

**INCH-POUND**

J-W-1177/3B

June 10, 1988

SUPERSEDING

J-W-1177/3A

September 27, 1976

## FEDERAL SPECIFICATION SHEET

WIRE, MAGNET, ELECTRICAL, CLASS 105, TYPE SN,  
SOLDERABLE POLYAMIDE COATED, 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 SN (single), type SN2 (heavy); round.  
 Insulating materials: The film shall be based on a polyamide resin.  
 NEMA/ANSI equivalent: All test requirements except thermal endurance are equivalent to MW-6 of NEMA MW 1000.  
 General requirements: See J-W-1177 for general requirements, quality assurance provisions, and packaging.

## Requirements:

| Characteristics           | Test procedure,<br>see J-W-1177 | Wire sizes,<br>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.  |
| Continuity                | 4.7.10<br>4.7.11                | 31-44<br>14-30     | The number of discontinuities shall be not greater than the number listed in table VI. |
| Thermoplastic flow        | 4.7.8                           | 18, 36             | Median not less than 170°C with heavy film coated wire.                                |

AMSC N/A

FSC 6145

DISTRIBUTION STATEMENT A Approved for public release; distribution unlimited

J-W-1177/3B

## Requirements: (Continued)

| Characteristics                    | Test procedure,<br>see J-W-1177 | Wire sizes,<br>AWG | Requirements  |
|------------------------------------|---------------------------------|--------------------|---|
| Solubility                         | 4.7.12                          | 18, 36             | Heavy film coated wire shall not soften sufficiently to expose bare conductor when immersed in xylene.  |
| Dielectric strength at temperature | 4.7.14                          | 18, 36             | Heavy film coated wire shall average not less than 3825 volts for 18 AWG or 1725 volts for 36 AWG.      |
| Thermal endurance                  | 4.7.15.1                        | 18                 | 105°C minimum with heavy film coated wire.  |
|                                    | 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.  |
| Solderability                      | 4.7.17                          | 14-44              | Covered with continuous film of solder and not readily separable after soldering as shown in table VII. |

TABLE I. Dimensions, sizes 14 to 44 AWG.

| AWG size | Bare wire diameter, inch |         |         | Type SN, single                    |                                | Type SN2, heavy                    |                                |
|----------|--------------------------|---------|---------|------------------------------------|--------------------------------|------------------------------------|--------------------------------|
|          |                          |         |         | Minimum increase in diameter, inch | Maximum overall diameter, inch | Minimum increase in diameter, inch | Maximum overall diameter, inch |
|          | Minimum                  | Nominal | Maximum |                                    |                                |                                    |                                |
| 1/14     | 0.0635                   | 0.0641  | 0.0644  | 0.0016                             | 0.0666                         | 0.0032                             | 0.0682                         |
| 1/15     | .0565                    | .0571   | .0574   | .0015                              | .0594                          | .0030                              | .0609                          |
| 1/16     | .0503                    | .0508   | .0511   | .0014                              | .0531                          | .0029                              | .0545                          |
| 1/17     | .0448                    | .0453   | .0455   | .0014                              | .0475                          | .0028                              | .0488                          |
| 1/18     | .0399                    | .0403   | .0405   | .0013                              | .0424                          | .0026                              | .0437                          |
| 1/19     | .0355                    | .0359   | .0361   | .0012                              | .0379                          | .0025                              | .0391                          |
| 1/20     | .0317                    | .0320   | .0322   | .0012                              | .0339                          | .0023                              | .0351                          |
| 1/21     | .0282                    | .0285   | .0286   | .0011                              | .0303                          | .0022                              | .0314                          |
| 1/22     | .0250                    | .0253   | .0254   | .0011                              | .0270                          | .0021                              | .0281                          |
| 1/23     | .0224                    | .0226   | .0227   | .0010                              | .0243                          | .0020                              | .0253                          |
| 1/24     | .0199                    | .0201   | .0202   | .0010                              | .0217                          | .0019                              | .0227                          |
| 1/25     | .0177                    | .0179   | .0180   | .0009                              | .0194                          | .0018                              | .0203                          |
| 1/26     | .0157                    | .0159   | .0160   | .0009                              | .0173                          | .0017                              | .0182                          |

See footnote at end of table.

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

| AWG<br>size | Bare wire diameter,<br>inch |         |         | Type SN, single                             |   | Type SN2, heavy                             |   |
|-------------|-----------------------------|---------|---------|---|---|---|---|
|             |                             |         |         | Minimum<br>increase<br>in diameter,<br>inch | Maximum<br>overall<br>diameter,<br>inch | Minimum<br>increase<br>in diameter,<br>inch | Maximum<br>overall<br>diameter,<br>inch |
|             | Minimum                     | Nominal | Maximum |   |   |   |   |
| 27          | 0.0141                      | 0.0142  | 0.0143  | 0.0008                                      | 0.0156                                  | 0.0016                                      | 0.0164                                  |
| 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                                   |
| 36          | .0049                       | .0050   | .0051   | .0004                                       | .0058                                   | .0008                                       | .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/ 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 shown in table I are maintained, and
- (c) The maximum overall diameters shown in table I 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 | Mandrel diameter | Minimum temperature, °C |
|----------|-----------------------------|------------------|-------------------------|
| 14-30    | 20                          | 3X               | 175                     |
| 31-44    | <u>1</u> /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 |
|----------|-----------------------------|----------|-----------------------------|
| 14       | 42                          | 23       | 62                          |
| 15       | 46                          | 24       | 67                          |
| 16       | 50                          | 25       | 72                          |
| 17       | 54                          | 26       | 76                          |
| 18       | 58                          | 27       | 50                          |
| 19       | 62                          | 28       | 55                          |
| 20       | 66                          | 29       | 61                          |
| 21       | 53                          | 30       | 66                          |
| 22       | 58                          |          |                             |

TABLE V. Minimum breakdown voltages.

| AWG<br>size | Volts   |          | AWG<br>size | Volts   |          |
|-------------|---------|----------|-------------|---------|----------|
|             | Type SN | Type SN2 |             | Type SN | Type SN2 |
| 14          | 3175    | 5700     | 30          | 2075    | 3725     |
| 15          | 3075    | 5550     | 31          | 1875    | 3450     |
| 16          | 3000    | 5400     | 32          | 1675    | 3175     |
| 17          | 2925    | 5275     | 33          | 1500    | 2925     |
| 18          | 2850    | 5125     | 34          | 1350    | 2675     |
| 19          | 2775    | 5000     | 35          | 1200    | 2475     |
| 20          | 2700    | 4850     | 36          | 1075    | 2275     |
| 21          | 2625    | 4725     | 37          | 975     | 2100     |
| 22          | 2575    | 4625     | 38          | 850     | 1925     |
| 23          | 2500    | 4500     | 39          | 775     | 1775     |
| 24          | 2425    | 4375     | 40          | 700     | 1625     |
| 25          | 2375    | 4250     | 41          | 625     | 1500     |
| 26          | 2300    | 4150     | 42          | 575     | 1375     |
| 27          | 2250    | 4050     | 43          | 500     | 1250     |
| 28          | 2175    | 3950     | 44          | 450     | 1175     |
| 29          | 2150    | 3825     |             |         |          |

TABLE VI. Continuity.

| AWG<br>size | Maximum number of discontinuities |          |
|-------------|-----------------------------------|----------|
|             | Type SN                           | Type SN2 |
| 14-24       | 25                                | 5        |
| 25-30       | 25                                | 7        |
| 31-44       | 25                                | 5        |

TABLE VII. Solderability.

| AWG<br>size | Maximum immersion<br>time, seconds | Temperature of<br>solder, °C |
|-------------|------------------------------------|------------------------------|
| 14-19       | 10                                 | 430                          |
| 20-23       | 8                                  | 430                          |
| 25-29       | 6                                  | 360                          |
| 30-36       | 5                                  | 360                          |
| 37-44       | 4                                  | 360                          |

J-W-1177/3B

Part number: Magnet wire covered by this specification shall be defined by the following part numbering system.  
Example: M1177/3-02C029

|  |  |  |   |
|--|--|--|---|
| <u>M1177/3-</u><br> <br>Federal<br>specification<br>identifier | <u>02</u><br> <br>Two digit<br>type code | <u>C</u><br> <br>Single letter<br>conductor code | <u>029</u><br> <br>Three character<br>size code |
|--|--|--|---|

The following codes shall apply:

| Type | Type code | Conductor            | Conductor code |
|------|-----------|----------------------|----------------|
| SN   | 01        | Copper               | C              |
| SN2  | 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 SN magnet wire is intended for use in 105°C applications similar to those for which type T is used and where a solderable wire having good windability 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 6145-1111-02)