

INCH-POUND

J-W-1177/29

June 10, 1988

FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 155, TYPE SPEN,
SOLDERABLE POLYESTER-IMIDE OVERCOATED WITH POLYAMIDE, 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 155; type SPEN (single), type SPEN2 (heavy); round.

Insulating materials: The conductor shall be coated with a dual film. The underlying coating shall be based on a solderable polyester-imide resin. The superimposed coating shall be based on a polyamide resin.

NEMA/ANSI equivalent: All test requirements except thermal endurance are equivalent to MW-27 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.
Scrape resistance	4.7.6	10-30	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.

AMSC N/A

FSC 6145

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J-W-1177/29

Requirements: (Continued)

Characteristics	Test procedure, see J-W-1177	Wire sizes, AWG	Requirements
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 200°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 no less than 1900 volts.
Thermal endurance	4.7.15.1	18	155°C minimum with heavy film wire.
	4.7.15.2	25-44	1000 volts/mil minimum after 168 hours at 200°C.
	4.7.15.3	25-44	175°C minimum.
	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 SPEN		Type SPEN2	
				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	1/0.0180	0.0009	0.0194	0.0018	0.0203
26	.0157	.0159	1/.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

See footnote at end of table.

J-W-1177/29

TABLE I. Dimensions. - Continued

AWG size	Bare wire diameter, inch			Type SPEN		Type SPEN2	
				Minimum increase in diameter, inch	Maximum overall diameter, inch	Minimum increase in diameter, inch	Maximum overall diameter, inch
	Minimum	Nominal	Maximum				
36	0.0049	0.0050	0.0051	0.0004	0.0058	0.0008	0.0063
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.

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

J-W-1177/29

TABLE III. Heat shock.

AWG size	Minimum elongation, percent	Mandrel diameter	Minimum temperature, °C
25-30	20	3X	175
31-44	$\frac{1}{20}$	3X	175

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

TABLE IV. Scrape resistance.

AWG size	Type SPEN		Type SPEN2	
	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	395

TABLE V. Springback.

AWG size	Springback, maximum degrees per turn
25	72
26	76
27	50
28	55
29	61
30	66

TABLE VI. Dielectric strength.

AWG size	Type SPEN	Type SPEN2
	Dielectric strength minimum breakdown volts	Dielectric strength minimum breakdown volts
25	2375	4250
26	2300	4150
27	2250	4050
28	2175	3950
29	2150	3825
30	2075	3725
31	1875	3450
32	1675	3175
33	1500	2925
34	1350	2675
35	1200	2475
36	1075	2275
37	975	2100
38	850	1925
39	775	1775
40	700	1625
41	625	1500
42	575	1375
43	500	1250
44	450	1175

TABLE VII. Continuity.

AWG size	Maximum number of discontinuities	
	Type SPEN	Type SPEN2
25-30	25	7
31-44	25	5

TABLE VIII. Solderability.

AWG size	Maximum immersion time, seconds		Temperature of solder, °C
	Type SPEN	Type SPEN2	
25-29	6	6	455
30-36	5	5	455
37-44	4	4	455

J-W-1177/29

Part number: Magnet wire covered by this specification shall be defined by the following part numbering system. Example:
M1177/29-02C029.

<u>M1177/29-</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
SPEN	01	Copper	C
SPEN2	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 SPEN magnet wire is intended for use in 155°C applications similar to type LN 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 6145-1111-25)