

INCH-POUND

J-W-1177/39

June 10, 1988

FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 180, TYPE SPEI,
SOLDERABLE POLYESTER-IMIDE, ROUND

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 180; type SPEI (single), type SPEI2 (heavy), round.

Insulating materials: The film shall be based on a solderable polyester-imide resin.

NEMA/ANSI equivalent: All test requirements except thermal endurance are equivalent to MW-77 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	25-44	See table I.
Adherence and flexibility	4.7.2.1	25-44	No cracks visible in the film coating.
Elongation	4.7.5	25-44	Not less than the value in table II.
Heat shock	4.7.4	25-44	No cracks visible in the coating after conditioning as shown in table III.

AMSC N/A

FSC 6145

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Requirements: (Continued)

Characteristics	Test procedure, see J-W-1177	Wire sizes, AWG	Requirements
Scrape resistance	4.7.6	25-30	Lowest grams-to-fail load for any of the three tests and the average of the three tests shall be not less than the values in table IV.
Springback	4.7.7	25-30	Not greater than the value in table V.
Dielectric strength	4.7.9	25-44	Not less than the value in table VI.
Continuity	4.7.10	31-44	The number of discontinuities shall be not greater than the number listed in table VII.
	4.7.11	25-30	
Thermoplastic flow	4.7.8	36	Median not less than 225°C with heavy film coated wire.
Solubility	4.7.12	36	Heavy film coated wire shall not soften sufficiently to expose bare conductor when immersed in xylene.
Dielectric strength at temperature	4.7.14	36	Heavy film coated wire shall average not less than 1900 volts.
Thermal endurance	4.7.15.1	18	155°C minimum with heavy film coated wire.
	4.7.15.2	25-44	1000 volts/mil minimum after 168 hours at 200°C.
	4.7.15.3	25-44	200°C minimum.
Solderability	4.7.17	25-44	Covered with continuous film of solder and not readily separable after soldering as shown in table VIII.

TABLE I. Dimensions.

AWG size	Bare wire diameter, inch			Type SPEI		Type SPEI2	
				Minimum increase in diameter, inch	Maximum overall diameter, inch	Minimum increase in diameter, inch	Maximum overall diameter, inch
	Minimum	Nominal	Maximum				
25	0.0177	0.0179	<u>1</u> /0.0180	0.0009	0.0194	0.0018	0.0203
26	.0157	.0159	<u>1</u> / .0160	.0009	.0173	.0017	.0182
27	.0141	.0142	.0143	.0008	.0156	.0016	.0164
28	.0125	.0126	.0127	.0008	.0140	.0016	.0147
29	.0112	.0113	.0114	.0007	.0126	.0015	.0133
30	.0099	.0100	.0101	.0007	.0112	.0014	.0119
31	.0088	.0089	.0090	.0006	.0100	.0013	.0108
32	.0079	.0080	.0081	.0006	.0091	.0012	.0098
33	.0070	.0071	.0072	.0005	.0081	.0011	.0088
34	.0062	.0063	.0064	.0005	.0072	.0010	.0078
35	.0055	.0056	.0057	.0004	.0064	.0009	.0070
36	.0049	.0050	.0051	.0004	.0058	.0008	.0063
37	.0044	.0045	.0046	.0003	.0052	.0008	.0057
38	.0039	.0040	.0041	.0003	.0047	.0007	.0051
39	.0034	.0035	.0036	.0002	.0041	.0006	.0045
40	.0030	.0031	.0032	.0002	.0037	.0006	.0040
41	.0027	.0028	.0029	.0002	.0033	.0005	.0036
42	.0024	.0025	.0026	.0002	.0030	.0004	.0032
43	.0021	.0022	.0023	.0002	.0026	.0004	.0029
44	.0019	.0020	.0021	.0001	.0024	.0004	.0027

1/ The maximum bare wire dimensions may be exceeded up to the NEMA/ANSI maximum bare wire limit, provided the minimum increase is maintained and the maximum overall diameter specified is not exceeded.

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TABLE II. Elongation.

AWG size	Elongation, minimum percent
25	28
26	27
27	27
28	26
29	26
30	25
31	24
32	24
33	23
34	22
35	21
36	20
37	20
38	19
39	18
40	17
41	17
42	16
43	15
44	14

TABLE III. Heat shock.

AWG size	Minimum elongation, percent	Mandrel diameter	Minimum temperature, °C
25-30	20	3X	200
31-44	<u>1</u> /20	3X	200

1/ Or to the breaking point, whichever is less.

TABLE IV. Scrape resistance.

AWG size	Type SPEI		Type SPEI2	
	Scrape, grams-to-fail		Scrape, grams-to-fail	
	Average	Minimum	Average	Minimum
25	350	300	635	540
26	335	285	595	505
27	310	265	560	475
28	295	250	525	450
29	275	235	495	420
30	260	220	460	385
31	---	---	---	---
32	---	---	---	---
33	---	---	---	---
34	---	---	---	---
35	---	---	---	---
36	---	---	---	---
37	---	---	---	---
38	---	---	---	---
39	---	---	---	---
40	---	---	---	---
41	---	---	---	---
42	---	---	---	---
43	---	---	---	---
44	---	---	---	---

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TABLE V. Springback.

AWG size	Springback, maximum degrees per turn
25	72
26	76
27	50
28	55
29	61
30	66
31	—
32	—
33	—
34	—
35	—
36	—
37	—
38	—
39	—
40	—
41	—
42	—
43	—
44	—

TABLE VI. Dielectric strength.

AWG size	Type SPEI	Type SPEI2
	Dielectric strength, minimum breakdown volts	Dielectric strength, minimum breakdown volts
25	2625	4725
26	2550	4600
27	2500	4500
28	2425	4375
29	2375	4250
30	2300	4150
31	2075	3825
32	1850	3525
33	1675	3250
34	1500	2975
35	1325	2750
36	1200	2525
37	1075	2325
38	950	2150
39	850	1975
40	775	1800
41	700	1675
42	625	1525
43	550	1400
44	500	1300

TABLE VII. Continuity.

AWG size	Maximum number of discontinuities	
	Type SPEI	Type SPEI2
25-30	25	7
31-44	25	5

TABLE VIII. Solderability.

AWG size	Maximum immersion time, seconds		Temperature of solder, °C
	Type SPEI	Type SPEI2	
25-29	6	6	455
30-36	5	5	455
37-44	4	4	455

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Part number: Magnet wire covered by this specification shall be defined by the following part numbering system. Example: M1177/39-02C029.

<u>M1177/39-</u>	<u>02</u>	<u>C</u>	<u>029</u>
Federal specification identifier	Two digit type code	Single letter conductor code	Three character size code

The following codes shall apply:

Type	Type code	Conductor	Conductor code
SPEI	01	Copper	C
SPEI2	02	Aluminum	A
		Nickel-coated copper	N
		Silver-coated copper	S

The size code shall be the bare wire dimension. AWG wire size shall be used.

Intended use: Type SPEI magnet wire is intended for use in 180°C applications similar to type H where a solderable magnet wire is desired.

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 6145-1111-35)