

REV.
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SAE AS22759/89

FEDERAL SUPPLY CLASS
6145

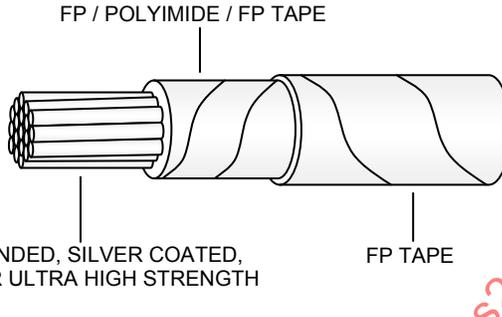
RATIONALE

INCOPORATE AS22759-89B-A1

NOTICE

THE REQUIREMENTS FOR ACQUIRING THE PRODUCT DESCRIBED HEREIN SHALL CONSIST OF THIS SPECIFICATION SHEET AND THE ISSUE OF THE FOLLOWING SPECIFICATION LISTED IN THAT ISSUE OF THE DEPARTMENT OF DEFENSE INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) SPECIFIED IN THE SOLICITATION: AS22759.

THIS SPECIFICATION IS NOT INTENDED FOR USE IN NAVAL AIRCRAFT OR NAVAL AIR SYSTEMS APPLICATIONS.



FP – FLUOROCARBON POLYMER, MODIFIED POLYTETRAFLUOROETHYLENE (PTFE)

1/ ALLOY CONDUCTOR: THE SIZE 26 CONDUCTOR SHALL BE ULTRA-HIGH STRENGTH COPPER ALLOY. THE BREAKING STRENGTH SHALL BE 21.5 LB (MINIMUM) AND THE CONDUCTOR ELONGATION 6.0% (MINIMUM). ALL OTHER GAUGE SIZES SHALL BE HIGH STRENGTH COPPER ALLOY IN ACCORDANCED WITH AS22759.

FIGURE 1 - GENERAL CONFIGURATION

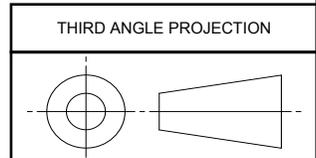
TABLE 1 - CONSTRUCTION DETAILS

PART NO. 1/	WIRE SIZE	CONDUCTOR				FINISHED WIRE				
		STRANDING (NUMBER OF STRANDS X AWG GAUGE OF STRANDS)	DIAMETER (IN)		RESISTANCE AT 20 °C (68 °F) (OHMS/1000 FT MAX)	DIAMETER (IN)		WEIGHT (LB/1000 FT) 2/		
			MIN	MAX		MIN	MAX	MIN	TARGET	MAX
M22759/89-26-*	26	19 X 38	0.0175	0.0204	56.4	0.033	0.037	1.34	1.47	1.60
M22759/89-24-*	24	19 X 36	0.0225	0.0244	28.4	0.038	0.042	1.87	2.04	2.20
M22759/89-22-*	22	19 X 34	0.0285	0.0314	17.5	0.043	0.047	2.70	2.90	3.10
M22759/89-20-*	20	19 X 32	0.0365	0.0395	10.7	0.051	0.055	4.25	4.45	4.65

1/ PART NUMBER: THE ASTERISKS IN THE PART NUMBER COLUMN OF TABLE 1 SHALL BE REPLACED BY COLOR CODE DESIGNATORS IN ACCORDANCE WITH MIL-STD-681. EXAMPLES: M22759/89-20-93 IS A 20 AWG WHITE WITH ORANGE STRIPE.

2/ THE ACCEPTABLE VALUE FOR THE CPK FOR THE FINISHED WIRE WEIGHT LISTED SHALL BE 1.3, USING A NORMAL (GAUSSIAN) DISTRIBUTION TO OBTAIN THOSE CPK VALUES.

SAE values your input. To provide feedback on this Technical Report, please visit <http://www.sae.org/technical/standards/AS22759/89C>



CUSTODIAN: AE-8/AE-8D

PROCUREMENT SPECIFICATION AS22759

SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

WIRE, ELECTRICAL, POLYTETRAFLUOROETHYLENE/ POLYIMIDE INSULATED, NORMAL WEIGHT, SILVER COATED, HIGH STRENGTH OR ULTRA HIGH STRENGTH COPPER ALLOY. 200 °C. 600 VOLTS

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SHEET 1 OF 5

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ISSUED 2000-06 REAFFIRMED 2006-04 REVISED 2010-10

TABLE 2 - WIRE INSULATION MATERIALS 1/

TAPE CODE	THICKNESS (NOM)	MATERIAL
1	0.0020	0.0005 (FP)/0.0010 (POLYIMIDE)/0.0005 (FP)
2	0.0020	FP (UNSINTERED)

1/ PHYSICAL PROPERTIES OF FP TAPES SHALL BE IN ACCORDANCE WITH AS22759 REQUIREMENTS.

TABLE 3 - PHYSICAL PROPERTIES OF FP/POLYIMIDE/FP TAPES

TENSILE STRENGTH	19 000 LB/IN SQ (AVERAGE MINIMUM)
TENSILE MODULUS	350 000 LB/IN SQ (AVERAGE MINIMUM)
ELONGATION	40 PERCENT (AVERAGE MINIMUM)
DIELECTRIC STRENGTH	4000 VOLTS/MIL (AVERAGE MINIMUM)
0.0005 FP LAYER (BOTTOM)	DISTINGUISHABLE COLOR (NEXT TO CONDUCTOR) MAY BE USED AT MANUFACTURER'S OPTION

TABLE 4 - TAPE OVERLAP REQUIREMENTS 1/

WIRE SIZE	WRAP 1				WRAP 2				NOMINAL WALL THICKNESS (MILS)
	TAPE CODE	PERCENT OVERLAP		TAPE CODE	PERCENT OVERLAP				
		MIN	MAX		MIN	MAX			
26	1	50.5	54.0	2	50.5	54.0	7.4		
24	1	50.5	54.0	2	50.5	54.0	7.4		
22	1	50.5	54.0	2	50.5	54.0	7.4		
20	1	50.5	54.0	2	50.5	54.0	7.4		

1/ WRAP 1 IS INNERMOST TAPE WHICH IS IN CONTACT WITH THE CONDUCTOR.

RATINGS:

TEMPERATURE RATING: 200 °C (392 °F) MAXIMUM CONTINUOUS CONDUCTOR TEMPERATURE.

VOLTAGE RATING: 600 VOLTS (RMS) AT SEA LEVEL.

ADDITIONAL REQUIREMENTS:

WET ARC PROPAGATION RESISTANCE (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH AS4373, METHOD 509. MEASURE THE DAMAGE OF THE BUNDLE ALONG THE AXIS. THE WIRE IS ACCEPTABLE IF THE FOLLOWING CRITERIA ARE MET:

1. A MINIMUM OF 67 WIRES PASS THE DIELECTRIC TEST.
2. THREE WIRES OR LESS FAIL THE DIELECTRIC TEST IN ANY ONE BUNDLE.
3. ACTUAL DAMAGE TO THE WIRE IS NOT MORE THAN 3 INCHES IN ANY TEST BUNDLE.

DRY ARC PROPAGATION RESISTANCE (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH AS4373, METHOD 508. MEASURE THE DAMAGE OF THE BUNDLE ALONG THE AXIS. THE WIRE IS ACCEPTABLE IF THE FOLLOWING CRITERIA ARE MET:

1. A MINIMUM OF 67 WIRES PASS THE DIELECTRIC TEST.
2. THREE WIRES OR LESS FAIL THE DIELECTRIC TEST IN ANY ONE BUNDLE.
3. ACTUAL DAMAGE TO THE WIRE IS NOT MORE THAN 3 INCHES IN ANY TEST BUNDLE.

BLOCKING: 200 °C ± 2 °C (392 °F ± 3.6 °F)

COLOR: WHITE IS THE PREFERRED COLOR AND SHALL BE IN ACCORDANCE WITH MIL-STD-104, CLASS 2. COLORS SHALL BE LASER MARKABLE AND MEET THE COLOR LIMITS BELOW. CONFORMITY OF COLOR SHALL NOT BE REQUIRED AFTER OVEN EXPOSURE.

 An SAE International Group	AEROSPACE STANDARD	SAE AS22759/89 SHEET 2 OF 5	REV. C
	WIRE, ELECTRICAL, POLYTETRAFLUOROETHYLENE/ POLYIMIDE INSULATED, NORMAL WEIGHT, SILVER COATED, HIGH STRENGTH OR ULTRA HIGH STRENGTH COPPER, ALLOY, 200 °C, 600 VOLTS		

TABLE 5 - MUNSELL COLOR LIMITS FOR UV LASER MARKABLE WIRE

COLOR	HUE		VALUE		CHROMA	
	FROM	TO	FROM	TO	FROM	TO
BLACK	2.5N	2.5N	7	8.5	N/A	N/A
BLUE	5PB	7.5B	7	8	4	6
GREEN	2.5G	7.5G	7	9	2	6
RED	10RP	5R	7	8	4	6
YELLOW	5Y	10Y	8	9	4	6
BROWN	2.5YR	7.5R	7	9	2	4
ORANGE	10R	2.5YR	6	7	8	10
VIOLET	2.5P	7.5R	7	8	4	8
GRAY	SAME AS BLACK		SAME AS BLACK		SAME AS BLACK	

COLOR STRIPING OR BANDING DURABILITY: 125 CYCLES (250 STROKES), 250 GRAMS WEIGHT

CONDUCTOR STRAND ADHESION: REQUIRED

CONTINUOUS LENGTHS: SCHEDULE B

DYNAMIC CUT-THROUGH (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH AS4373, METHOD 703. BLADE SHALL BE THE STANDARD CUTTING BLADE EXCEPT THE CUTTING EDGE RADIUS SHALL BE 0.005 INCH ± 0.001 INCH. MINIMUM AVERAGE DYNAMIC CUT-THROUGH (LB) SHALL BE AS FOLLOWS:

WIRE SIZE	23 °C ± 5 °C	150 °C ± 5 °C	200 °C ± 5 °C
26	10 LB	8 LB	6 LB
20	15 LB	12 LB	10 LB

FLAMMABILITY: TEST IN ACCORDANCE WITH AS4373, METHOD 801.

REQUIREMENTS:

DURATION OF AFTER-FLAME 3 SECONDS (MAXIMUM)

FLAME TRAVEL 3.0 INCHES (MAXIMUM)

NO FLAMING OF TISSUE

FORCED HYDROLYSIS: (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY) 5000 HOURS AT 70 °C. TEST 5 UNCONDITIONED AND 5 CONDITIONED SAMPLES OF AWG SIZE 20 ONLY IN ACCORDANCE WITH SAE AS4373 METHOD 602. ALL SAMPLES MUST PASS THE DIELECTRIC TEST AS LISTED IN METHOD 602.

HIGH FREQUENCY SPARK TEST: (WHEN USED IN LIEU OF IMPULSE DIELECTRIC TEST) TEST IN ACCORDANCE WITH AS4373, METHOD 505, 5.7 KILOVOLTS (RMS). TEST 100 PERCENT OF THE WIRE.

HUMIDITY RESISTANCE: AFTER HUMIDITY EXPOSURE WIRE SHALL MEET THE REQUIREMENTS FOR INITIAL INSULATION RESISTANCE.

IDENTIFICATION OF PRODUCT: NOT REQUIRED FOR SIZE 26. COLOR CODE DESIGNATOR NOT REQUIRED.

IDENTIFICATION DURABILITY: 125 CYCLES (250 STROKES), 250 GRAMS WEIGHT.

IMMERSION (TEST REQUIRED FOR INITIAL QUALIFICATION ONLY): TEST IN ACCORDANCE WITH AS4373, METHOD 601 INCLUDING THE ADDITIONAL FLUIDS LISTED IN TABLE 6 OF THIS SPECIFICATION. USE MANDRELS AND WEIGHTS LISTED IN TABLE 7 FOR BEND TESTING. DIELECTRIC TEST, 2500 VOLTS (RMS), 60 HZ. FOR TURBINE FUEL IMMERSION TEST OF AS4373, EITHER JP4 OR MIL-DTL-83133 TYPE JP-8 (NATO TYPE F-34) MAY BE USED.

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	WIRE, ELECTRICAL, POLYTETRAFLUOROETHYLENE/ POLYIMIDE INSULATED, NORMAL WEIGHT, SILVER COATED, HIGH STRENGTH OR ULTRA HIGH STRENGTH COPPER, ALLOY, 200 °C, 600 VOLTS		

TABLE 6 - FLUID TABLE

TEST FLUID	TEST TEMPERATURE (°C (°F))	IMMERSION TIME (HOURS)
A. SAE AMS 1424, ANTI-ICING AND DEICING DEFROSTING FLUID, UNDILUTED	48-50 (118-122)	20
B. SAE AMS 1424, ANTI-ICING AND DEICING DEFROSTING FLUID, DILUTED 60/40 (FLUID/WATER) RATIO	48-50 (118-122)	20
C. MIL-C-43616, CLEANING COMPOUND, AIRCRAFT SURFACE, TYPE I	48-50 (118-122)	20
D. ASTM D 1153, METHYL ISOBUTYL KETONE (FOR USE IN ORGANIC COATINGS)	20-25 (68-77)	168
E. SAE AS1241, FIRE RESISTANT HYDRAULIC FLUID FOR AIRCRAFT	48-50 (118-122)	20
F. MIL-PRF-7808, LUBRICATING OIL, AIRCRAFT TURBINE ENGINE, SYNTHETIC BASE	118-121 (244-250)	30
G. MIL-PRF-87937, CLEANING COMPOUND, AEROSPACE EQUIPMENT, TYPE II OR TYPE IV, UNDILUTED	63-68 (145-154)	20
H. MIL-PRF-87937, CLEANING COMPOUND, AEROSPACE EQUIPMENT, TYPE II OR TYPE IV, DILUTED 25/75 (FLUID/WATER) RATIO	63-68 (145-154)	20
I. TT-S-735, STANDARD TEST FLUIDS: HYDROCARBON, TYPE I	20-25 (68-77)	168
J. TT-S-735, STANDARD TEST FLUIDS: HYDROCARBON, TYPE II	20-25 (68-77)	168
K. TT-S-735, STANDARD TEST FLUIDS: HYDROCARBON, TYPE IV	20-25 (68-77)	168
L. DIELECTRIC-COOLANT FLUID SYNTHETIC SILICATE ESTER BASE, MONSANTO COOLANOL 25 OR APPROVED EQUIVALENT	20-25 (68-77)	168
M. ASTM D 4814, GASOLINE, AUTOMOTIVE, COMBAT	20-25 (68-77)	168

IMPULSE DIELECTRIC TEST: 8.0 KILOVOLTS (PEAK). TEST 100 PERCENT OF THE WIRE.

INSULATION RESISTANCE: 5000 MEGOHMS FOR 1000 FEET (MINIMUM).

INSULATION STATE OF SINTER: (QUALITY CONFORMANCE INSPECTION PERFORMED ON ONE SAMPLE PER LOT) EVALUATE FP LAYERS WITH A DIFFERENTIAL SCANNING CALORIMETER PER AS4373, METHOD 813. THE DIFFERENCE IN ENERGY TO MELT BETWEEN THE FIRST AND SECOND HEATS SHALL BE LESS THAN OR EQUAL TO 3 JOULES/GRAM.

LAMINATION SEALING: (GROUP II QUALITY CONFORMANCE TEST) WHEN TESTED IN ACCORDANCE WITH AS4373, METHOD 809 AT 260 °C FOR 6 HOURS, THERE SHALL BE NO EVIDENCE OF TAPE SEPARATION OR LIFTING. THREE SAMPLES PER LOT SHALL BE TESTED.

LIFE CYCLE: 500 HOURS AT 230 °C ± 2 °C (446 °F ± 3.6 °F). DIELECTRIC TEST, 2500 VOLTS (RMS), 60 HZ. USE MANDRELS COATED WITH POLYTETRAFLUOROETHYLENE SUCH THAT THE DIAMETER OF THE MANDRELS, AFTER COATING, STILL CONFORM TO THE REQUIRED TEST MANDRELS DIAMETERS OF TABLE 7. AFTER OVEN EXPOSURE, LAYERS SHALL NOT SEPARATE AND OR TAPES SHALL NOT LIFT ALONG THE INSULATION OR AT THE ENDS.

LOW TEMPERATURE (COLD BEND): USE MANDRELS AND WEIGHTS SPECIFIED IN TABLE 7. CHAMBER TEMPERATURE, -65 °C ± 2 °C (-85 °F ± 3.6 °F). DIELECTRIC TEST, 2500 VOLTS (RMS), 60 HZ.

SHRINKAGE: 0.091 INCH (MAXIMUM) AT 230 °C ± 2 °C (446 °F ± 3.6 °F).

SMOKE: 200 °C ± 5 °C (392 °F ± 9 °F); NO VISIBLE SMOKE.

SOLDERABILITY: REQUIRED.

STRIPPABILITY: (GROUP II QUALITY CONFORMANCE TEST) AFTER STRIPPING WITH TOOLS AS DEFINED IN AS22759 AND AS5457, NO FRAGMENTS OF ANY LAYER SHALL EXTEND MORE THAN 0.031 INCHES BEYOND THE END OF THE POLYIMIDE TAPE LAYER.

INSULATION STRIP FORCE: (GROUP II QUALITY CONFORMANCE TEST). TEST IN ACCORDANCE WITH ASTM D 3032 SECTION 27. THE LENGTH OF THE INSULATION SLUGS SHALL BE 0.25 INCHES. STRIP FORCES (LB) SHALL BE AS FOLLOWS. THERE SHALL BE NO EVIDENCE OF INSULATION LEFT ON THE CONDUCTOR WHEN VIEWED WITH THE NAKED EYE.

WIRE SIZE	MIN FORCE	MAX FORCE
26-20	0.25 LB	6.0 LB

TAPE OVERLAP: IN ACCORDANCE WITH MIL-STD-2223, METHOD 6005.

TENSILE MODULUS: TEST COMPOSITE FILM IN ACCORDANCE WITH ASTM D 882, METHOD A.

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	WIRE, ELECTRICAL, POLYTETRAFLUOROETHYLENE/ POLYIMIDE INSULATED, NORMAL WEIGHT, SILVER COATED, HIGH STRENGTH OR ULTRA HIGH STRENGTH COPPER, ALLOY, 200 °C, 600 VOLTS		