INCH-POUND
J-W-1177/6B
June 10, 1988
SUPERSEDING
J-W-1177/6A
September 27, 1976

FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 105, TYPE TB, POLYVINYL FORMAL 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 TB (single), type T2B (heavy), type T3B (triple); round.

Insulating materials: The conductor shall be coated with a dual film. The underlying coating shall be based on a polyvinyl formal and phenolic resin. The superimposed coating shall be based on a thermoplastic polyvinyl butyral resin.

NEMA/ANSI equivalent: Test requirements are equivalent to MW-19 of NEMA MW 1000 with the exceptions of bond coat dimensions, applicable wire sizes for type T3B, heat activated bond strength and thermal endurance.

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	14-44	See table I.
Adherence and flexibility	4.7.2.1	14-44	No cracks visible in the film coating.
Elongation	4.7.5	14-44	Not less than the value in table II.
Heat shock	4.7.4	14-44	No cracks visible in the coating after conditioning as shown in table III.
Springback	4.7.7	14-30	Not greater than the value in table IV.
Dielectric strength	4.7.9	14-44	Not less than the value in table V.

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Requirements: (Continued)

Characteristics	Test procedure, see J-W-1177	Wire sizes, AWG	Requirements
Continuity	4.7.10	31-44	The number of discontinuities shall be not greater than the number listed in table VI.
	4.7.11	14-30	
Completeness of cure	4.7.16.1	4-44	No swelling or blistering visible in the film coating.
Thermoplastic flow	4.7.8	18, 36	Median not less than 180°C with heavy film coated wire.
Solubility	4.7.12	18, 36	Heavy film coated wire shall not soften sufficiently to expose bare copper when immersed in xylene.
Dielectric strength at temperature	4.7.14	18, 36	Heavy film coated wire shall average not less than 4275 volts for 18 AWG or 1900 volts for 36 AWG.
Thermal endurance	4.7.15.1	18	105°C minimum with heavy film.
	4.7.15.2	14-44	1000 volts/mil minimum after 168 hours at 180°C.
	4.7.15.3	14-44	175°C minimum as shown in table III.
Bond (heat activated)	4.7.13.1	18, 26	Heavy film coated wire shall show no separation of turns when bonded 1 hour at 150°C.
Bond (solvent activated)	4.7.13.2	18, 26	Heavy film coated wire shall show no separation of turns when bonded with denatured alcohol.

TABLE I. Dimensions, sizes 14 to 44 AWG.

AWG size	Bare wire diameter, inch1/			Type TB, single			Type T2B, heavy			Type T3B, triple		
				Minimum increase in diameter, inch			Minimum increase in diameter, inch			Minimum increase in diameter, inch		
	Minimum	Nominal	Maximum	Polyvinyl-formal coating	Thermo-plastic outer coating	Maximum overall diameter, inch	Polyvinyl-formal coating	Thermo-plastic outer coating	Maximum overall diameter, inch	Polyvinyl-formal coating	Thermo-plastic outer coating	Maximum overall diameter inch
14	0.0635	0.0641	0.0644	0.0016	0.0009	0.0682	0.0032	0.0009	0.0700	---	---	---
15	.0565	.0571	.0574	.0015	.0009	.0609	.0030	.0009	.0627	---	---	---
16	.0503	.0508	.0511	.0014	.0009	.0545	.0029	.0009	.0562	0.0043	0.0009	0.0577
17	.0448	.0453	.0455	.0014	.0009	.0488	.0028	.0009	.0504	.0041	.0009	.0520
18	.0399	.0403	.0405	.0013	.0008	.0437	.0026	.0008	.0452	.0039	.0008	.0468
19	.0355	.0359	.0361	.0012	.0008	.0391	.0025	.0008	.0406	.0037	.0008	.0422
20	.0317	.0320	.0322	.0012	.0007	.0351	.0023	.0007	.0364	.0035	.0007	.0379
21	.0282	.0285	.0286	.0011	.0007	.0314	.0022	.0007	.0326	.0033	.0007	.0342
22	.0250	.0253	.0254	.0011	.0007	.0281	.0021	.0007	.0293	.0032	.0007	.0308
23	.0224	.0226	.0227	.0010	.0006	.0253	.0020	.0006	.0264	.0030	.0006	.0279
24	.0199	.0201	.0202	.0010	.0006	.0227	.0019	.0006	.0238	.0029	.0006	.0252
25	.0177	.0179	.0180	.0009	.0006	.0203	.0018	.0006	.0214	.0027	.0006	.0228
26	.0157	.0159	.0160	.0009	.0005	.0182	.0017	.0005	.0193	.0026	.0005	.0206
27	.0141	.0142	.0143	.0008	.0005	.0164	.0016	.0005	.0173	.0024	.0005	.0185
28	.0125	.0126	.0127	.0008	.0005	.0147	.0016	.0005	.0156	.0023	.0005	.0166
29	.0112	.0113	.0114	.0007	.0004	.0133	.0015	.0004	.0142	.0022	.0004	.0152
30	.0099	.0100	.0101	.0007	.0004	.0119	.0014	.0004	.0128	.0021	.0004	.0137
31	.0088	.0089	.0090	.0006	.0004	.0108	.0013	.0004	.0115	.0019	.0004	.0124
32	.0079	.0080	.0081	.0006	.0004	.0098	.0012	.0004	.0105	.0018	.0004	.0113
33	.0070	.0071	.0072	.0005	.0004	.0088	.0011	.0004	.0095	.0017	.0004	.0102
34	.0062	.0063	.0064	.0005	.0003	.0078	.0010	.0003	.0084	.0015	.0003	.0091
35	.0055	.0056	.0057	.0004	.0003	.0070	.0009	.0003	.0076	.0014	.0003	.0082
36	.0049	.0050	.0051	.0004	.0003	.0063	.0008	.0003	.0069	.0013	.0003	.0074
37	.0044	.0045	.0046	.0003	.0003	.0057	.0008	.0003	.0062	.0012	.0003	.0067
38	.0039	.0040	.0041	.0003	.0002	.0051	.0007	.0002	.0056	.0011	.0002	.0060

See footnote at end of table.

TABLE I. Dimensions, sizes 14 to 44 AWG. - Continued

AWG size	Bare wire diameter, inch 1/			Type TB, single			Type T2B, heavy			Type T3B, triple		
				Minimum increase in diameter, inch		Maximum overall diameter, inch	Minimum increase in diameter, inch		Maximum overall diameter, inch	Minimum increase in diameter, inch		Maximum overall diameter inch
	Minimum	Nominal	Maximum	Polyvinyl-formal coating	Thermo-plastic outer coating		Polyvinyl-formal coating	Thermo-plastic outer coating		Polyvinyl-formal coating	Thermo-plastic outer coating	
39	0.0034	0.0035	0.0036	0.0002	0.0002	0.0045	0.0006	0.0002	0.0050	0.0010	0.0002	0.0053
40	.0030	.0031	.0032	.0002	.0002	.0040	.0006	.0002	.0044	.0009	.0002	.0047
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	---	---	---

1/ These bare wire diameters may be exceeded, provided:

(a) The maximum diameters specified by QQ-W-343 are not exceeded,
(b) The minimum increases in diameter are maintained, and
(c) The maximum overall diameters are not exceeded.

TABLE II. Elongation of finished wire.

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

TABLE III. Heat shock.

AWG size	Minimum elongation, percent	Mandral diameter	Minimum temperature, °C
14-30	20	3X	175
31-44	1/ 20	3X	175

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

TABLE IV. Springback of finished wire.

AWG size	Maximum springback, degrees		AWG size	Maximum springback, degrees	
	Type TB	Types T2B and T3B		Type TB	Types T2B and T3B
14	42	46	23	62	64
15	46	49	24	67	69
16	50	53	25	72	74
17	54	58	26	76	80
18	58	62	27	50	55
19	62	66	28	55	60
20	66	70	29	61	65
21	53	53	30	66	70
22	58	58			

TABLE V. Minimum breakdown voltages.

AWG size	Volts			AWG size	Volts		
	Type TB	Type T2B	Type T3B		Type TN	Type TN2	Type T3B
14	3525	6325	----	30	2300	4150	5550
15	3425	6175	----	31	2075	3825	5100
16	3325	6000	8000	32	1850	3525	4750
17	3250	5850	7800	33	1675	3250	4450
18	3175	5700	7600	34	1500	2975	4150
19	3075	5550	7400	35	1325	2750	3900
20	3000	5400	7200	36	1200	2525	3650
21	2925	5250	7025	37	1075	2325	3425
22	2850	5125	6850	38	950	2150	3200
23	2775	5000	6675	39	850	1975	2975
24	2700	4850	6500	40	775	1800	2750
25	2625	4725	6325	41	700	1675	----
26	2550	4600	6150	42	625	1525	----
27	2500	4500	6000	43	550	1400	----
28	2425	4375	5850	44	500	1300	----
29	2375	4250	5700				

TABLE VI. Continuity.

AWG size	Maximum number of discontinuities		
	Type TB	Type T2B	Type T3B
14-24	25	5	3
25-30	25	7	5
31-44	25	5	

Part number: Magnet wire covered by this specification shall be defined by the following part numbering system. Example: M1177/6-02C029

M1177/6-	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
TB	01	Copper	C
T2B	02	Aluminum	A
T3B	03	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 TB magnet wire is intended for use in 105°C applications such as solenoid coils, relays and similar devices where self bonding is desired.

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 6145-1111-05)