INCH-POUND
J-W-1177/18B
June 10, 1988
SUPERSEDING
J-W-1177/18A
September 27, 1976

FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 220, TYPE M, POLYIMIDE-COATED, RECTANGULAR

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

The requirements for acquiring the wire described herein shall consist of this specification and the latest issue of J-W-1177.

Classification:	Class 220; type M2 (heavy), type M4 (quadruple); rectangular.
Insulating materials:	The film shall be based on a polyimide resin.
NEMA/ANSI equivalent:	All test requirements except thermal endurance are equivalent to MW-20 of NEMA MW 1000.
General requirements:	See J-W-1177 for general requirements, quality assurance provisions, and packaging.

Requirements:

Characteristics	Test procedure, see J-W-1177	Wire sizes, AWG	Requirements
Dimensions	4.7.1.2	All	Rectangular wire: (a) Conductor dimensions and radii - see table I. (b) Conductor tolerances - see table II. (c) Increase in thickness and width - see table III. Square wire: (a) Conductor dimensions, radii and tolerances - see table IV. (b) Increase in thickness and width - see table IV.
Adherence and flexibility	4.7.2.1	All	No cracks visible in the film coating.

AMSC N/A FSC 6145

DISTRIBUTION STATEMENT A Approved for public release; distribution unlimited

Requirements: (Continued)

Characteristics	Test procedure, see J-W-1177	Wire sizes, AWG	Requirements
Elongation	4.7.5	All	Not less than 32 percent for thicknesses of 0.049 inch and greater, or 30 percent for thicknesses less than 0.049 inch.
Heat shock	4.7.4	All	No cracks visible in the film coating after 15 percent elongation followed by conditioning at 240°C.
Dielectric strength	4.7.9	All	Not less than the values shown in table V.
Completeness of cure	4.7.16.2	All	Dissipation factor not greater than 0.60 percent.
Thermoplastic flow	4.7.8	18 AWG	Median not less than 400°C with heavy film coated wire.
Solubility	4.7.12	All	The specimens shall not soften sufficiencly to expose bare conductor when immersed in xylene or 50/50 parts by volume xylene/ethyl Cellosolve.
Dielectric strength at temperature	4.7.14	18 AWG	Heavy film coated wire shall average not less than 4275 volts.
Thermal endurance	4.7.15.1	18 AWG	220°C minimum with heavy film coated wire.
	4.7.15.3	All	240°C minimum as shown in table IV.

TABLE I. Dimensions and radii for rectangular wire.

Nominal thickness	Nominal width																																											
Inch	.063	1/.067	.071	1/.075	.079	1/.083	.088	1/.093	.098	1/.104	.110	1/.118	.124	1/.132	.140	1/.148	.157	1/.167	.177	1/.187	.197	1/.209	.220	1/.236	.248	1/.264	.280	1/.295	.315	1/.335	.354	1/.374	.394	1/.417	.441	1/.465	.492	1/.520	.551	1/.591	.630	1/.669	.709	1/.748
0.025																																												
.028																																												
.031																																												
.035																																												
.039																			ROUNDED EDGES																									
.044																																												
.049																																												
.055																																												
.063																																												
.071																																												
.079													0.020																															
.088																																												
.098																																												
.110																0.025															0.031													
.124																																												
.140																																												
.157																																												
.177																																												
.197																																												
.220																													0.039															
.248																																												
.280																																												

1/ R-40 series numbers.
Radii tolerance is plus or minus 25 percent.

EXAMPLE - Preferred sizes 55 x 110 (R20 x R20)
Intermediate sizes 55 x 118 (R20 x R40)

TABLE II. Conductor tolerances.

Thickness, inch	Permissible variations in thickness
0.280 to 0.098	± 1 percent
Under 0.098 to 0.025	± 0.001 inch
Width, inch	
Over 0.492	± 1 percent
0.492 to 0.315	± 0.003 inch
Under 0.315 to 0.098	± 1 percent
Under 0.098 to 0.063	± 0.001 inch

TABLE III. Increase in thickness and width due to film coating.

Type	Increase in width, inch		Increase in thickness, inch	
	Minimum	Maximum1/	Minimum	Maximum1/
Heavy, M2	0.0025	0.0045	0.0030	0.0050
Quadruple, M4	0.0040	0.0060	0.0050	0.0070

1/ The maximum increase may be exceeded provided the maximum overall dimensions of the coated wire does not exceed the sum of the maximum dimensions of the bare wire plus the maximum increase due to the coating.

TABLE IV. Dimensions of square wire, sizes 1 to 14 AWG.

AWG size	Bare wire dimensions, inch			Radii, inch1/	Heavy, type M2		Quadruple, type M4	
	Minimum	Nominal	Maximum		Minimum increase in dimension, inch	Maximum overall dimension, inch	Minimum increase in dimension, inch	Maximum overall dimension, inch
1	0.2864	0.2893	0.2922	0.040	0.0030	0.2972	0.0050	0.2992
2	.2550	.2576	.2602	.040	.0030	.2652	.0050	.2672
3	.2271	.2294	.2317	.040	.0030	.2367	.0050	.2387
4	.2023	.2043	.2063	.040	.0030	.2113	.0050	.2133
5	.1801	.1819	.1837	.040	.0030	.1887	.0050	.1907
6	.1604	.1620	.1636	.032	.0030	.1686	.0050	.1706
7	.1429	.1443	.1457	.032	.0030	.1507	.0050	.1527
8	.1272	.1285	.1298	.032	.0030	.1348	.0050	.1368
9	.1133	.1144	.1155	.026	.0030	.1205	.0050	.1225
10	.1009	.1019	.1029	.026	.0030	.1079	.0050	.1099
11	.0897	.0907	.0917	.020	.0030	.0967	.0050	.0987
12	.0798	.0808	.0818	.020	.0030	.0868	.0050	.0888
13	.0710	.0720	.0730	.016	.0030	.0780	.0050	.0800
14	.0631	.0641	.0651	.016	.0030	.0701	.0050	.0721

1/ Radii tolerance is plus or minus 25 percent.

TABLE V. Minimum breakdown voltages.

Type	Volts Any three out of four electrodes	Fourth electrode
M2	1500	500
M4	2500	900

Part number: Magnet wire covered by this specification shall be defined by the following part numbering system. Example: M1177/18-02CXXX.

M1177/18-	02	C	XXX
Federal specification identifier	Two digit type code	Single letter conductor code	Rectangular wire code

The following codes shall apply:

Type	Type code	Conductor	Conductor code
M2	01	Copper	C
M4	02	Aluminum	A
		Nickel-coated copper	N
		Silver-coated copper	S

Intended use: Type M rectangular magnet wire is intended for use in 220°C applications similar to those for which type M round magnet wire is used. Type M magnet wire has been standardized for the repair of shipboard electrical power equipment.

Revision letters are not used to denote changes due to the extensiveness of the changes.

MILITARY INTERESTS:

Custodians:
Army - CR
Navy - SH
Air Force - 85

Review activities:
Army - AR, ER, MI
DLA - IS

User activities:
Army - ME
Navy - AS, CG, MC, OS

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA - FSS, PBO, PCD
INTERIOR - BLM
HHS - FDA
DCGOVT - DCG
NASA - JFK
COMMERCE - NBS
TRANSPORTATION - APM, FAA

Preparing activity:
Navy - SH
(Project 6145-1111-14)

☆U.S. GOVERNMENT PRINTING OFFICE: 1988 - 505-033/92148