POLYIMIDE INSULATED SHIELDED CABLES

WITH DRAIN WIRE,

LOW FREQUENCY, 600V, -150 TO +200 °C,

BASED ON TYPE SPA2110

ESCC Detail Specification No. 3901/014

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Pages 1 to 19

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space components
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APPENDICES (Applicable to specific Manufacturers only)

None.

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Polyimide Insulated Shielded Cables with Drain Wire, Low Frequency, 600V, -150 to +200 °C based on type SPA2110.

It shall be read in conjunction with ESA/SCC Generic Specification No. 3901, the requirements of which are supplemented herein.

NOTES

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

1.2 TYPE VARIANTS

Variants of the basic types of 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 cables specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

Not applicable.

TABLE 1(a) - TYPE VARIANTS

VARIANT No.	DRAIN WIRE SIZE AWG	DRAIN WIRE No. of STRANDS X DIAMETER (mm)	DRAIN WIRE MAX ⊖ (mm)	SHIELDED		No. OF CORES	WIRE SIZE AWG	STRANDING No. OF STRANDS x DIAMETER (mm)	CONDUCTOR CHARACTERISTICS			SHIELD STRAND ⊖ (mm)	CORE MAX ⊖ (mm)	FINISHED WIRE OR CABLE CHARACTERISTICS	
				1	2				MAX ⊖ (mm)	NOM SECT. (mm²)	MAX OHMIC RESISTANCE (Ω/km)			MAX ⊖ (mm)	MAX WEIGHT (kg/km)
01	24	7 x 0.20	0.62	X		1	28	7 x 0.127	0.40	0.09	253	0.07	0.88	2.24	7.37
02	24	7 x 0.20	0.62	X		1	26	19 x 0.102	0.54	0.15	147	0.07	1.00	2.36	8.58
03	24	7 x 0.20	0.62	X		1	24	19 x 0.127	0.67	0.24	94	0.07	1.15	2.51	10.58
04	24	7 x 0.20	0.62	X		1	22	19 x 0.160	0.84	0.38	49.5	0.07	1.31	2.67	12.56
05	24	7 x 0.20	0.62	X		1	20	19 x 0.203	1.05	0.62	30.2	0.07	1.56	2.95	16.50
06	22	7 x 0.25	0.77	X		1	16	19 x 0.287	1.48	1.23	15	0.10	2.05	3.76	27.38
07	22	7 x 0.25	0.77	X		1	12	37 x 0.320	2.29	2.88	6.3	0.10	2.86	4.65	51.01
08	24	7 x 0.20	0.62	X		2	28	7 x 0,127	0.40	0.09	258	0.07	0.88	3.12	12.98
09	24	7 x 0.20	0.62	X		2	26	19 x 0.102	0.54	0.15	150	0.07	1.00	3.36	16.43
10	24	7 x 0.20	0.62	X		2	24	19 x 0.127	0.67	0.24	96	0.07	1.15	3.66	18.83
11	24	7 x 0.20	0.62	X		2	22	19 x 0.160	0.84	0.38	50.5	0.07	1.31	4.19	24.35
12	24	7 x 0.20	0.62	X		2	20	19 x 0.203	1.05	0.62	30.5	0.07	1.56	4.54	30.27
13	22	7 x 0.25	0.77	X		2	16	19 x 0.287	1.48	1.23	15.3	0.10	2.05	5.71	52.49
14	22	7 x 0.25	0.77	X		2	12	37 x 0.320	2.29	2.88	6.4	0.10	2.86	7.42	102.53
15	24	7 x 0.20	0.62	X		3	28	7 x 0.127	0.40	0.09	258	0.07	0.88	3.23	15.28
16	24	7 x 0.20	0.62	X		3	26	19 x 0.102	0.54	0.15	150	0.07	1.00	3.51	19.36
17	24	7 x 0.20	0.62	X		3	24	19 x 0.127	0.67	0.24	96	0.07	1.15	3.83	22.87
18	24	7 x 0.20	0.62	X		3	22	19 x 0.160	0.84	0.38	50.5	0.07	1.31	4.37	30.16
19	24	7 x 0.20	0.62	X		3	20	19 x 0.203	1.05	0.62	30.5	0.10	1.56	4.86	39.68
20	22	7 x 0.25	0.77	X		3	16	19 x 0.287	1.48	1.23	15.3	0.10	2.05	6.11	68.22
21	22	7 x 0.25	0.77	X		3	12	37 x 0.320	2.29	2.88	6.4	0.10	2.86	7.85	117.71

TABLE 1(a) - TYPE VARIANTS (CONTINUED)

VARIANT No.	DRAIN WIRE SIZE AWG	DRAIN WIRE No. of STRANDS X DIAMETER (mm)	DRAIN WIRE MAX ⊖ (mm)	SHIELDED		No. OF CORES	WIRE SIZE AWG	STRANDING No. OF STRANDS x DIAMETER (mm)	CONDUCTOR CHARACTERISTICS			SHIELD STRAND ⊖ (mm)	CORE MAX ⊖ (mm)	FINISHED WIRE OR CABLE CHARACTERISTICS	
				1	2				MAX ⊖ (mm)	NOM SECT. (mm^2)	MAX OHMIC RESISTANCE (Ω/km)			MAX ⊖ (mm)	MAX WEIGHT (kg/km)
22	24	7 x 0.20	0.62	X		4	28	7 x 0.127	0.40	0.09	261	0.07	0.88	3.52	18.35
23	24	7 x 0.20	0.62	X		4	26	19 x 0.102	0.54	0.15	151	0.07	1.00	3.81	21.14
24	24	7 x 0.20	0.62	X		4	24	19 x 0.127	0.67	0.24	97	0.07	1.15	4.18	28.75
25	24	7 x 0.20	0.62	X		4	22	19 x 0.160	0.84	0.38	51	0.10	1.31	4.76	37.81
26	24	7 x 0.20	0.62	X		4	20	19 x 0.203	1.05	0.62	31.1	0.10	1.56	5.25	51.98
27	22	7 x 0.25	0.77	X		4	16	19 x 0.287	1.48	1.23	15.4	0.10	2.05	6.51	90.35
28	22	7 x 0.25	0.77	X		4	12	37 x 0.320	2.29	2.88	6.5	0.10	2.86	8.70	154.73
29	24	7 x 0.20	0.62	X		5	28	7 x 0,127	0.40	0.09	262	0.07	0.88	4.03	21.09
30	24	7 x 0.20	0.62	X		5	26	19 x 0.102	0.54	0.15	152	0.07	1.00	4.37	26.11
31	24	7 x 0.20	0.62	X		5	24	19 x 0.127	0.67	0.24	97.5	0.07	1.15	4.74	33.56
32	24	7 x 0.20	0.62	X		5	22	19 x 0.160	0.84	0.38	51.3	0.10	1.31	5.26	45.20
33	24	7 x 0.20	0.62	X		5	20	19 x 0.203	1.05	0.62	31.3	0.10	1.56	6.00	60.78
34	24	7 x 0.20	0.62	X		7	28	7 x 0.127	0.40	0.09	263	0.07	0.88	4.10	30.38
35	24	7 x 0.20	0.62	X		7	26	19 x 0.102	0.54	0.15	153	0.07	1.00	4.48	30.69
36	24	7 x 0.20	0.62	X		7	24	19 x 0.127	0.67	0.24	98	0.10	1.15	4.77	39.98
37	24	7 x 0.20	0.62	X		7	22	19 x 0.160	0.84	0.38	51.5	0.10	1.31	5.31	57.64
38	24	7 x 0.20	0.62	X		7	20	19 x 0.203	1.05	0.62	31.4	0.10	1.56	6.16	79.38
39	22	7 x 0.25	0.77		X	2	20	19 x 0.203	1.05	0.62	30.5	0.07/ 0.07	1.56	5.04	41.77
40	22	7 x 0.25	0.77		X	4	20	19 x 0.203	1.05	0.62	31.1	0.10/ 0.10	1.56	5.67	64.54

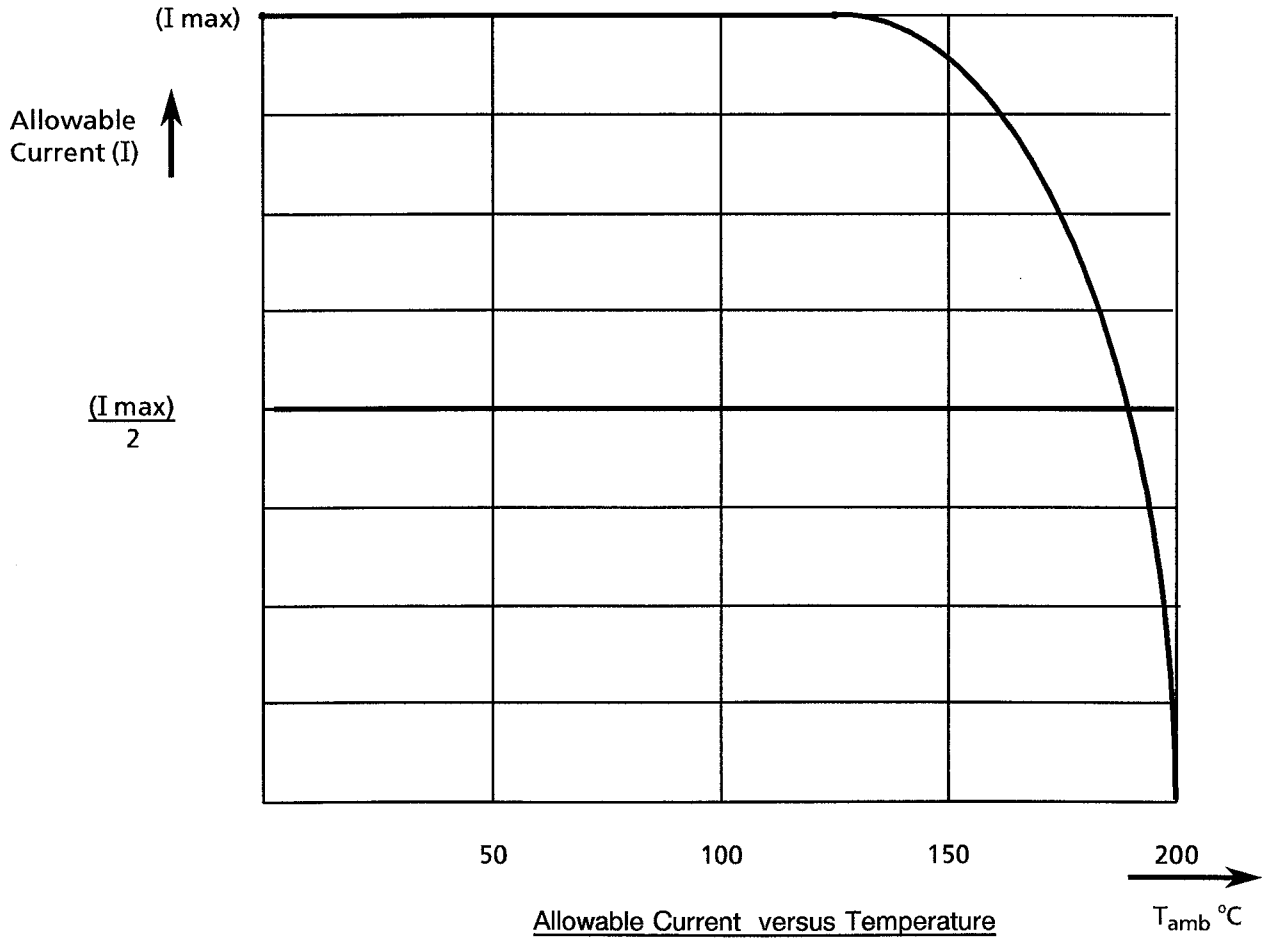
TABLE 1(b) - MAXIMUM RATINGS

NO	CHARACTERISTICS	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Voltage	V_P	600	Vrms	
2	Maximum Current (Note 1)	I_{max}	1.5 2.5 3.5 5.0 7.5 13 23	A	For AWG 28 26 24 22 20 16 12
3	Operating Temperature Range	T_{amb}	-150 to +200	°C	
4	Storage Temperature Range	T_{stg}	-150 to +200	°C	

NOTES

1. 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



Allowable Current versus Temperature

FIGURE 2 - PHYSICAL CHARACTERISTICS

Dimensions are given in Table 1(a)

FIGURE 2(a) - FINISHED WIRES

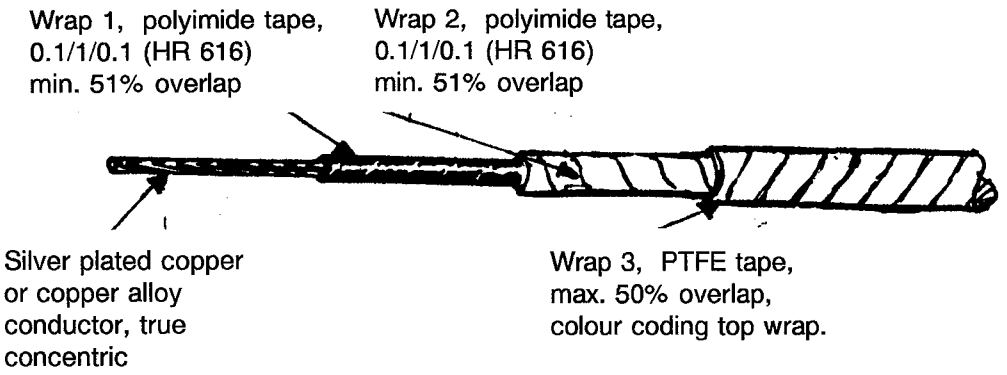


FIGURE 2(b) - SINGLE CABLE WITH SINGLE SHIELD AND JACKET

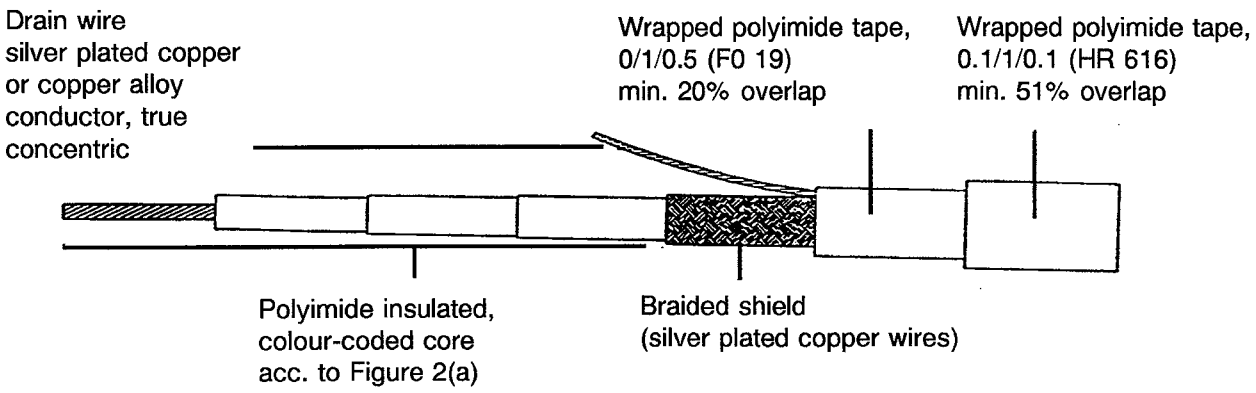


FIGURE 2(c) - MULTICORE CABLE WITH SINGLE SHIELD AND JACKET

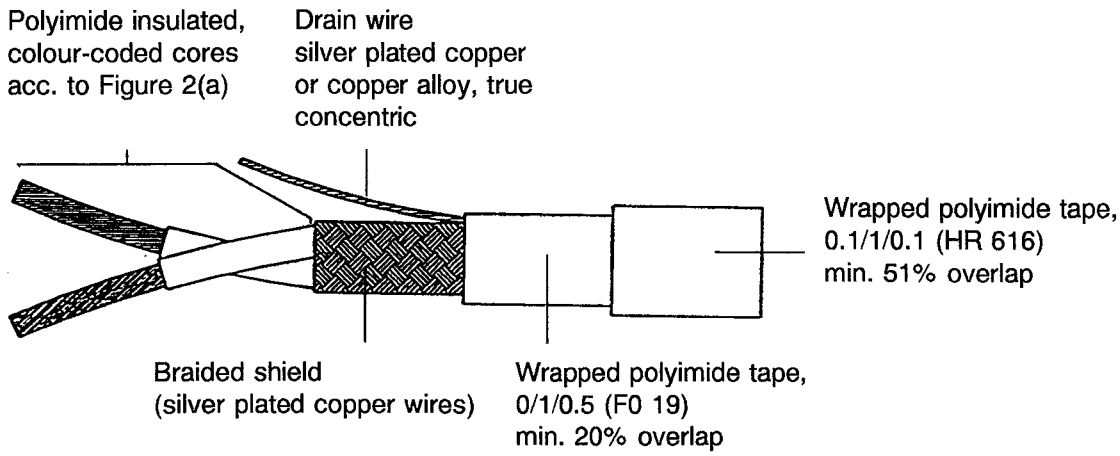


FIGURE 2 - PHYSICAL CHARACTERISTICS (CONTINUED)

FIGURE 2(d) - MULTICORE CABLE WITH DOUBLE SHIELD AND JACKETS

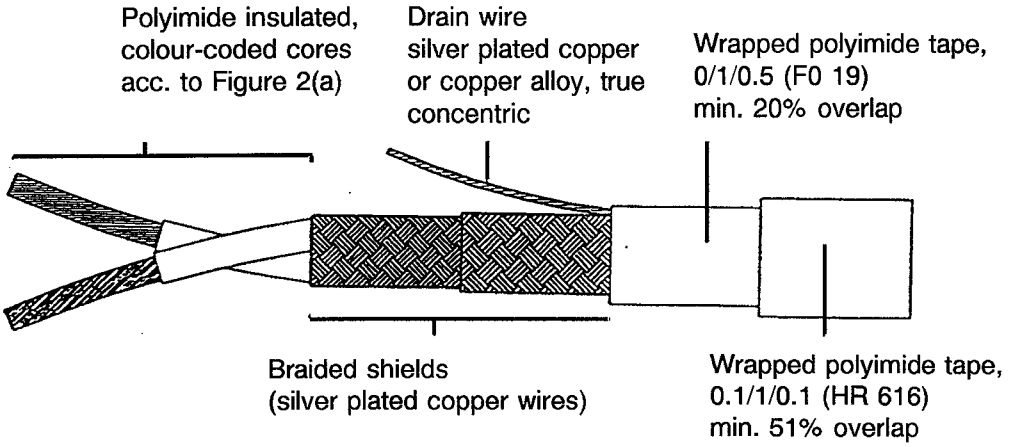
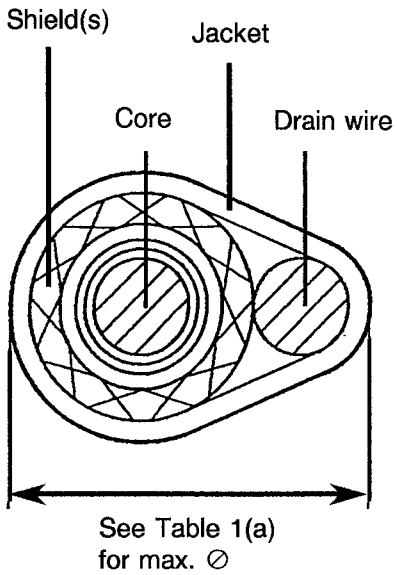


FIGURE 3 - DIMENSION CHECK



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-STD-104, Limits for Electrical Insulation, Coloured.

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, Environmental and Endurance Tests (Chart IV)

None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

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 3 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
COMPOSITION			
Number of conductors	X		
Gauge	X		
Shielding	X		
Jacket		X	
CONDUCTOR			
Nature			X
Outer diameter	X		
Number of strands	X		
Strand diameter	X		
Length of lay			X
Plating Thickness			X
INSULATION			
Composition		X	X
Thickness			X
Concentricity			X
Outer diameter	X		
Core identification			X
SHIELDING			
Number of strands	X		
Type of shielding			X
Strand diameter	X		
Nature		X	
Shield strand adhesion			X
Shielding lay			X
Shield coverage			X
DRAIN WIRE			
Nature		X	X
Outer diameter	X		
Number of strands	X		
Strand diameter	X		
Length of lay			X
Silver thickness			X
JACKET			
Composition		X	X
Protective tape wraps		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).

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 Characterisitics

All strands used in the manufacture of the conductors shall be silver-coated, soft or annealed, oxygen-free high conductivity copper from AWG 12 to 22 inclusive and silver-coated, high strength copper alloy from AWG 24 to 28. On silver-coated strands, the thickness of silver shall be 2 microns minimum.

On all copper conductors, any strand shall show a 10% minimum elongation.

For high-strength copper alloy conductors, the tensile characteristics shall be not less than 6% in elongation and 35kg per square mm in tensile strength.

For determination of the conductor resistance at +20°C, as mentioned in Para 9.5 of ESA/SCC Generic Specification No. 3901, 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 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 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 centered in the insulation.

The insulation shall consist of 2 wrapped layers of polyimide tapes as specified in Figure 2(a).

4.4.3 Shield

4.4.3.1 Material

Shield strands shall be silver-coated, soft or annealed oxygen-free high-conductivity copper. The thickness of silver shall be 2.5 microns minimum.

4.4.3.2 Construction

Shields shall be closely woven braid. The strand sizes for the shields shall be as specified in Table 1(a) of this specification.

The shield braid shall be a push-back type. The angle of the carriers of the braid with the axis of the cable shall not be less than 10, nor more than 40 degrees.

The shield braid shall be applied in such a manner as to provide a coverage of not less than 90%. The coverage factor K is calculated as follows:-

$K = (2F-F^2) \times 100$ (%)
= percent coverage
F = N.P. d/sin α; tan $\alpha = 2(D+2d)P/C$
N = number of strands per carrier
d = diameter of strands (mm)
α = angle of shield with cable axis in degrees
D = effective diameter of cable under shield (mm)
C = number of carriers
P = picks per mm.

4.4.4 Drain Wire

4.4.4.1 Material Characteristics

All strands used in the manufacture of the drain wires shall be silver-coated, soft or annealed, oxygen-free high conductivity copper for AWG 22 and silver-coated, high strength copper alloy for AWG 24.

On silver-coated strands, the thickness of silver shall be 2 microns minimum. On all drain wires, any strand shall show a 10% minimum elongation.

For high strength copper alloy drain wires, the tensile characteristics shall be not less than 6% in elongation and 35 kg per square mm in tensile strength.

4.4.4.2 Stranding

The drain wire shall be constructed of strands which are laid concentrically to produce a smooth and uniform drain wire, circular in cross-section and free from any high strands or other surface irregularities. The length of lay of the external layer shall not be less than 8, nor more than 16 times the maximum drain wire diameter specified in Table 1(a).

4.4.4.3 Construction

All drain wires shall be placed longitudinally along the cable core, directly upon the braided shield and under the first layer of the wrapped polyimide jacket, electrically in contact with the braided shield as specified in Figures 2(b) and 2(c). In case of double shielded cables, the drain wire shall be placed longitudinally along the cable core, directly upon the second braided shield, electrically in contact with the shield as specified in Figure 2(d).

4.4.5 Jacket

All shielded cables shall be provided with jackets of wrapped polyimide tapes as specified in Figures 2(b), 2(c) and 2(d). The wrapped tapes shall be heat-sealed. The side of the tape of the first layer above the shield, which is not coated with FEP resin, shall be facing the shield.

4.4.6 Construction of Multicore Cables

Multicore cables shall be constructed by twisting the required number and size of finished wires to form a uniform cable without high strands, bends or other irregularities. Finished wires of only one size shall be used for one cable. The cabling shall be with a left-hand lay and the lay length shall not be less than 12 times and not be more than 16 times the outside diameter of the unshielded unjacketed cable. The construction of shielded and jacketed cables is shown in Figures 2(b) to 2(d). Fillers shall not be used in the construction of multicore cables except for the 5-core cable, where

the 5 wires shall be twisted around a round, uncoloured PTFE/filler. The diameter of the PTFE/filler for the 5-conductor cable shall be 0.7 times the diameter of the conductors used in the cable.

4.4.7 Colour-coding

4.4.7.1 Single and multicore cable colour-coding

The colour-coding of all cables shall be according to the following list, if not otherwise specified in the contract.

No OF CORES IN CABLE	COLOUR OF RESPECTIVE CORES						
1	red						
2	red	blue					
3	red	blue	yellow				
4	red	blue	yellow	green			
5	red	blue	yellow	green	brown		
6	red	blue	yellow	green	brown	grey	
7	red	blue	yellow	green	brown	grey	white

The colour of finished wire top wraps shall conform to the colour limits specified in MIL-STD-104, Class 1.

4.4.7.2 Jacket colour

The colour of jackets shall normally be the natural colour of the polyimide tapes.

4.5 MARKING

4.5.1 General

The marking of all spools of finished 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.

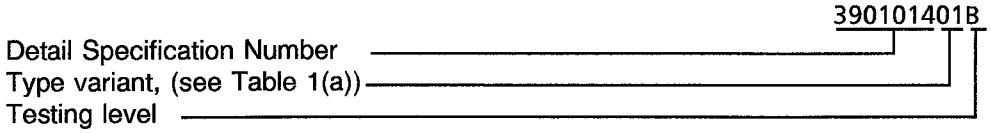
(b) Characteristics.

(c) Traceability Information.

(d) Additional Marking.

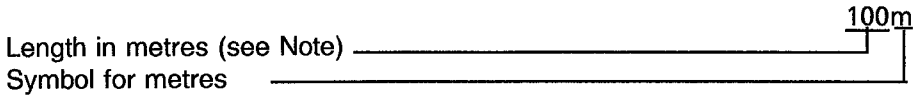
4.5.2 The SCC Component Number

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



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:-



NOTES

1. Whenever the length is less than 100 metres, insert a zero in the first block (example: 075 m). 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 ± 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 Subparas 4.4.1.1 and 4.4.4.1 of this specification.

4.8.2 Accelerated Ageing

Ageing Temperature +230 ± 5 °C.

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 shielded and jacketed cables are given in Table B.

TABLE A - MANDREL DIAMETERS AND LOADS FOR FINISHED WIRES

Wire Size AWG	Mandrel Diameter (mm)	Weight (kg)
28	6	0.250
26	6	0.250
24	6	0.250
22	6	0.400
20	6	0.400
16	10	0.500
12	20	1.000

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

CABLE SIZE AWG	NUMBER OF CORES	NUMBER OF SHIELDS	MANDREL DIAMETER (mm)	APPLIED WEIGHT (kg)
28	1	1	15	0.5
26	1	1	15	0.5
24	1	1	15	0.5
22	1	1	20	0.8
20	1	1	20	0.8
16	1	1	20	0.8
12	1	1	25	1.0
28	2	1	20	0.8
26	2	1	20	0.8
24	2	1	25	1.5
22	2	1	25	1.5
20	2	1	30	2.0
16	2	1	40	2.5
12	2	1	50	3.0
28	3	1	20	1.2
26	3	1	25	1.5
24	3	1	25	1.5
22	3	1	30	2.0
20	3	1	30	2.0
16	3	1	40	2.5
12	3	1	50	3.0
28	4	1	25	1.5
26	4	1	25	1.5
24	4	1	30	2.0
22	4	1	30	2.0
20	4	1	30	2.0
16	4	1	40	2.5
12	4	1	55	3.0
28	5	1	25	1.5
26	5	1	30	2.0
24	5	1	30	2.0
22	5	1	40	2.5
20	5	1	40	2.5
28	7	1	30	2.0
26	7	1	30	2.0
24	7	1	30	2.0
22	7	1	40	2.5
20	7	1	40	2.5
20	2	2	40	2.5
20	4	2	40	2.5

4.8.4 Voltage Test

No particular conditions are applicable.

4.8.5 Shrinkage

The shrinkage temperature shall be +230 ± 5 °C

4.8.6 Blocking

The blocking temperature shall be +230 ± 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)
28	6	0.250
26	6	0.250
24	6	0.250
22	6	0.400
20	6	0.400
16	10	0.500
12	20	1.000

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 Requirements	28	26	24	22	20	16	12
Cut-through Load (kg)	12	15	17	21	26	43	66

4.8.9 Notch Resistance

The depth of notch shall be 0.04mm.

4.8.10 Flammability Resistance

No particular conditions are applicable.

4.8.11 Resistance to Fluids

Tests (e), (f) and (g) shall be performed only on simple elements (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 Requirements	28	26	24	22	20	16	12
Scrape Abrasion (Load in grammes)	500	650	750	800	900	1050	1200

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	SPECIFICATION AND 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 :750 Jacket : 30	MΩ.km
5	Surface Resistance	ESA/SCC No. 3901, Section 9	Para 9.22	:125	MΩ.mm