INCH-POUND
J-W-1177/44
June 10, 1988

FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 105, TYPE SUB, SOLDERABLE POLYURETHANE WITH SELF-BONDING THERMOPLASTIC OVERCOAT, 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 105; type SUB (single), type SUB2 (heavy); round.
Insulating materials:	The conductor shall be coated with a dual film. The underlying coating shall be based on a solderable polyurethane resin. The superimposed coating shall be based on a polyvinyl butyral thermoplastic resin.
NEMA/ANSI equivalent:	All test requirements are equivalent to MW-3 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	25-52	See table I.
Adherence and flexibility	4.7.2.1	25-52	No cracks visible in the film coating.
Elongation	4.7.5	25-50	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
Springback	4.7.7	25-30	Not greater than the value in table IV.
Dielectric strength	4.7.9	25-44	Not less than the value in table V.
Continuity	4.7.10	31-50	The number of discontinuities shall be not greater than the number listed in table VI.
	4.7.11	25-30	
Thermoplastic flow	4.7.8	36	Median not less than 170°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	105°C minimum with heavy film coated wire.
	4.7.15.2	25-44	1000 volts/mil minimum after 168 hours at 180°C.
	4.7.15.3	25-44	150°C minimum.
Solderability	4.7.17	25-46	Covered with continuous film of solder and not readily separable after soldering as shown in table VII.
Bond (heat activated)	4.7.13.1	26, 36	No separation in turns with heavy film coated wire when bonded 1 hour at 150°C.

TABLE I. Dimensions.

AWG size	Bare wire diameter, inch			Type SUB			Type SUB2		
				Minimum increase in diameter, inch		Maximum overall diameter, inch	Minimum increase in diameter, inch		Maximum overall diameter, inch
	Minimum	Nominal	Maximum	Film coating	Outer coating		Film coating	Outer coating	
25	.0177	.0179	1/0.0180	0.0009	0.0005	0.0203	0.0018	0.0005	0.0214
26	.0157	.0159	1/ .0160	.0009	.0005	.0182	.0017	.0005	.0193
27	.0141	.0142	.0143	.0008	.0005	.0164	.0016	.0005	.0173
28	.0125	.0126	.0127	.0008	.0005	.0147	.0016	.0005	.0156
29	.0112	.0113	.0114	.0007	.0004	.0133	.0015	.0004	.0142
30	.0099	.0100	.0101	.0007	.0004	.0119	.0014	.0004	.0128
31	.0088	.0089	.0090	.0006	.0004	.0108	.0013	.0004	.0115
32	.0079	.0080	.0081	.0006	.0004	.0098	.0012	.0004	.0105
33	.0070	.0071	.0072	.0005	.0004	.0088	.0011	.0004	.0095
34	.0062	.0063	.0064	.0005	.0003	.0078	.0010	.0003	.0084
35	.0055	.0056	.0057	.0004	.0003	.0070	.0009	.0003	.0076
36	.0049	.0050	.0051	.0004	.0003	.0063	.0008	.0003	.0069
37	.0044	.0045	.0046	.0003	.0003	.0057	.0008	.0003	.0062
38	.0039	.0040	.0041	.0003	.0002	.0051	.0007	.0002	.0056
39	.0034	.0035	.0036	.0002	.0002	.0045	.0006	.0002	.0050

See footnote at end of table.

TABLE I. Dimensions. - Continued

AWG size	Bare wire diameter, inch			Type SUB			Type SUB2		
				Minimum increase in diameter, inch		Maximum overall diameter, inch	Minimum increase in diameter, inch		Maximum overall diameter, inch
	Minimum	Nominal	Maximum	Film coating	Outer coating		Film coating	Outer coating	
40	.0030	.0031	.0032	.0002	.0002	.0040	.0006	.0002	.0044
41	.0027	.0028	.0029	.0002	.0002	.0036	.0005	.0002	.0040
42	.0024	.0025	.0026	.0002	.0002	.0032	.0004	.0002	.0037
43	.0021	.0022	.0023	.0002	.0001	.0029	.0004	.0001	.0033
44	.0019	.0020	.0021	.0001	.0001	.0027	.0004	.0001	.0030
	Conductor resistance at 20°C, ohms per foot								
	Minimum	Nominal	Maximum						
45	3.080	3.348	3.616	.0001	.0001	.0023	.0003	.0001	.00255
46	3.870	4.207	4.544	.0001	.0001	.0021	.0003	.0001	.00235
47	4.868	5.291	5.714	.0001	.0001	.0019	.0003	.0001	.00210
48	6.205	6.745	7.285	.0001	.0001	.0017	.0002	.0001	.00185
49	7.744	8.417	9.090	.0001	.0001	.0015	.0002	.0001	.00170
50	9.734	10.58	11.43	.0001	.0001	.0014	.0002	.0001	.00160
51	12.32	13.39	14.46	.0001	.0001	.0013	----	----	----
52	16.69	17.05	18.41	.0001	.00005	.00115	----	----	----

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
45	11
46	10
47	8
48	7
49	6
50	5

TABLE III. Heat shock.

AWG size	Minimum elongation, percent	Mandrel diameter	Minimum temperature, °C
25-30	20	6X	150
31-44	1/20	6X	150

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

TABLE IV. Springback.

AWG size	Type SUB	Type SUB2
	Springback, maximum degrees per turn	Springback, maximum degrees per turn
25	72	74
26	76	80
27	50	55
28	55	60
29	61	65
30	66	70

TABLE V. Dielectric strength.

AWG size	Type SUB	Type SUB2
	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 VI. Continuity.

AWG size	Maximum number of discontinuities	
	Type SUB	Type SUB2
25-30	25	7
31-46	25	5
47-50	25	10

TABLE VII. Solderability.

AWG size	Maximum immersion time, seconds	Temperature of solder, °C
25-29	6	360
30-36	5	360
37-46	4	360

Part number: Magnet wire covered by this specification shall be defined by the following part numbering system. Example: M1177/44-02C029.

M1177/44-	02	C	029
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
SUB	01	Copper	C
SUB2	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 SUB magnet wire is intended for use in 105°C applications similar to those for which type T is used and where a solderable 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
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