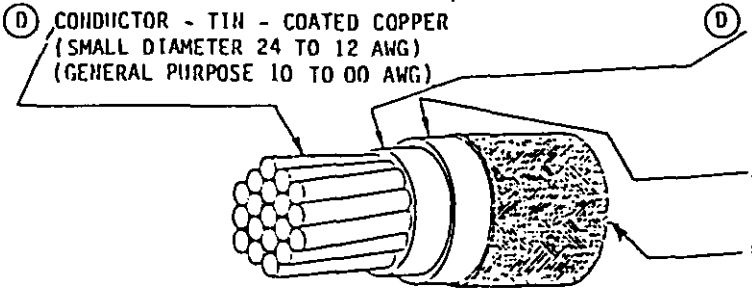
MILITARY SPECIFICATION SHEET

(D) WIRE, ELECTRICAL, FLUOROPOLYMER-INSULATED, CROSSLINKED MODIFIED ETFE, NORMAL WEIGHT, TIN-COATED COPPER, 150°C, 600 VOLT

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the wire described herein shall consist of this specification and the latest issue of MIL-W-22759.



NOTES:
1. ETFE - Ethylene-tetrafluoroethylene copolymer.
2. Braid (sizes 2 and larger): Bright aromatic polyamide yarn, 200 denier, 100 filaments, tightly formed, uniform in appearance, treated with a clear finisher coating. The finisher coating shall be compatible with the temperature rating and performance requirements of the insulated wire.

FIGURE 1. General configuration.

TABLE I. Construction details.

Part no. 1/	Wire size	Stranding (number of strands x AWG gauge of strands)	Diameter of stranded conductor (inches) (min)	(max)	Finished wire: Resistance at 20°C (68°F) (ohms/1000 ft) (max)	Diameter (inches)	Weight (lbs/1000 ft) (max)
(D) M22759/34-24-*	24	19 x 36	.023	.025	26.2	.045 ±.002	2.3
M22759/34-22-*	22	19 x 34	.029	.031	16.2	.050 ±.002	3.2
M22759/34-20-*	20	19 x 32	.037	.039	9.88	.058 ±.002	4.7
M22759/34-18-*	18	19 x 30	.046	.049	6.23	.070 ±.003	7.2
M22759/34-16-*	16	19 x 29	.052	.055	4.81	.077 ±.003	9.0
M22759/34-14-*	14	19 x 27	.065	.069	3.06	.094 ±.003	13.8
M22759/34-12-*	12	37 x 28	.084	.089	2.02	.111 ±.003	20.5
M22759/34-10-*	10	37 x 26	.106	.113	1.26	.134 ±.004	32.4
M22759/34- 8-*	8	133 x 29	.158	.173	.701	.195 ±.008	60.3
M22759/34- 6-*	6	133 x 27	.198	.217	.445	.241 ±.010	94.5
M22759/34- 4-*	4	133 x 25	.250	.274	.280	.310 ±.010	150.
M22759/34- 2-*	2	665 x 30	.320	.340	.183	.405 ±.016	239.
M22759/34- 1-*	1	817 x 30	.360	.380	.149	.445 ±.016	290.
M22759/34-01-*	0 2/	1045 x 30	.395	.425	.116	.485 ±.016	377.
M22759/34-02-*	00 2/	1330 x 30	.440	.475	.091	.545 ±.016	487.

1/ Part number: The asterisks in the part number column, tables I and II, shall be replaced by color code designators in accordance with MIL-STD-681 except that for sizes 2 and larger the braid color shall be dark green and the designator shall be 5D. Examples: Size 20, white with orange stripe - M22759/34-20-93; size 2, dark green - M22759/34-2-5D. Printing of color code designator on surface of wire insulation is not required.

2/ Wire sizes 0 and 00 have been superseded by -01 and -02 respectively.

(D) denotes changes

TABLE II. Performance details.

Part no.	Bend testing			
	Mandrel diameter (inches) (±3%)		Test load (lbs) (±3%)	
	Crosslinking proof, immersion and life cycle tests	Cold bend test	Crosslinking proof, immersion and life cycle tests	Cold bend test
M22759/34-24-*	.500	1.00	.750	3.00
M22759/34-22-*	.500	1.00	1.00	3.00
M22759/34-20-*	.500	1.00	1.50	4.00
M22759/34-18-*	.750	1.50	2.00	4.00
M22759/34-16-*	1.00	1.50	2.00	5.00
M22759/34-14-*	1.00	2.00	3.00	5.00
M22759/34-12-*	1.50	2.00	3.00	5.00
M22759/34-10-*	2.00	3.00	3.00	5.00
M22759/34- 8-*	3.00	4.00	4.00	6.00
M22759/34- 6-*	4.00	5.00	4.00	10.0
M22759/34- 4-*	5.00	6.00	4.00	10.0
M22759/34- 2-*	6.00	8.00	6.00	15.0
M22759/34- 1-*	8.00	10.0	6.00	15.0
M22759/34-01-*	8.00	10.0	6.00	15.0
M22759/34-02-*	10.0	12.0	8.00	20.0

RATINGS:

Temperature rating: 150°C (302°F) maximum continuous conductor temperature.
Voltage rating: 600 volts (rms) at sea level.

ADDITIONAL REQUIREMENTS:

Acid resistance: No requirement.
Blocking: 200°C ±3°C (392°F ±5.4°F).
Color: In accordance with MIL-STD-104, class 1; white preferred. For braided constructions, color shall be dark green within Munsell color limits of 5Y 3/2 and 5B 2/0.5. Conformity of color shall not be required after crosslinking proof test or life cycle oven exposure.
Color striping or banding durability: 125 cycles (250 strokes) (min), 500 grams weight. Not required for sizes 2 and larger.
Crosslinking proof test: 7 hours at 300°C ±3°C (572°F ±5.4°F). Quality conformance test, group II. Requirements and procedures as for life cycle except for time and temperature.
Dielectric test after immersion: 2,500 volts (rms), 60 Hz.
Flammability: Quality conformance test, group II. For requirements and procedures see below.
Humidity resistance: After humidity exposure, wire shall meet the requirements for initial insulation resistance.
Identification of product: Not required for size 24. Color code designator not required.
Identification durability: 125 cycles (250 strokes) (min), 500 grams weight. Not required for sizes 2 and larger.
Immersion: For procedure see below.
Impulse dielectric test: 8.0 kilovolts (peak), 100 percent test.
Insulation resistance, initial:
  Sizes 24 through 10, 5,000 megohms for 1,000 feet (min).
  Sizes 8 through 00, 3,000 megohms for 1,000 feet (min).
Insulation thickness:
  0.003 inch (min) for primary insulation.
  0.004 inch (min) for outer jacket.
  0.008 inch (min) for total insulation.
Life cycle: 500 hours at 200°C ±3°C (392°F ±5.4°F). Dielectric test, 2,500 volts (rms), 60 Hz. Procedure to use mandrels coated with polytetrafluoroethylene in the form of either enamel or wrapped tape, such that the diameter of the mandrels, after coating, still conform to the requirements of performance details, table II.
Low temperature (cold bend):
  Bend temperature, -65°C ±3°C (-85°F ±5.4°F).
  Dielectric test, 2,500 volts (rms), 60 Hz.

Physical properties of insulation: Pulled at 2 inches per minute. Primary insulation shall be separated from the outer jacket for determination of primary insulation tensile strength and elongation.
Tensile strength, 5,000 lbf/in^2 (min) for primary insulation, 5,000 lbf/in^2 (min) for total insulation (primary insulation and jacket).
Elongation, 125 percent (min) for primary insulation (AWGs 24-10 only), 75 percent (min) for total insulation (primary insulation and jacket).
Propellant resistance: No dielectric breakdown. For procedure see below.
Shrinkage: 0.125 inch (max) at 200°C ±3°C (392°F ±5.4°F).
Smoke: 200°C ±2°C (392°F ±3.6°F); no visible smoke.
(0) Solderability: All conductors shall be tested in accordance with MIL-STD-202, method 208 without steam aging.
Spark test of primary insulation: 1,500 volts (rms), 60 Hz.
Surface resistance: 500 megohms - inches (min), initial and final readings.
Thermal shock resistance:
Oven temperature, 150°C ±3°C (302°F ±5.4°F).
Maximum change in measurement, sizes 24 through 12: 0.060 inch.
sizes 10 through 8: 0.100 inch.
sizes 6 through 00: 0.125 inch.
Wicking:
Procedure II; weight increase, no requirement.
Dye travel between layers of insulation, 2.25 inches (max) from end of specimen.
Wire length requirements: Schedule B.
Wrap test:
Wrap back test.
Oven temperature, 200°C ±3°C (392°F ±5.4°F).
Sizes 8 and larger, mandrel diameter shall be 3 times the outside diameter of the wire.

Flammability requirements and procedure:

The flammability test of MIL-W-22759 shall be modified for the wire of this specification sheet as follows: The specified test burner shall be used without the wing top flame spreader and shall be adjusted to furnish a 3-inch conical flame with an inner cone approximately 1 inch in height and a temperature of 955°C ±30°C (1751°F ±54°F) at its hottest point. A sheet of facial tissue conforming to UU-T-450 shall be suspended taut and horizontal 9-1/2 inches below the marked point on the wire specimen in the test chamber and at least 1/2 inch above the floor of the chamber. The period of application of the hot flame tip to the marked point on the wire specimen shall be 30 seconds for all sizes of wire. Observations shall include time of burning after removal of the test flame, final distance of flame travel on the wire above the test mark, and presence or absence of flame in the facial tissue due to incendiary drip from the specimen. Requirements shall be:

Duration of after-flame	3 seconds (max)
Flame travel	3.0 inches (max)
No flaming of tissue	

Breaking of the wire specimen in size 24 or smaller shall not be considered as failure provided the requirements for duration of flame, final distance of flame travel, and absence of incendiary dripping are met.

One specimen shall be tested from each sample unit. The post-flame dielectric test of MIL-W-22759 is not required for wire of this specification sheet.

Immersion procedure:

A 24-inch specimen, for each test fluid in table III, shall have its diameter measured and shall then be immersed to within 6 inches of each end for the time and temperautre specified. During immersion, the radius of bend of the wire shall be not less than 14 nor more than 35 times the specified maximum diameter of the wire under test. Upon removal from the test fluid, the specimen shall be wiped dry and then remain for 1 hour in free air at room temperature. The diameter shall be measured and compared to the initial diameter. The insulation shall be removed for a distance of 1/2 inch from each end of the specimen. The specimen shall then be subjected to the bend test and dielectric test specified in the procedure for life cycle testing.

Propellant resistance procedure: (Initial qualification test only)

TABLE III. Immersion test fluids.

Test fluid		Test temperature	Immersion time
a	MIL-L-23699, Lubricating Oil, Aircraft Turbine Engine, Synthetic Base	48°C to 50°C (118°F to 122°F)	20 hours
b	MIL-H-5606, Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance	48°C to 50°C (118°F to 122°F)	20 hours
c	TT-I-735, Isopropyl Alcohol	20°C to 25°C (68°F to 77°F)	168 hours
d	MIL-T-5624, Turbine Fuel, Aviation, Grade JP-4	20°C to 25°C (68°F to 77°F)	168 hours
e	MIL-A-8243, Anti-Icing and Deicing-Defrosting Fluid, undiluted	48°C to 50°C (118°F to 122°F)	20 hours
f	MIL-A-8243, Anti-Icing and Deicing-Defrosting Fluid, diluted 60/40 (fluid/water) ratio	48°C to 50°C (118°F to 122°F)	20 hours
g	MIL-C-43616, Cleaning Compound, Aircraft Surface	48°C to 50°C (118°F to 122°F)	20 hours
h	TT-M-268, Methyl Isobutyl Ketone (For Use in Organic Coatings)	20°C to 25°C (68°F to 77°F)	168 hours
i	SAE-AS-1241, Fire Resistant Hydraulic Fluid for Aircraft	48°C to 50°C (118°F to 122°F)	20 hours
j	MIL-L-7808, Lubricating Oil, Aircraft Turbine Engine, Synthetic Base	118°C to 121°C (244°F to 250°F)	30 minutes
k	MIL-C-25769, Cleaning Compound, Aircraft Surface, Alkaline Waterbase, undiluted	63°C to 68°C (145°F to 154°F)	20 hours
l	MIL-C-25769, Cleaning Compound, Aircraft Surface, Alkaline Waterbase, diluted 25/75 (fluid/water) ratio	63°C to 68°C (145°F to 154°F)	20 hours
m	TT-S-735, Standard Test Fluids; Hydrocarbon, Type I	20°C to 25°C (68°F to 77°F)	168 hours
n	TT-S-735, Standard Test Fluids; Hydrocarbon, Type II	20°C to 25°C (68°F to 77°F)	168 hours
o	TT-S-735, Standard Test Fluids; Hydrocarbon, Type III	20°C to 25°C (68°F to 77°F)	168 hours
p	TT-S-735, Standard Test Fluids; Hydrocarbon, Type VII	20°C to 25°C (68°F to 77°F)	168 hours
q	Dielectric-coolant fluid, synthetic silicate ester base, Monsanto Coolanol 25 or equivalent	20°C to 25°C (68°F to 77°F)	168 hours
r	MIL-T-81533, 1,1,1 Trichloroethane (Methyl Chloroform) Inhibited, Vapor Degreasing	20°C to 25°C (68°F to 77°F)	168 hours
s	Azeotrope of trichlorotrifluoroethane and methylene chloride, Dupont Freon TMC or equivalent	20°C to 25°C (68°F to 77°F)	168 hours
t	MIL-G-3056, Gasoline, Automotive, Combat	20°C to 25°C (68°F to 77°F)	168 hours

Specimens of finished wire, 24 inches long, shall be immersed to within 1-1/2 inches of each end in the following propellants for the specified time at normal room temperature, using a separate specimen for each propellant.

	Propellant	Immersion time
a.	MIL-P-26536, Propellant, Hydrazine	30 minutes
b.	MIL-P-26539, Propellant, Nitrogen Tetroxide	1 minute
c.	MIL-P-27402, Propellant, Hydrazine - Uns-Dimethylhydrazine (50 percent N_2H_4 - 50 percent UDMH)	30 minutes

During immersion, the radius of bend of the wire shall be not less than 14 nor more than 35 times the specified maximum diameter of the wire under test. Upon removal from the liquids, the specimens shall remain for no more than 48 hours in free air at room temperature. The insulation shall be removed for a distance of 1 inch from each end of the specimens, and the specimens shall be subjected to the dielectric test specified for life cycle testing.

Qualifying activity: The activity responsible for the qualified products covered by this specification sheet is Naval Avionics Center, Code B/714, 6000 East 21st Street, Indianapolis, IN 46219-2189.

CONCLUDING MATERIAL

Custodians:
Army - AV
Navy - AS
Air Force - 85

Review activities:
Army - CR, MI
(D) Air Force - 11, 19, 70, 99
DLA - ES, IS

User activities:
Navy - EC, OS, SH

Preparing activity:
Air Force - 85

Agent:
DLA - ES

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