

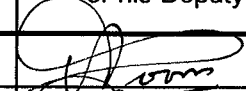
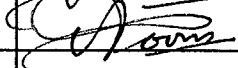
**european space agency
agence spatiale européenne**

Pages 1 to 20

**PTFE INSULATED WIRES AND CABLES,
LOW FREQUENCY, 600V, - 100 TO + 200 °C,
ESA/SCC Detail Specification No. 3901/013**



**space components
coordination group**

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 2	January 1996		
Revision 'A'	January 1999		

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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 1 and incorporates all modifications defined in Revisions 'A' and 'B' to Issue 1 and the changes agreed in the following DCR's:- Cover Page DCN Para. 4.2.4 : Title amended Para. 4.3.1 : Wording amended Para. 4.4.1.1 : Paragraph standardised Para. 4.4.1.2 : Paragraph standardised Para. 4.4.3.2 : Paragraph standardised Para. 4.5.2 : Wording amended Para. 4.5.5 : Wording amended Para. 4.8.2 : Sentence added Para. 4.8.3 : Sentence added Para. 4.8.7 : Sentence added Para. 4.8.11 : Test '(h)' and '(i)' corrected to '(e)' and '(f)' Para. 4.8.18 : Original paragraph deleted and Para. 4.8.19 renumbered to 4.8.18 Para. 4.8.19 : New paragraph added		None None 23791 23791 23791 23791 23791 23791 23791 23791 23791 23791 23791
'A'	Jan. '99	P1. Cover Page P2. DCN P8. Table 1(a)	: Variant 60, Finished Wire Max Ø corrected	None None 23905



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APPENDICES (Applicable to specific Manufacturers only)

None.

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1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for PTFE Insulated Wires and Cables, Low Frequency, 600V, - 100 to +200 °C. It shall be read in conjunction with ESA/SCC Generic Specification No. 3901, the requirements of which are supplemented herein.

NOTES

- Only simple elements (finished wires and unshielded, unjacketed multicore cables) can be used in the presence of hydrazine or nitrogen tetroxide.

1.2 TYPE VARIANTS

Variants of the basic types of wires and cables specified herein which are also covered by this specification, are listed in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, applicable to the finished wires and cables specified herein, which shall not be exceeded at any time during use or storage in controlled space environment, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the finished wires and cables specified herein is as follows:

- The maximum current for each wire used in a bundle shall be:-

$$I_{Bmax} = I_{max} \times \frac{29 - n}{28} \quad (\text{for } 1 < n < 15)$$

$$I_{Bmax} = \frac{I_{max}}{2} \quad (\text{for } n > 15)$$

where n = number of wires in the bundle;

- The temperature derating information is shown in Figure 1 with maximum current I_{max} for a single wire.
- The derating factors contained herein indicate maximum stress values and do not preclude further derating.

1.5 PHYSICAL CHARACTERISTICS

The physical characteristics of the finished wires and cables specified herein are shown in Figures 2(a), 2(b), 2(c) and 2(d) and their dimensions in Table 1(a).

1.6 FUNCTIONAL DIAGRAM

Not applicable.

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TABLE 1(a) - TYPE VARIANTS

VARIANT No.	SHIELDED	UN-SHIELDED		No. OF CORES	WIRE SIZE AWG	STRANDING No. OF STRANDS x DIAMETER (mm)	CONDUCTOR CHARACTERISTICS			SHIELD STRAND Ø (mm)	CORE MAX Ø (mm)	FINISHED WIRE OR CABLE CHARACTERISTICS	
		JACKETED	UN-JACKETED				MAX Ø (mm)	NOM SECT. (mm ²)	MAX OHMIC RESISTANCE (Ω/km)			MAX Ø (mm)	MAX WEIGHT (kg/km)
01			X	1	28	7 x 0.127 (1)	0.42	0.089	215	-	-	0.82	1.80
02			X	1	26	7 x 0.16 (1)	0.50	0.14	146	-	-	0.89	2.30
03			X	1	24	7 x 0.20	0.62	0.22	87.2	-	-	1.04	3.34
04			X	1	22	7 x 0.25	0.77	0.34	55.8	-	-	1.19	4.84
05			X	1	20	19 x 0.20	1.03	0.60	32.2	-	-	1.44	7.40
06			X	2	28	7 x 0.127 (1)	0.42	0.089	225	-	0.82	1.64	3.80
07			X	2	26	7 x 0.16 (1)	0.50	0.14	153	-	0.89	1.78	4.84
08			X	2	24	7 x 0.20	0.62	0.22	91.6	-	1.04	2.08	6.90
09			X	2	22	7 x 0.25	0.77	0.34	58.7	-	1.19	2.38	10.0
10			X	2	20	19 x 0.20	1.03	0.60	33.8	-	1.44	2.88	15.3
11			X	3	28	7 x 0.127 (1)	0.42	0.089	225	-	0.82	1.76	5.70
12			X	3	26	7 x 0.16 (1)	0.50	0.14	153	-	0.89	1.92	7.28
13			X	3	24	7 x 0.20	0.62	0.22	91.6	-	1.04	2.24	10.35
14			X	3	22	7 x 0.25	0.77	0.34	58.7	-	1.19	2.56	15.0
15			X	3	20	19 x 0.20	1.03	0.60	33.8	-	1.44	3.12	23.0
16			X	4	28	7 x 0.127 (1)	0.42	0.089	225	-	0.82	1.97	7.55
17			X	4	26	7 x 0.16 (1)	0.50	0.14	153	-	0.89	2.14	9.71
18			X	4	24	7 x 0.20	0.62	0.22	91.6	-	1.04	2.50	14.0
19			X	4	22	7 x 0.25	0.77	0.34	58.7	-	1.19	2.86	20.3
20			X	4	20	19 x 0.20	1.03	0.60	33.8	-	1.44	3.46	31.1
21		X		2	28	7 x 0.127 (1)	0.42	0.089	225	-	0.82	1.92	4.32
22		X		2	26	7 x 0.16 (1)	0.50	0.14	153	-	0.89	2.06	5.28

NOTES: 1. Copper alloy.

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TABLE 1(a) - TYPE VARIANTS (CONTINUED)

VARIANT No.	SHIELDED	UN-SHIELDED		No. OF CORES	WIRE SIZE AWG	STRANDING No. OF STRANDS x DIAMETER (mm)	CONDUCTOR CHARACTERISTICS			SHIELD STRAND Ø (mm)	CORE MAX Ø (mm)	FINISHED WIRE OR CABLE CHARACTERISTICS	
		JACKETED	UN-JACKETED				MAX Ø (mm)	NOM SECT. (mm ²)	MAX OHMIC RESISTANCE (Ω/km)			MAX Ø (mm)	MAX WEIGHT (kg/km)
23		X		2	24	7 x 0.20	0.62	0.22	91.6	-	1.04	2.36	7.54
24		X		2	22	7 x 0.25	0.77	0.34	58.7	-	1.19	2.66	10.7
25		X		2	20	19 x 0.20	1.03	0.60	33.8	-	1.44	3.16	16.2
26		X		3	28	7 x 0.127 (1)	0.42	0.089	225	-	0.82	2.04	6.26
27		X		3	26	7 x 0.16 (1)	0.50	0.14	153	-	0.89	2.20	7.80
28		X		3	24	7 x 0.20	0.62	0.22	91.6	-	1.04	2.52	11
29		X		3	22	7 x 0.25	0.77	0.34	58.7	-	1.19	2.84	15.8
30		X		3	20	19 x 0.20	1.03	0.60	33.8	-	1.44	3.40	24
31		X		4	28	7 x 0.127 (1)	0.42	0.089	225	-	0.82	2.25	8.17
32		X		4	26	7 x 0.16 (1)	0.50	0.14	153	-	0.89	2.42	10.3
33		X		4	24	7 x 0.20	0.62	0.22	91.6	-	1.04	2.78	14.8
34		X		4	22	7 x 0.25	0.77	0.34	58.7	-	1.19	3.14	21.2
35		X		4	20	19 x 0.20	1.03	0.60	33.8	-	1.44	3.74	32.2
36	X			1	28	7 x 0.127 (1)	0.42	0.089	215	0.055	0.82	1.22	3.77
37	X			1	26	7 x 0.16 (1)	0.50	0.14	146	0.055	0.89	1.29	4.63
38	X			1	24	7 x 0.20	0.62	0.22	87.2	0.07	1.04	1.52	6.38
39	X			1	22	7 x 0.25	0.77	0.34	55.8	0.07	1.19	1.67	8.26
40	X			1	20	19 x 0.20	1.03	0.60	32.2	0.07	1.44	1.92	11.4
41	X			2	28	7 x 0.127 (1)	0.42	0.089	225	0.07	0.82	2.12	7.62
42	X			2	26	7 x 0.16 (1)	0.50	0.14	153	0.07	0.89	2.26	9.24
43	X			2	24	7 x 0.20	0.62	0.22	91.6	0.07	1.04	2.56	11.7
44	X			2	22	7 x 0.25	0.77	0.34	58.7	0.07	1.19	2.86	15.5

NOTES: 1. Copper alloy.

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TABLE 1(a) - TYPE VARIANTS (CONTINUED)

VARIANT No.	SHIELDED	UN-SHIELDED		No. OF CORES	WIRE SIZE AWG	STRANDING No. OF STRANDS x DIAMETER (mm)	CONDUCTOR CHARACTERISTICS			SHIELD STRAND Ø (mm)	CORE MAX Ø (mm)	FINISHED WIRE OR CABLE CHARACTERISTICS	
		JACKETED	UN-JACKETED				MAX Ø (mm)	NOM SECT. (mm ²)	MAX OHMIC RESISTANCE (Ω/km)			MAX Ø (mm)	MAX WEIGHT (kg/km)
45	X			2	20	19x0.20	1.03	0.60	33.8	0.07	1.44	3.36	21.7
46	X			3	28	7x0.127 (1)	0.42	0.089	225	0.07	0.82	2.24	10.7
47	X			3	26	7x0.16 (1)	0.50	0.14	153	0.07	0.89	2.39	12.5
48	X			3	24	7x0.20	0.62	0.22	91.6	0.07	1.04	2.72	16.0
49	X			3	22	7x0.25	0.77	0.34	58.7	0.07	1.19	3.04	21.2
50	X			3	20	19x0.20	1.03	0.60	33.8	0.10	1.44	3.73	33.7
51	X			4	28	7x0.127 (1)	0.42	0.089	225	0.07	0.82	2.45	12.8
52	X			4	26	7x0.16 (1)	0.50	0.14	153	0.07	0.89	2.62	15.6
53	X			4	24	7x0.20	0.62	0.22	91.6	0.07	1.04	2.98	20.5
54	X			4	22	7x0.25	0.77	0.34	58.7	0.10	1.19	3.49	30.5
55	X			4	20	19x0.20	1.03	0.60	33.8	0.10	1.44	4.09	43.2
56			X	1	18	19x0.25	1.29	0.93	20.6	-	-	1.85	12.0
57			X	1	16	19x0.285	1.44	1.23	16.5	-	-	2.23	17.0
58			X	2	18	19x0.25	1.29	0.93	21.6	-	1.85	3.70	24.9
59			X	2	16	19x0.285	1.44	1.23	17.3	-	2.23	4.46	34.6
60			X	3	18	19x0.25	1.29	0.93	21.6	-	1.85	3.98	37.3
61			X	3	16	19x0.285	1.44	1.23	17.3	-	2.23	4.80	51.8
62			X	4	18	19x0.25	1.29	0.93	21.6	-	1.85	4.46	49.7
63			X	4	16	19x0.285	1.44	1.23	17.3	-	2.23	5.37	69.1
64		X		2	18	19x0.25	1.29	0.93	21.6	-	1.85	3.83	26.0
65		X		2	16	19x0.285	1.44	1.23	17.3	-	2.23	4.63	35.8
66		X		3	18	19x0.25	1.29	0.93	21.6	-	1.85	4.13	38.6

NOTES: 1. Copper alloy.



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TABLE 1(a) - TYPE VARIANTS (CONTINUED)

VARIANT No.	SHIELDED	UN-SHIELDED		No. OF CORES	WIRE SIZE AWG	STRANDING No. OF STRANDS x DIAMETER (mm)	CONDUCTOR CHARACTERISTICS			SHIELD STRAND Ø (mm)	CORE MAX Ø (mm)	FINISHED WIRE OR CABLE CHARACTERISTICS	
		JACKETED	UN-JACKETED				MAX Ø (mm)	NOM SECT. (mm ²)	MAX OHMIC RESISTANCE (Ω/km)			MAX Ø (mm)	MAX WEIGHT (kg/km)
67		X		3	16	19×0.285	1.44	1.23	17.3	-	2.23	4.93	53.3
68		X		4	18	19×0.25	1.29	0.93	21.6	-	1.85	4.59	51.2
69		X		4	16	19×0.285	1.44	1.23	17.3	-	2.23	5.50	70.9
70	X			1	18	19×0.25	1.29	0.93	20.6	0.07	1.85	2.26	17.0
71	X			1	16	19×0.285	1.44	1.23	16.5	0.07	2.23	2.60	22.9
72	X			2	18	19×0.25	1.29	0.93	21.6	0.10	1.85	4.23	35.5
73	X			2	16	19×0.285	1.44	1.23	17.3	0.10	2.23	4.98	47.8
74	X			3	18	19×0.25	1.29	0.93	21.6	0.10	1.85	4.60	51.0
75	X			3	16	19×0.285	1.44	1.23	17.3	0.10	2.23	5.41	67.9
76	X			4	18	19×0.25	1.29	0.93	21.6	0.10	1.85	5.07	65.9
77	X			4	16	19×0.285	1.44	1.23	17.3	0.10	2.23	5.97	91.5
78			X	1	30	7×0.10 (1)	0.32	0.055	375	-	-	0.71	1.20

NOTES: 1. Copper alloy.

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Voltage	V_P	600	Vrms	
2	Maximum Current (Note 1)	I_{max}	0.8 1.5 2.5 3.5 5.0 7.5 10.0 13.0	A	For AWG 30 28 26 24 22 20 18 16
3	Operating Temperature Range	T_{amb}	- 100 to + 200	°C	
4	Storage Temperature Range	T_{stg}	- 100 to + 200	°C	

NOTES

- The above specified current will generate a temperature rise of approximately 50°C above ambient temperature in a vacuum environment. Precautions shall be taken to prevent the total temperature of the wire (ambient plus rise) exceeding the continuous operating temperature of the wire.

FIGURE 1 - PARAMETER DERATING INFORMATION

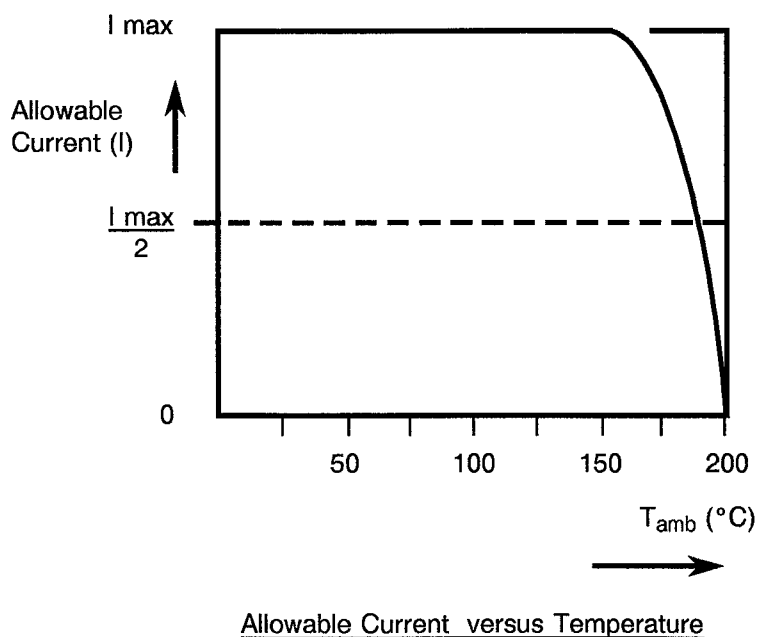


FIGURE 2 - PHYSICAL CHARACTERISTICS

Dimensions are given in Table 1(a)

FIGURE 2(a) - FINISHED WIRES

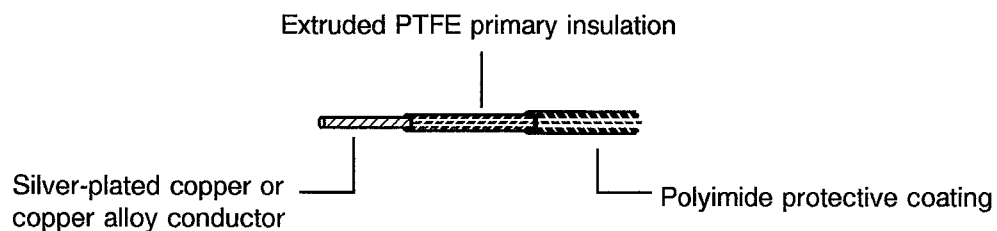


FIGURE 2(b) - UNSHIELDED MULTICORE CABLES

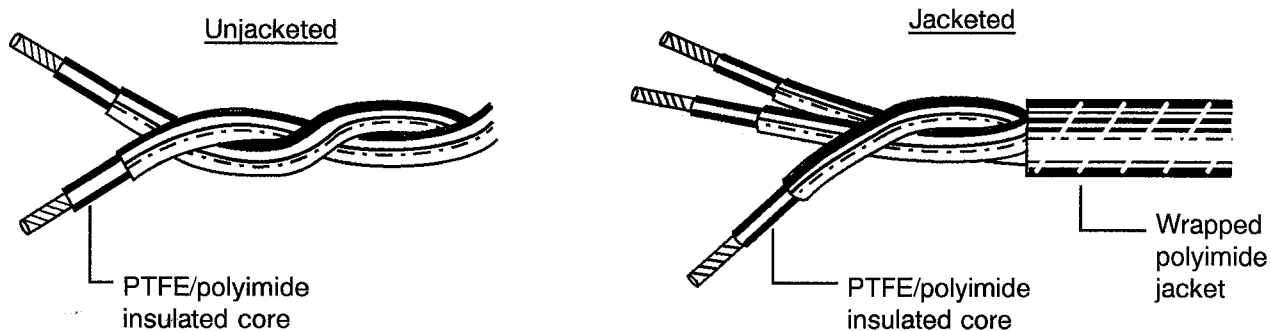


FIGURE 2(c) - SHIELDED AND JACKETED CABLES

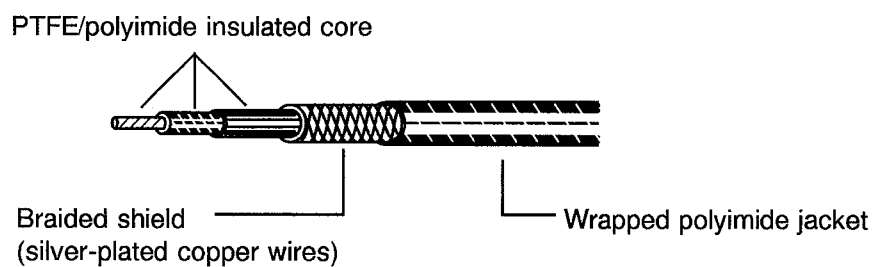
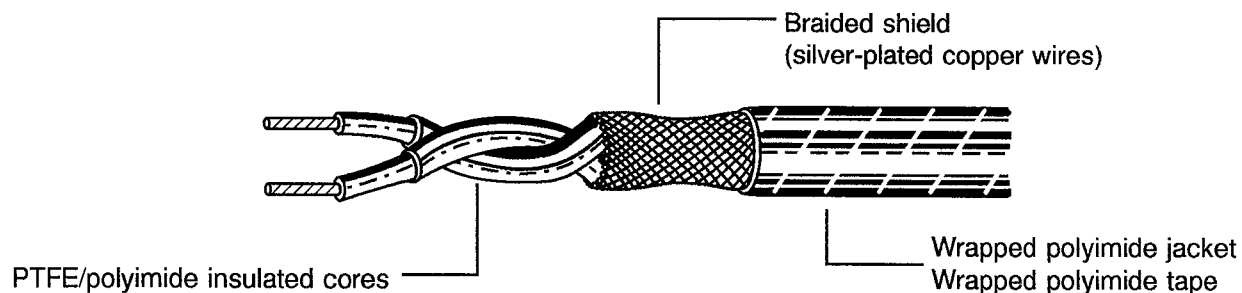


FIGURE 2(d) - SHIELDED AND JACKETED CABLES



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2. **APPLICABLE DOCUMENTS**

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESA/SCC Generic Specification No. 3901, "Wires and Cables, Electrical, 600V, Low Frequency".
- (b) MIL-W-81381, "Wires, Electric, Polyimide Insulated, Copper or Copper Alloy".

3. **TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS**

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 and ESA/SCC Generic Specification No. 3901 shall apply.

4. **REQUIREMENTS**

4.1 **GENERAL**

The complete requirements for procurement of the finished wires and cables specified herein are stated in this specification and ESA/SCC Generic Specification No. 3901. Deviations from the Generic Specification, applicable to this specification only, are listed in Para 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the Appendices attached to this specification.

4.2 **DEVIATIONS FROM GENERIC SPECIFICATION**

4.2.1 **Deviations from Special In-process Controls**

None.

4.2.2 **Deviations from Final Production Tests (Chart II)**

None.

4.2.3 **Deviations from Burn-in and Electrical Measurements (Chart III)**

Not applicable.

4.2.4 **Deviations from Qualification Tests (Chart IV)**

- (a) Para. 9.21, "Resistance to Fluids": To be modified as stated in Para. 4.8.11 of this specification.

4.2.5 **Deviations from Lot Acceptance Tests (Chart V)**

None.

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4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the finished wires and cables specified herein shall be checked; they shall conform to those shown in Table 1(a), Figure 2 and Para 4.4 of this specification (see below for the list of parameters to be checked).

LIST OF PARAMETERS TO BE CHECKED

PARAMETER	TABLE 1(a)	FIGURE 2	PARA 4.4
<u>COMPOSITION</u>			
Number of conductors	X		
Gauge	X		
Shielding	X		
Jacket		X	
<u>CONDUCTOR</u>			
Nature			X
Outer diameter	X		
Number of strands	X		
Strand diameter	X		
Length of lay			X
Silver thickness			X
<u>INSULATION</u>			
Composition		X	X
Protective coating		X	X
Thickness			X
Outer diameter	X		
Concentricity			X
<u>SHIELDING</u>			
Number of strands	X		
Type of shielding			X
Strand diameter	X		
Nature		X	X
Silver thickness			X
Shielding lay			X
Braid angle			X
Shield coverage			X
<u>JACKET</u>			
Composition		X	X
Protective coating		X	X
Thickness			X
Overlapping			X
Outer diameter	X		

4.3.2 Weight

The maximum weight of the finished wires and cables specified herein shall be as specified in Table 1(a).

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4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the wires and cables specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Conductor

4.4.1.1 Material Characteristics

All strands used in the manufacture of the conductors shall be silver-coated, soft or annealed, oxygen-free high conductivity copper from AWG 16 to 24 inclusive and silver-coated, high strength copper alloy for AWG 26 to 30. On silver-coated strands, the thickness of silver shall be 2.0 microns minimum.

On all copper conductors, any strand shall show a 10% minimum elongation. On all high-strength copper alloy conductors, any strand shall show a 6% minimum elongation at break and a 350N/mm² minimum tensile strength.

The resistance of the conductors shall be determined at +20°C in accordance with Para. 9.5 of ESA/SCC Generic Specification No. 3901, where the 'α' coefficient for copper alloy is 0.0035.

4.4.1.2 Stranding

The conductors shall be constructed of concentrically laid strands to produce a smooth and uniform conductor of circular cross-section and free from any high strands or other surface irregularities.

The length of the left-hand lay of the external layer shall not be less than 8, nor more than 16, times the maximum conductor diameter specified in Table 1(a).

4.4.2 Insulation

4.4.2.1 Material

Any insulating material shall be virgin polytetrafluorethylene and polyimide with only those additives that are necessary for processing and pigmentation.

4.4.2.2 Construction

The insulation shall have a uniform cross-section throughout the length of the cable and the conductor shall be evenly centred in the insulation.

At any cross-section along the length of the completed wire, the minimum thickness of the insulation shall not be less than 41% of the difference between measured diameter over insulation and measured diameter over conductor, nor less than 70% of the maximum thickness at that cross-section. Measurements to determine concentricity shall be made of the primary insulation only and shall not include the thickness of outer coverings.

Nominal overall wall thickness : 0.20mm.

PTFE : 0.18mm.

Coating : 0.02mm.



4.4.3 Shield

4.4.3.1 Material

Shield strands shall meet the requirements for silver-coated annealed copper as outlined in Para. 4.4.1.1 of this specification.

4.4.3.2 Construction

The shield shall be made of closely woven round strands and provide not less than 90% coverage, 'K' being calculated by the following formula:-

$$K = (2F - F^2) \times 100.$$

where:-

K = percent coverage.

F = $\frac{N.d.P}{\sin a}$

where:-

N = number of strands per carrier.

d = diameter of strands (mm).

P = picks per mm.

a = angle of braid with cable axis in degrees.

$$\tan a = \frac{2\pi (D + 2d) P}{C}$$

where:-

D = effective diameter of cable under shield (mm).

d = $(\pi + n) b / \pi$.

where:-

n = number of basic wires.

b = basic wire diameter.

C = number of carriers.

4.4.4 Jacket

Wrapped sealed polyimide tape, type 0.1/1.0/0.1 according to MIL-W-81381:

- 1 layer minimum for jacketed unshielded cables.
- 2 layers minimum for shielded and unjacketed cables.

4.5 MARKING

4.5.1 General

The marking of all spools of finished wires and cables delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each spool shall be marked in respect of:-

- (a) The SCC Component Number.
- (b) Characteristics.
- (c) Traceability Information.
- (d) Additional Markings.

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4.5.2 The SCC Component Number

Each spool shall bear the SCC Component Number which shall be constituted and marked as follows:-

390101302B

Detail Specification Number _____

Type Variant (see Table 1(a)) _____

Testing Level _____

4.5.3 Characteristics

The characteristics shall show the length(s) of finished wire or cable wound on each spool and shall be marked as follows:-

100m

Length in metres (see Note) _____

Symbol for metres _____

NOTE

Whenever the length is less than 100 metres, insert a zero in the first block (example: 075m). If more than one length of finished wire or cable is wound on a spool, the characteristics of each length shall be marked as above.

4.5.4 Traceability Information

Each spool shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.5.5 Additional Marking

Each spool shall bear the cable manufacturer's Quality Control Inspector's stamp or initials.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

Not applicable.

4.6.3 Circuits for Electrical Measurements

Not applicable.

4.7 BURN-IN TESTS

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS

4.8.1 Mechanical Properties of Conductor

As detailed in Para. 4.4.1.1 of this Specification.

4.8.2 Accelerated Ageing

Ageing Temperature $+250 \pm 5^{\circ}\text{C}$.

The mandrel diameter and appropriate weight used for accelerated age testing of the finished wires is given in Table A.

TABLE A - MANDREL DIAMETERS AND LOADS FOR FINISHED WIRES

Wire Size (AWG)	Mandrel Diameter (mm)	Weight (kg)
30	3.0	0.2
28	3.0	0.2
26	3.0	0.2
24	3.0	0.2
22	6.0	0.35
20	6.0	0.35
18	6.0	0.5
16	10	0.5

4.8.3 Wrap Test at Ambient Temperature

The mandrel diameters and applied loads for wrap testing of finished wires are given in Table A.
 The mandrel diameters and applied loads for screened and jacketed cables are given in Table B.

**TABLE B - MANDREL DIAMETERS AND LOADS FOR SHIELDED
AND JACKETED CABLES**

Cable Size (AWG)	Number of Cores	Mandrel Diameter (mm)	Load (kg)
28	1	6.0	0.2
26	1	6.0	0.2
24	1	6.0	0.2
22	1	6.0	0.35
20	1	6.0	0.35
18	1	10	0.5
16	1	12	0.5
28	2	12	0.4
26	2	12	0.4
24	2	12	0.4
22	2	12	0.7
20	2	12	0.7
18	2	15	1.0
16	2	15	1.0
28	3	12	0.6
26	3	12	0.6
24	3	12	0.6
22	3	12	1.0
20	3	12	1.0
18	3	15	1.5
16	3	15	1.5
28	4	12	0.8
26	4	12	0.8
24	4	12	0.8
22	4	12	1.5
20	4	12	1.5
18	4	20	2.0
16	4	20	2.0

4.8.4 Voltage Test

No particular conditions are applicable.

4.8.5 Shrinkage

The shrinkage temperature shall be $+260 \pm 5$ °C

4.8.6 Blocking

The blocking temperature shall be $+260 \pm 5$ °C.

4.8.7 Cold Bend Test

The mandrel diameters and loads shall be as specified in Table C.

**TABLE C - MANDREL DIAMETERS AND LOADS FOR
FINISHED WIRES OR CORES**

Wire Size (AWG)	Mandrel Diameter (mm)	Weight (kg)
30	6.0	0.2
28	6.0	0.2
26	6.0	0.2
24	6.0	0.2
22	10	0.35
20	10	0.35
18	10	0.5
16	13	0.5

4.8.8 Cut-through Resistance

The mean load measured during the required tests shall not be less than the relevant value specified below:-

Wire Size (AWG)	30	28	26	24	22	20	18	16
Cut-through Load (kg)	2.0	2.5	2.7	3.0	3.6	4.2	4.75	5.4

4.8.9 Notch Resistance

The depth of notch shall be 0.08mm.

4.8.10 Flammability

No particular conditions are applicable.

4.8.11 Resistance to Fluids

Tests (e) and (f) shall be performed only on finished wires or cores.

4.8.12 Surface Resistance

No particular conditions are applicable.

4.8.13 Abrasion Resistance

The weight to be applied to the needle is specified below:-

Wire Size (AWG)	30	28	26	24	22	20	18	16
Scrape Abrasion Load (g)	450	500	550	650	750	850	925	1000

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4.8.14 Soldering

No particular conditions are applicable.

4.8.15 Solderability

No particular conditions are applicable.

4.8.16 Radiation Resistance

No particular conditions are applicable.

4.8.17 Overload Resistance

No particular conditions are applicable.

4.8.18 Long-term Ageing Test

The long-term ageing temperature shall be + 200°C.

4.8.19 Anthony and Brown Test

No particular conditions are applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	CHARACTERISTICS	SPEC. AND/OR TEST METHOD	TEST CONDITION	LIMITS	UNIT
1	Conductor Resistance	ESA/SCC No. 3901, Section 9	Para 9.5	Table 1(a)	Ω/km
2	Spark Test	ESA/SCC No. 3901, Section 9	Para 9.6	Insulation : 3 Jacket : 1.5	kV
3	Voltage Test	ESA/SCC No. 3901, Section 9	Para 9.7	Para 9.7	kV
4	Insulation Resistance	ESA/SCC No. 3901, Section 9	Para 9.8	Insulation : 5000 Jacket : 30	MΩ.km
5	Surface Resistance	ESA/SCC No. 3901, Section 9	Para 9.22	: 125	MΩ.mm