .178)	.027 (.686)
M23053/4-104-*	.375 (9.5)	.135 (3.43)	.050 ± .007 (1.27 ± .178)	.030 (.762)
M23053/4-105-*	.500 (12.7)	.195 (4.95)	.055 ± .007 (1.40 ± .178)	.035 (.889)
M23053/4-106-*	.750 (19.1)	.313 (7.95)	.065 ± .007 (1.65 ± .178)	.040 (1.016)
M23053/4-107-*	1.000 (25.4)	.400 (10.2)	.075 ± .007 (1.91 ± .178)	.040 (1.016)
M23053/4-108-*	.300 (7.6)	.050 (1.27)	.100 ± .008 (2.54 ± .178)	.065 (1.651)
Class 2				
M23053/4-201-*	.238 (6.06)	.125 (3.18)	.029 ± .005 (7.37 ± .127)	.004 (.102)
M23053/4-202-*	.355 (9.02)	.187 (4.75)	.029 ± .005 (7.37 ± .127)	.004 (.102)
M23053/4-203-*	.475 (12.07)	.250 (6.35)	.030 ± .005 (7.62 ± .127)	.005 (.127)
M23053/4-204-*	.712 (18.08)	.375 (9.53)	.035 ± .005 (8.89 ± .127)	.005 (.127)
M23053/4-205-*	.950 (24.13)	.500 (12.7)	.042 ± .007 (10.7 ± .178)	.007 (.178)
M23053/4-206-*	1.425 (35.20)	.750 (19.05)	.047 ± .008 (11.9 ± .203)	.007 (.178)
Class 3				
M23053/4-301-*	.120 (3.05)	.040 (1.02)	.040 ± .010 (1.02 ± .254)	.020 (.508)
M23053/4-302-*	.240 (6.10)	.080 (2.04)	.040 ± .010 (1.02 ± .254)	.020 (.508)
M23053/4-303-*	.470 (11.94)	.160 (4.06)	.070 ± .014 (1.78 ± .356)	.030 (.762)
M23053/4-304-*	.940 (23.87)	.320 (8.13)	.100 ± .020 (2.54 ± .508)	.040 (1.02)
M23053/4-305-*	1.570 (39.38)	.510 (12.95)	.100 ± .020 (2.54 ± .508)	.040(1.02)

1/ Diameter limits for objects 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).

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TABLE II. Physical properties.

Characteristic	Requirement	Test procedure and condition
<u>As supplied:</u>		
ID, minimum	Table I	4.6.3
Cold impact	No cracking	4.6.7.2 ASTM D746, -55° ± 2°C (-67 ± 4°F)
Heat shock	No cracks, flowing or dripping of outerwall	4.6.8 250° ± 3°C (482° ± 6°F) 1/
Sealing efficiency (Classes 1 and 3 only)	No openings on reheat	2/
Secant modulus, psi (MPa)	Class 1 - 25,000 (172) minimum Cl 2 & 3 - 25,000 (172) maximum	4.6.12.1, ASTM D882, 2 percent strain
Color stability	Pass	4.6.15 175° ± 2°C (347° ± 4°F), 24 hours
<u>After unrestricted shrinkage:</u>		
ID, maximum	Table I	4.6.3
Wall thickness	Table I	4.6.3
Tensile strength, psi (MPa), minimum	Classes 1 & 2 - 1,500 (10.3) Class 3 - 1,300 (9.0)	4.6.12, ASTM D638, 20 inches/minute
Ultimate elongation, percent minimum	Classes 1 & 2 - 200 Class 3 - 250	4.6.12, ASTM D638, 20 inches/minute

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TABLE II. Physical properties. - Continued

Characteristic	Requirement	Test procedure and condition
Dielectric strength, volts/roil (Kv/mm), minimum	Classes 1 & 2 500 (19.7) Class 3 - 300 (11.8)	4.6.2, ASTM D2671
Volume resistivity, Ohm-CM, minimum	Class 1 - $1 \times 10^{15}$ Classes 2 & 3 - $1 \times 10^{12}$	4.6.2 ASTM D876
Flammability	Class 1 - N/A; Classes 2 & 3 - self-extinguishing within one minute, no more than 25 percent of indicator flag burned or charred	4.6.13 Procedure B ASTM D2671
Corrosion	No corrosion	4.6.10.1 and 4.6.10.2 $121 \pm 2^{\circ}\text{C}$ ( $250 \pm 4^{\circ}\text{F}$ ) for 16 hours
Water absorption, percent, maximum	Class 1 - 0.5 Class 2 - 0.5 Class 3 - 1.0	4.6.2 ASTM D570, 24 hrs at $23^{\circ}\text{C}$
Heat resistance, properties after:		4.6.9 3/
Visual inspect and bend test	No dripping, flowing of outer wall. No cracks	
Fluid resistance, properties after:		4.6.11
Tensile stength, psi (MPa), minimum	Classes 1 & 2 - 1,000 (6.9) Class 3 - 900 (6.2)	

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TABLE II. Physical Properties. - Continued

Characteristic	Requirement	Test procedure and condition
Dielectric strength, volts/mil (Kv/mm), minimum	Classes 1 & 2 - 400 (15.8) Class 3 - 200 (7.9)	
Fungus resistance 4/	No growth	4.6.2, ASTM G21

1/ Use mandrel sizes specified in footnote 3/

2/ Sealing Efficiency: A six-inch length of sleeving shall be heated in an oven at  $200^{\circ} \pm 2^{\circ}\text{C}$  ( $392^{\circ} \pm 4^{\circ}\text{F}$ ) for 3 minutes. A pair of pliers shall be pre-conditioned in an oven at  $200^{\circ} \pm 2^{\circ}\text{C}$  ( $392^{\circ} \pm 4^{\circ}\text{F}$ ) for 10 minutes. Within 5 seconds after removal from the oven, approximately .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  $150^{\circ}\text{C}$  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/  $175^{\circ} \pm 2^{\circ}\text{C}$  ( $347^{\circ} \pm 4^{\circ}\text{F}$ ) for 168 hours followed by a mandrel bend test at room temperature. The sleeving shall be bent through  $360^{\circ}$  in  $10 \pm 2$  seconds. 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>
.125 to .250 (3.18 to 6.35)	.438 (11.1)
over .250 to .750 (6.35 to 19.1)	.50 (12.7)
over .750 (19.1)	.563 (14.3)

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).

Storage life conditions: Supplier shall certify to storage at temperatures  $18^{\circ}$  to  $35^{\circ}\text{C}$  ( $65^{\circ}$  to  $95^{\circ}\text{F}$ ) for 3 years. Conformance to 3.5. See 3.5.2 for storage life extension.

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NOTICE

- a. Flammability - Class 1 shrinkable sleeveings described in this specification sheet have not been flame retarded and will burn readily. These sleeveings shall not be considered for acquisition when flame resistance is required. Additionally, only the outer jacket of Classes 2 and 3 sleeveings are flame retardant.

Intended use: Heat shrinkable dual-wall polyolefin sleeving is used in one-step potting, encapsulating, or moisture sealing of electrical components.

Custodians:

Army - ER

Navy - AS

Air Force - 85

Preparing activity:

Navy - AS

(Project 5970-1129-04)

Review activities:

Army - ME, MI, MU

Navy - EC, MC

Air Force - 99

DLA - GS