INCH-POUND
J-W-1177/34
June 10, 1988

FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 180, TYPE Dg0, POLYESTER-GLASS-FIBER-COVERED, ORGANIC VARNISH TREATED, 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 180; type Dg20 (bare with double polyester-glass fiber covered, varnished), type L2Dg0 and type L2Dg20 (heavy film, single or double polyester-glass fiber covered, varnished); rectangular.
Insulating materials:	The fiber covering and application of the covering shall be as specified in J-W-1177. If an underlying film coating is used, it shall have a class 155 rating. The varnish used in treating fibrous covered wire shall conform to the requirements of class 180 of MIL-I-24092, or an alternate selected on the basis of equivalent test data. The varnish shall be a high temperature non-silicone insulating varnish. The varnish used shall be identified in the qualification test report.
NEMA/ANSI equivalent:	All test requirements are equivalent to MW-53 of NEMA MW 1000.
General requirements:	See J-W-1177 for general requirements, quality assurance provisions, and packaging.

AMSC N/A
FSC 6145
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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 - see table III (type L2Dg0), table IV (type Dg20) and table V (type L2Dg20). (d) Increase in width due to the glass fiber covering shall be equal to or less than the increase in thickness. Square wire: (a) Conductor dimensions, radii and tolerances - see table VI. (b) Increase in thickness and width - see table VI.
Adherence and flexibility	4.7.2.3.1	All	For bare wire, not less than 75 volts/mil of minimum thickness of the glass fiber covering on one side.
	4.7.2.3.2	All	For film coated wire, no cracks visible in the film coating after 20 percent elongation. Examine with normal vision without removal of the glass fiber covering.
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.
Dielectric strength	4.7.9	All	Not less than 90 volts/mil of the minimum thickness of the glass fiber covering on one side (one-half the minimum specified under "Dimensions") plus the minimum breakdown for film coated wire.
Thermal endurance	----	All	Class 180. Insulating materials shall meet the thermal class ratings described above.

TABLE I. Dimensions and radii for rectangular wire.

Nominal thickness	Nominal width																															
Inch	.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
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							

1/ R-40 series numbers. Radii tolerances are 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
0.220 to 0.098	± 1 percent
Under 0.098 to 0.025	± 0.001 percent
Width, inch	
0.492 to 0.315	± 0.003 inch
Under 0.315 to 0.098	± 1 percent
Under 0.098 to 0.079	± 0.001 inch

TABLE III. Dimensions (type L2DgO).

Maximum increase in thickness, inches (mm), due to single polyester glass fiber covering, heavy film coating and high temperature organic varnish, rectangular wire

Nominal thickness		Nominal width																																				Nominal thickness	
Millimeters	Inches	2.00	2.12	2.24	2.37	2.50	2.65	2.80	3.00	3.15	3.35	3.55	3.75	4.00	4.25	4.50	4.75	5.00	5.30	5.60	6.00	6.30	6.70	7.10	7.50	8.00	8.50	9.00	9.50	10.0	10.6	11.2	11.8	12.5	Millimeters	Inches
		0.079	1/0.083	0.088	1/0.093	0.098	1/0.104	0.110	1/0.118	0.124	1/0.132	0.140	1/0.148	0.157	1/0.167	0.177	1/0.187	0.197	1/0.209	0.220	1/0.236	0.248	1/0.264	0.280	1/0.295	0.315	1/0.335	0.354	1/0.374	0.394	1/0.417	0.441	1/0.465	0.492		
0.63	0.025	0.010 inch (0.254 mm)								0.011 inch (0.279 mm)								0.012 inch (0.305 mm)								0.013 inch (0.330 mm)									0.025	0.63
.71	.028																																		.028	.71
.80	.031																																		.031	.80
.90	.035																																		.035	.90
1.00	.039																																		.039	1.00
1.12	.044																																		.044	1.12
1.25	.049																																		.049	1.25
1.40	.055																																		.055	1.40
1.60	.063																																		.063	1.60
1.80	.071																																		.071	1.80
2.00	.079																																		.079	2.00
2.24	.088																																		.088	2.24
2.50	.098																																		.098	2.50
2.80	.110																																		.110	2.80
3.15	.124																																		.124	3.15
3.55	.140																																		.140	3.55
4.00	.157																																		.157	4.00
4.50	.177																																		.177	4.50
5.00	.197																																		.197	5.00
5.60	.220																																		.220	5.60

See footnote at top of next page.

1/ R-40 series intermediate numbers.

EXAMPLE - Preferred size	0.055 x 0.110	(R-20 x R-20)
Intermediate size	0.055 x 0.118	(R-20 x R-40)

NOTES:

1. The maximum increase due to the film and fiber covering may be exceeded provided the overall dimension of the covered wire does not exceed the sum of the maximum thickness of the bare wire plus the maximum increase due to the heavy film coating and single polyester glass fiber covering.
2. The increase in thickness due to the heavy film coating shall be for film coated wire.
3. The increase in thickness due to the single polyester glass fiber covering shall be determined by subtracting 0.005 inch (0.127 mm) (maximum thickness of film coating) from the maximum increase in thickness given in the table.
4. The increase in width due to the polyester glass fiber covering shall be equal to or less than the maximum increase in thickness given in the table. Note 1 applies to the increase in width as well as the increase in thickness.
5. Because it is impossible to accurately separate the polyester glass fiber covering from the film coating, the total minimum increase in the thickness of the film-coated glass fiber covered rectangular wire shall be the sum of the minimum increase due to the film coating (as shown for film-coated wire) and the minimum increase due to the polyester glass-fiber covering. The total minimum increase shall be not less than 70 percent of the maximum increase given in the table above, rounded to the nearest 0.001 inch (0.025 mm).
6. For direct conversion of inches to millimeters, multiply inches by the factor 25.4 (exact).

TABLE IV. Dimensions (type Dg20).

Maximum increase in thickness, inches (mm), due to double polyester glass fiber covering and high temperature organic varnish, rectangular wire

Nominal thickness		Nominal width																																Nominal thickness	
Millimeters		2.00	2.12	2.24	2.37	2.50	2.65	2.80	3.00	3.15	3.35	3.55	3.75	4.00	4.25	4.50	4.75	5.00	5.30	5.60	6.00	6.30	6.70	7.10	7.50	8.00	8.50	9.00	9.50	10.0	10.6	11.2	11.8	12.5	Millimeters	
	Inches	0.079	1/0.083	0.088	1/0.093	0.098	1/0.104	0.110	1/0.118	0.124	1/0.132	0.140	1/0.148	0.157	1/0.167	0.177	1/0.187	0.197	1/0.209	0.220	1/0.236	0.248	1/0.264	0.280	1/0.295	0.315	1/0.335	0.354	1/0.374	0.394	1/0.417	0.441	1/0.465	0.492	Inches	
0.63	0.025	0.011 inch (0.279 mm)								0.012 inch (0.305 mm)				0.013 inch (0.330 mm)				0.014 inch (0.364 mm)				0.015 inch (0.381 mm)				0.016 inch (0.406 mm)									0.025	0.63
.71	.028																																		.028	.71
.80	.031																																		.031	.80
.90	.035																																		.035	.90
1.00	.039																																		.039	1.00
1.12	.044																																		.044	1.12
1.25	.049																																		.049	1.25
1.40	.055																																		.055	1.40
1.60	.063																																		.063	1.60
1.80	.071																																		.071	1.80
2.00	.079																																		.079	2.00
2.24	.088																																		.088	2.24
2.50	.098																																		.098	2.50
2.80	.110									0.013 inch										0.015 inch															.110	2.80
3.15	.124																																		.124	3.15
3.55	.140																																		.140	3.55
4.00	.157																																		.157	4.00
4.50	.177															0.015 inch																			.177	4.50
5.00	.197																																		.197	5.00
5.60	.220																																		.220	5.60

See footnote at top of next page.

1/ R-40 series intermediate numbers.

EXAMPLE -	Preferred size	0.055 x 0.110 (R-20 x R-20)
	Intermediate size	0.055 x 0.118 (R-20 x R-40)

NOTES:

1. The maximum increase due to the polyester glass fiber covering may be exceeded provided the overall dimension of the covered wire does not exceed the sum of the maximum thickness of the bare wire plus the maximum increase due to the glass fiber covering.
2. The minimum increase due to the polyester glass fiber covering shall be not less than 70 percent of the maximum shown in the table above, rounded to the nearest 0.001 inch (0.025 mm).
3. The increase in width due to the polyester glass fiber covering shall be equal to or less than the maximum in thickness given in the table. Note 1 applies to the increase in width as well as the increase in thickness.
4. For direct conversion of inches to millimeters, multiply inches by the factor 25.4 (exact).

TABLE V. Dimensions (type L2Dg20).

Maximum increase in thickness, inches (mm), due to heavy film coating, double polyester glass fiber covering and high temperature organic varnish, rectangular wire

Nominal thickness		Nominal width																																		Nominal thickness	
Millimeters	Inches	2.00	2.12	2.24	2.37	2.50	2.65	2.80	3.00	3.15	3.35	3.55	3.75	4.00	4.25	4.50	4.75	5.00	5.30	5.60	6.00	6.30	6.70	7.10	7.50	8.00	8.50	9.00	9.50	10.0	10.6	11.2	11.8	12.5	Millimeters	Inches
		0.079	1/0.083	0.088	1/0.093	0.098	1/0.104	0.110	1/0.118	0.124	1/0.132	0.140	1/0.148	0.157	1/0.167	0.177	1/0.187	0.197	1/0.209	0.220	1/0.236	0.248	1/0.264	0.280	1/0.295	0.315	1/0.335	0.354	1/0.374	0.394	1/0.417	0.441	1/0.465	0.492		
0.63	0.025	0.016 inch (0.406 mm)								0.017 inch (0.432 mm)				0.018 inch (0.457 mm)				0.019 inch (0.483 mm)				0.020 inch (0.508 mm)						0.021 inch (0.533 mm)							0.025	0.63
.71	.028																																		.028	.71
.80	.031																																		.031	.80
.90	.035																																		.035	.90
1.00	.039																																		.039	1.00
1.12	.044																																		.044	1.12
1.25	.049																																		.049	1.25
1.40	.055																																		.055	1.40
1.60	.063																																		.063	1.60
1.80	.071																																		.071	1.80
2.00	.079																																		.079	2.00
2.24	.088																																		.088	2.24
2.50	.098																																		.098	2.50
2.80	.110									0.018 inch										0.020 inch															.110	2.80
3.15	.124																																		.124	3.15
3.55	.140																																		.140	3.55
4.00	.157																																		.157	4.00
4.50	.177																0.020 inch																		.177	4.50
5.00	.197																																		.197	5.00
5.60	.220																																		.220	5.60

See footnote at top of next page.

1/ R-40 series intermediate numbers.

EXAMPLE -	Preferred size	0.055 x 0.110 (R-20 x R-20)
	Intermediate size	0.055 x 0.118 (R-20 x R-40)

NOTES:

1. The maximum increase due to the polyester glass fiber covering may be exceeded provided the overall dimension of the covered wire does not exceed the sum of the maximum thickness of the bare wire plus the maximum increase given in table V.
2. The increase in thickness due to the heavy film coating shall be for film coated wire.
3. The minimum increase due to the polyester glass fiber covering shall be not less than 70 percent of the maximum shown in table IV, rounded to the nearest 0.001 inch (0.025 mm).
4. The increase in width due to the polyester glass fiber covering shall be equal to or less than the maximum increase in thickness given in table IV. Note 1 applies to the increase in width as well as the increase in thickness.
5. Because it is impossible to accurately separate the polyester glass fiber covering from the film coating, the total minimum increase in the thickness of a film and fiber covered rectangular wire shall be the sum of the minimum increase due to the film coating (as shown for film coated wire) and the minimum increase due to the polyester glass fiber covering. The total minimum increase shall be not less than 70 percent of the maximum increase given in table IV, plus the minimum for the film coated wire, rounded to the nearest 0.001 inch (0.025 mm).
6. For direct conversion of inches to millimeters, multiply inches by the factor 25.4 (exact).

TABLE VI. Dimensions, square wire.

Type L2DgO
Minimum increase and maximum overall dimensions, inches (mm), due to single polyester glass fiber covering, heavy film coating and high temperature organic varnish, square wire

Square AWG size	Bare wire dimension						Nominal radii		Insulation				Square AWG size
	Minimum		Nominal		Maximum				Minimum increase in dimension		Maximum overall dimension		
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	
0	0.3219	8.176	0.3249	8.252	0.3279	8.329	0.040	1.02	0.009	0.229	0.341	8.661	0
1	.2864	7.275	.2893	7.348	.2922	7.422	.040	1.02	.009	.229	.305	7.747	1
2	.2550	6.477	.2576	6.543	.2602	6.609	.040	1.02	.008	.203	.272	6.909	2
3	.2271	5.768	.2294	5.827	.2317	5.885	.040	1.02	.008	.203	.244	6.198	3
4	.2023	5.138	.2043	5.189	.2063	5.240	.040	1.02	.008	.203	.219	5.563	4
5	.1801	4.575	.1819	4.620	.1837	4.666	.040	1.02	.008	.203	.196	4.978	5
6	.1604	4.074	.1620	4.115	.1636	4.155	.032	0.81	.008	.203	.175	4.445	6
7	.1429	3.630	.1443	3.665	.1457	3.701	.032	.81	.008	.203	.157	3.988	7
8	.1272	3.231	.1285	3.264	.1298	3.297	.032	.81	.008	.203	.141	3.581	8
9	.1133	2.878	.1144	2.906	.1155	2.934	.026	.66	.008	.203	.127	3.226	9
10	.1009	2.563	.1019	2.588	.1029	2.614	.026	.66	.007	.178	.113	2.870	10
11	.0897	2.278	.0907	2.304	.0917	2.329	.020	.51	.007	.178	.102	2.591	11
12	.0798	2.027	.0808	2.052	.0818	2.078	.020	.51	.007	.178	.092	2.337	12
13	.0710	1.803	.0720	1.829	.0730	1.854	.016	.41	.007	.178	.084	2.134	13
14	.0631	1.603	.0641	1.628	.0651	1.654	.016	.41	.007	.178	.076	1.930	14

NOTES:
1. Radii tolerance is plus or minus 25 percent.
2. For direct conversion of inches to millimeters, multiply inches by the factor 25.4 (exact).

TABLE VI. Dimensions, square wire. - Continued

Type Dg20 and L2Dg20
Minimum increase and maximum overall dimensions, inches (mm), due to double polyester glass fiber covering and high temperature organic varnish, square wire

Square AWG size	Bare wire dimension						Nominal radii		Bare double-polyester-glass-fiber-covered wire				Heavy-film-coated double-polyester-glass-fiber-covered wire			
	Minimum		Nominal		Maximum				Minimum increase in dimension		Maximum overall dimension		Minimum increase in dimension		Maximum overall dimension	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0	0.3219	8.176	0.3249	8.252	0.3279	8.329	0.040	1.02	0.012	0.305	0.344	8.738	0.015	0.381	0.349	8.865
1	.2864	7.275	.2893	7.348	.2922	7.422	.040	1.02	.012	.305	.308	7.823	.015	.381	.313	7.950
2	.2550	6.477	.2576	6.543	.2602	6.609	.040	1.02	.012	.305	.276	7.010	.015	.381	.281	7.137
3	.2271	5.768	.2294	5.827	.2317	5.885	.040	1.02	.012	.305	.248	6.299	.015	.381	.253	6.426
4	.2023	5.138	.2043	5.189	.2063	5.240	.040	1.02	.012	.305	.222	5.639	.015	.381	.227	5.766
5	.1801	4.575	.1819	4.620	.1837	4.666	.040	1.02	.011	.279	.199	5.055	.014	.356	.204	5.182
6	.1604	4.074	.1620	4.115	.1636	4.155	.032	0.81	.011	.279	.179	4.547	.014	.356	.184	4.674
7	.1429	3.630	.1443	3.665	.1457	3.701	.032	.81	.010	.254	.160	4.064	.013	.330	.165	4.191
8	.1272	3.231	.1285	3.264	.1298	3.297	.032	.81	.009	.229	.143	3.632	.012	.305	.148	3.759
9	.1133	2.878	.1144	2.906	.1155	2.934	.026	.66	.009	.229	.129	3.277	.012	.305	.134	3.404
10	.1009	2.563	.1019	2.588	.1029	2.614	.026	.66	.008	.203	.115	2.921	.011	.279	.120	3.048
11	.0897	2.278	.0907	2.304	.0917	2.329	.020	.51	.008	.203	.103	2.616	.011	.279	.108	2.743
12	.0798	2.027	.0808	2.052	.0818	2.078	.020	.51	.008	.203	.093	2.362	.011	.279	.098	2.489
13	.0710	1.803	.0720	1.829	.0730	1.854	.016	.41	.008	.203	.084	2.134	.011	.279	.089	2.261
14	.0631	1.603	.0641	1.628	.0651	1.654	.016	.41	.008	.203	.076	1.930	.011	.279	.081	2.057

NOTES:
1. Radii tolerance is plus or minus 25 percent.
2. For direct conversion of inches to millimeters, multiply inches by the factor 25.4 (exact).

Part number: Magnet wire covered by this specification shall be defined by the following part numbering system. Example: M1177/34-02CXXX.

M1177/34-	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
Dg20	01	Copper	C
L2Dg0	02	Aluminum	A
L2Dg20	03	Nickel-coated copper	N
		Silver-coated copper	S

Intended use: Type Dg0 rectangular magnet wire is intended for use in 180°C applications similar to those for which type Dg0 round magnet wire is used.

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 6145-1111-30)