

J-W-1177/26A  
 September 27, 1976  
 SUPERSEDING  
 J-W-001177/26 (NAVY-Ships)  
 September 21, 1973

FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 180, TYPE DgH,  
 POLYESTER-GLASS-FIBER-COVERED, RECTANGULAR

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for use of all Federal agencies.

The complete requirements for procuring the wire described herein shall consist of this document and the latest issue of Specification J-W-1177/GEN.

The magnet wire shall be of the following classification:

Type Dg2H - Bare with double polyester-glass, silicone varnished  
 Type LDg2H and type L2Dg2H - Single or heavy film, double polyester-glass-fiber, silicone varnished.  
 Rectangular.

REQUIREMENTS:

1. Qualification is required.
2. Insulating materials. The fiber covering shall consist of a combination of polyester and glass fibers. The glass fiber shall be continuous-filament glass yarn conforming to MIL-Y-1140. The polyester fiber shall be a high-grade yarn resulting from the linear polymerization of ethylene glycol and terephthalic acid. The maximum content by weight of the polyester fiber in the yarn shall not exceed 50 percent.
3. Thermal evaluation. When the wire has an underlying film, the film coated wire shall meet the requirements of the applicable specification sheet for class 155 requirements before it is covered with fiber. 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 service experience or equivalent test data. The varnish used shall be identified in the qualification test report (see 6.3 of basic specification).
4. Application of polyester-glass-fiber. The polyester-glass-fiber covering shall be wrapped firmly, closely, evenly and continuously around the wire. When more than one layer of polyester-glass-fiber is applied, adjacent layers shall be wound in opposite directions. The polyester-glass-fiber covering shall be fused and treated with a modified silicone insulating varnish or silicone compound to provide a tough outer finish.
5. Dimensions.
  - 5.1 Rectangular.
    - 5.1.1 Conductor dimensions. The sizes and radii shall be as shown in table I. The tolerances shall be as shown in table II.
    - 5.1.2 Increase in thickness. When measured in accordance with 4.7.1.2.5, the increase in thickness due to double polyester-glass fiber covering shall be as shown in table III and the increase due to polyester-glass fiber and heavy film shall be as shown in table IV (single fiber covering) and table V (double fiber covering).
    - 5.1.3 Increase in width. When measured in accordance with 4.7.1.2.5, the increase in width due to the polyester-glass-fiber covering shall be equal to or less than the increase in thickness.
  - 5.2 Square. The conductor size and radii shall be in accordance with table VI. When measured in accordance with 4.7.1.2.5 the minimum increase and maximum overall dimensions due to the polyester glass-fiber covering over bare or heavy-film-coated square wire shall be as shown in table VI.



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 inch
<u>Width, inch</u>	
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. Maximum increase in thickness, inch, due to double-polyester-glass-fiber covering over rectangular wire, type Dg2H.

Nominal Thickness		Nominal Width																	
Inch	0.079 ✓ .083 .088 ✓ .093 .098 ✓ .104 .110 ✓ .118 .124 ✓ .132 .140 ✓ .148 .157 ✓ .167 .177 ✓ .187 .197 ✓ .209 .220 ✓ .236 .248 ✓ .264 .280 ✓ .295 .315 ✓ .335 .364 ✓ .374 .394 ✓ .417 .441 ✓ .465 .492																	Inch	
0.025																		0.025	
.028																		.028	
.031																		.031	
.035																		.035	
.039																		.039	
.044																		.044	
.049	0.010	0.011				0.012				0.013				.049					
.055																		.055	
.063																		.063	
.071																		.071	
.079																		.079	
.088																		.088	
.098																		.098	
.110																		.110	
.124																		.124	
.140																		.140	
.157																		.157	
.177																		.177	
.197																		.197	
.220																		.220	

✓R-40 series numbers.

Radial tolerance is plus or minus 25 percent.

EXAMPLE—Preferred Sizes ..... 55 x 110 (R20 x R20)  
Intermediate Sizes ..... 55 x 118 (R20 x R40)

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 polyester-glass fiber covering.
2. The increase due to the polyester-glass-fiber covering for wires having dimensions not shown in table III shall be the same as those for the next larger thickness or width.
3. The minimum increase shall be 70 percent of the maximum increase shown in table III, rounded off to the nearest 0.001 inch.

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TABLE IV. Maximum increase in thickness, inch, due to single-polyester-glass-fiber covering and heavy-film coating over rectangular wire, type L2DqH.

Nominal Thickness		Nominal Width																																
Inch	0.079 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	1/230	.248	1/264	.280	1/295	.315	1/333	.354	1/374	.394	1/417	.441	1/466	.492	Inch	
0.025																																		0.025
.028																																		.028
.031																																		.031
.035																																		.035
.039																																		.039
.044				0.011				0.012			0.013											0.015											.044	
.049																																		.049
.055																																		.055
.063																																		.063
.071																																		.071
.079																																		.079
.088																																		.088
.098																																		.098
.110											0.013		0.014					0.015										0.016					.110	
.124																																		.124
.140																																		.140
.157																																		.157
.177																		0.015																.177
.197																																		.197
.220																																		.220

1/R-40 series numbers.

Radial tolerance is plus or minus 25 percent.

EXAMPLE—Preferred Sizes ..... 55 x 110 (R20 x R20)

Intermediate Sizes ..... 55 x 118 (R20 x R40)

NOTES:

1. The maximum increase due to the heavy-film coating and single-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 heavy-film coating and single-polyester-glass-fiber covering.
2. The increase due to the heavy-film coating and single polyester-glass-fiber covering for wire having dimensions not shown in table IV shall be the same as those for the next larger thickness or width.
3. The increase in thickness due to the heavy-film coating, if any, shall be in accordance with the applicable specification sheet for film-coated wire.
4. The increase in thickness due to the single-polyester-glass-fiber covering shall be determined by subtracting 0.005 inch (maximum thickness of film coating) from the maximum increase in thickness given in table IV.

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TABLE V. Maximum increase in thickness, inch, due to double-polyester-glass-fiber covering and heavy-film coating over rectangular wire, type L2Dq2H.

Nominal Thickness	Nominal Width																		Inch															
Inch	0.079 1/16	0.083 1/16	0.088 1/16	0.093 1/16	0.098 1/16	0.104 1/16	0.110 1/16	0.118 1/16	0.124 1/16	0.132 1/16	0.140 1/16	0.148 1/16	0.157 1/16	0.167 1/16	0.177 1/16	0.187 1/16	0.197 1/16	0.209 1/16	0.220 1/16	0.236 1/16	0.248 1/16	0.264 1/16	0.280 1/16	0.295 1/16	0.315 1/16	0.335 1/16	0.354 1/16	0.374 1/16	0.394 1/16	0.417 1/16	0.441 1/16	0.465 1/16	0.492 1/16	Inch
0.025																													0.025					
.028																													.028					
.031																													.031					
.035																													.035					
.039																													.039					
.044	0.016					0.017				0.018			0.020													.044								
.049																													.049					
.055																													.055					
.063																													.063					
.071																													.071					
.079																													.079					
.088																													.088					
.093																													.093					
.110	0.018						0.019			0.020		0.021															.110							
.124																													.124					
.140																													.140					
.157																													.157					
.177	0.020																												.177					
.197																													.197					
.220																													.220					

R-40 series numbers.

Radial tolerance is plus or minus 25 percent.

EXAMPLE—Preferred Sizes ..... 55 x 110 (R20 x R20)  
Intermediate Sizes ..... 55 x 118 (R20 x R40)

NOTES:

- 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 or film-coated wire plus the maximum increase due to the polyester-glass-fiber covering.
- The increase due to the polyester-glass-fiber covering for wires having dimensions not shown in table IV shall be the same as those for the next larger thickness or width.
- The increase in thickness due to the heavy film-coating, if any, shall be in accordance with the applicable specification sheet for film-coated wire.
- The minimum increase shall be not less than 70 percent of the maximum increase shown in table III, rounded off to the nearest 0.001 inch.
- Because it is impossible to separate accurately the polyester-glass-fiber covering from the film coating, the total minimum increase in the thickness of film-coated double-polyester-glass-fiber-covered rectangular wire shall be 70 percent the maximum increase given in table V rounded off to the nearest 0.001 inch.

TABLE VI. Minimum increase and maximum overall dimensions of glass-fiber-covered square wire.

AWG size	Bare wire dimension, inch			Radii, inch	Type Dq2H		Type L2DqH		Type L2Dq2H	
					Minimum increase, inch	Maximum overall dimension, inch	Minimum increase, inch	Maximum overall dimension, inch	Minimum increase, inch	Maximum overall dimension, inch
	Min	Nom	Max		Minimum increase, inch	Maximum overall dimension, inch	Minimum increase, inch	Maximum overall dimension, inch	Minimum increase, inch	Maximum overall dimension, inch
0	0.3219	0.3249	0.3279	0.040	0.012	0.344	0.009	0.341	0.015	0.349
1	.2864	.2893	.2922	.040	.012	.308	.009	.305	.015	.313
2	.2550	.2576	.2602	.040	.012	.276	.008	.272	.015	.281
3	.2271	.2294	.2317	.040	.012	.248	.008	.244	.015	.253
4	.2023	.2043	.2063	.040	.012	.222	.008	.219	.015	.227
5	.1801	.1819	.1837	.040	.011	.199	.008	.196	.014	.204
6	.1604	.1620	.1636	.032	.011	.179	.008	.175	.014	.184
7	.1429	.1443	.1457	.032	.010	.160	.008	.157	.013	.165
8	.1272	.1285	.1298	.032	.009	.143	.008	.141	.012	.148
9	.1133	.1144	.1155	.026	.009	.129	.008	.127	.012	.134
10	.1009	.1019	.1029	.026	.008	.115	.007	.113	.011	.120
11	.0897	.0907	.0917	.020	.008	.103	.007	.102	.011	.108
12	.0798	.0808	.0818	.020	.008	.093	.007	.092	.011	.098
13	.0710	.0720	.0730	.016	.008	.084	.007	.084	.011	.089
14	.0631	.0641	.0651	.016	.008	.076	.007	.076	.011	.081

1/ Tolerance is plus or minus 25 percent.

## NOTES:

1. The increase due to the heavy coating and/or glass-fiber covering for wires having dimensions not shown in table VI shall be the same as those for the next larger size.
2. The increase in thickness due to the heavy film coating, if any, shall be in accordance with the applicable specification sheet for film-coated wire.

## REQUIREMENTS (Continued):

6. Adhesion and flexibility. When the wire is tested in accordance with 4.7.2.4, polyester-glass-fiber-covered wire without an underlying film coating shall withstand a minimum of 75 volts per mil of the minimum thickness of the polyester-glass-fiber covering on one side (one-half the minimum increase as shown in tables III, IV, V and VI). When the wire is tested in accordance with 4.7.2.4 after having been elongated 20 percent in 10 inches, polyester-glass-fiber covered wire with an underlying film coating shall show no cracks in the film coating when examined with normal vision and without removal of the polyester-glass-fiber covering.
7. Elongation. When the wire is tested in accordance with 4.7.4.3, it shall meet the requirements of table VII.

TABLE VII. Elongation of finished wire.

Nominal thickness of bare wire, inch	Minimum elongation, percent
0.220 - 0.049	32
0.048 - 0.025	30

8. Dielectric strength. When the wire is tested in accordance with 4.7.8.3, polyester-glass-fiber-covered wire without an underlying film coating shall withstand a minimum of 90 volts per mil (0.001 inch) of the minimum thickness of the polyester-glass-fiber covering on one side (one-half of the minimum increase specified in paragraph 5). Polyester-glass-fiber-covered wire with an underlying film coating shall withstand a minimum of 90 volts per mil of the minimum thickness of the polyester-glass-fiber covering on one side (one-half the minimum increase specified in paragraph 5) plus the minimum breakdown voltage given in the applicable specification sheet for film-coated wire.

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## QUALITY ASSURANCE PROVISIONS:

Qualification and quality conformance inspection. Qualification and quality conformance inspection shall consist of the examination and tests shown in table VIII.

TABLE VIII. Qualification and quality conformance inspection.

Examination or test	Test paragraph	Qualification inspection	Quality conformance inspection (Group)
Visual and dimensional	4.7.1	X	A
Adhesion and flexibility	4.7.2	X	A
Elongation	4.7.4	X	A
Dielectric strength	4.7.8	X	B
Thermal evaluation (Temperature index)	4.7.18.1	X	-

Intended use. Type DgH rectangular magnet wire is intended for use in 180°C applications similar to those of glass-insulated (type GV) wire where increased toughness and non-fraying properties are required.

## Custodians:

Army - EL  
Navy - SH  
Air Force - 80

## Review activities:

Army - EL, MI, MU

## User activities:

Army - ME  
Navy - AS, CG, MC

## Preparing activity:

Navy - SH

## Civil Agency Coordinating Activities:

GSA - FSS, PBO, PCD  
INTERIOR - BPA  
DOT - ACO, FIS, RDS  
DC GOVT - DCG  
NASA - JFK  
HEW - FEC, FDA  
COM - NBS

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