



**POLYIMIDE INSULATED FINISHED WIRES AND CABLES,  
LOW FREQUENCY, 600V, -200 TO +200°C**

**BASED ON TYPE SPL**

**ESCC Detail Specification No. 3901/019**

Issue 4	May 2024
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DCR No.	CHANGE DESCRIPTION
1662	Specification upissued to incorporate changes per DCR.

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## 1 GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Polyimide Insulated Finished Wires and Cables, Low Frequency, 600V, -200 to +200 °C, Based on Type SPL.

It shall be read in conjunction with ESCC Generic Specification No. [3901](#), the requirements of which are supplemented herein.

#### NOTES:

1. These finished wires and cables shall not be used in the presence or vicinity of hydrazine or nitrogen tetroxide.
2. These finished wires and cables are light versions of SPC types according to ESCC Detail Specification No. [3901/009](#); they are identical in production and test with the following exceptions:
  - Conductor according to ISO 2635 (except AWG 28)
  - Shield size # 40
  - Shield type served wire shield (SWS)This leads to savings in diameter and weight according to Table 1(a).

### 1.2 COMPONENT TYPE VARIANTS

Variants of the basic types of finished 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 core used in a cable shall be:

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

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

where n = number of cores in the cable.

- The temperature derating information is shown in Figure 1 with maximum current  $I_{max}$  for a single wire/core.
- 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 Figure 2 and Table 1(a).

### 1.6 FUNCTIONAL DIAGRAM

Not applicable.

**TABLE 1(a) – COMPONENT TYPE VARIANTS**

Variant No.	Shielded		No. of Cores	Wire Size ISO / (AWG)	Stranding No. of Strands × Diameter (mm)	Conductor Characteristics			Shield Strand Ø (mm)	Core Max Ø (mm)	Finished Wire/Cable Characteristics	
	Yes	No				Max Ø (mm)	Nom Section (mm <sup>2</sup> )	Max Ohmic Resistance (Ω/km)			Max Ø (mm)	Max Weight (kg/km)
01		X	1	- / (30)	7×0.102	0.32	0.057	375			0.78	0.98
02		X	1	- / (28)	7×0.127	0.47	0.09	253			0.87	1.4
03		X	1	001/ (26)	19×0.1(1)	0.57	0.15	157			0.96	1.9
04		X	1	002/ (24)	19×0.12 (1)	0.58	0.25	111			1.13	2.6
05		X	1	004/ (22)	19×0.15(1)	0.76	0.4	58			1.25	3.9
06		X	1	006/ (20)	19×0.2(1)	0.99	0.6	32			1.48	6.4
07		X	1	012/ (16)	19×0.3(1)	1.49	1.2	14			1.98	13
08		X	1	030/ (12)	37×0.32(1)	2.18	3	7			2.73	27
09		X	2	- / (30)	7×0.102	0.32	0.057	383		0.78	1.5	2.1
10		X	2	- / (28)	7×0.127	0.47	0.09	258		0.87	1.7	2.8
11		X	2	001/ (26)	19×0.1(1)	0.57	0.15	170		0.96	1.9	3.8
12		X	2	002/ (24)	19×0.12(1)	0.58	0.25	120		1.13	2.3	5.2
13		X	2	004/ (22)	19×0.15(1)	0.76	0.4	63		1.25	2.5	8.2
14		X	2	006/ (20)	19×0.2(1)	0.99	0.6	35		1.48	3	13.5
15		X	2	012/ (16)	19×0.3(1)	1.49	1.2	15		1.98	4	27
16		X	2	030/ (12)	37×0.32(1)	2.18	3	7.5		2.73	5.5	55
17		X	3	- / (30)	7×0.102	0.32	0.057	384		0.78	1.7	3.3
18		X	3	- / (28)	7×0.127	0.47	0.09	259		0.87	1.9	4.5
19		X	3	001/ (26)	19×0.1(1)	0.57	0.15	171		0.96	2.1	6.2
20		X	3	002/ (24)	19×0.12(1)	0.58	0.25	121		1.13	2.5	8.3



Variant No.	Shielded		No. of Cores	Wire Size ISO / (AWG)	Stranding No. of Strands × Diameter (mm)	Conductor Characteristics			Shield Strand Ø (mm)	Core Max Ø (mm)	Finished Wire/Cable Characteristics	
	Yes	No				Max Ø (mm)	Nom Section (mm <sup>2</sup> )	Max Ohmic Resistance (Ω/km)			Max Ø (mm)	Max Weight (kg/km)
21		X	3	004/(22)	19×0.15(1)	0.76	0.4	64		1.25	2.7	12.7
22		X	3	006/(20)	19×0.2(1)	0.99	0.6	37		1.48	3.2	20.6
23		X	3	012/(16)	19×0.3(1)	1.49	1.2	15		1.98	4.3	43
24		X	3	030/(12)	37×0.32(1)	2.18	3	7.5		2.73	5.9	88
25		X	4	-/(30)	7×0.102	0.32	0.057	385		0.78	1.9	4.4
26		X	4	-/(28)	7×0.127	0.47	0.09	260		0.87	2.1	6
27		X	4	001/(26)	19×0.1(1)	0.57	0.15	171		0.96	2.3	8.2
28		X	4	002/(24)	19×0.12(1)	0.58	0.25	122		1.13	2.7	11
29		X	4	004/(22)	19×0.15(1)	0.76	0.4	64		1.25	3	16.9
30		X	4	006/(20)	19×0.2(1)	0.99	0.6	37		1.48	3.6	27.3
31		X	4	012/(16)	19×0.3(1)	1.49	1.2	16		1.98	4.8	57
32		X	4	030/(12)	37×0.32(1)	2.18	3	7.9		2.73	6.5	118
33		X	5	-/(28)	7×0.127	0.47	0.09	260		0.87	2.4	7.8
34		X	5	001/(26)	19×0.1(1)	0.57	0.15	172		0.96	2.6	10.7
35		X	5	002/(24)	19×0.12(1)	0.58	0.25	123		1.13	3.1	14.3
36		X	5	004/(22)	19×0.15(1)	0.76	0.4	64		1.25	3.4	21.8
37		X	5	006/(20)	19×0.2(1)	0.99	0.6	37		1.48	4	35
38		X	6	-/(28)	7×0.127	0.47	0.09	261		0.87	2.6	9.6
39		X	6	001/(26)	19×0.1(1)	0.57	0.15	172		0.96	2.9	13.1
40		X	6	002/(24)	19×0.12(1)	0.58	0.25	124		1.13	3.4	17.6
41		X	6	004/(22)	19×0.15(1)	0.76	0.4	65		1.25	3.7	26.6



Variant No.	Shielded		No. of Cores	Wire Size ISO / (AWG)	Stranding No. of Strands × Diameter (mm)	Conductor Characteristics			Shield Strand Ø (mm)	Core Max Ø (mm)	Finished Wire/Cable Characteristics	
	Yes	No				Max Ø (mm)	Nom Section (mm <sup>2</sup> )	Max Ohmic Resistance (Ω/km)			Max Ø (mm)	Max Weight (kg/km)
42		X	6	006/(20)	19×0.2(1)	0.99	0.6	38		1.48	4.4	48.2
43		X	7	-/(28)	7×0.127	0.47	0.09	261		0.87	2.6	10.5
44		X	7	001/(26)	19×0.1(1)	0.57	0.15	172		0.96	2.9	14.4
45		X	7	002/(24)	19×0.12(1)	0.58	0.25	124		1.13	3.4	19.3
46		X	7	004/(22)	19×0.15(1)	0.76	0.4	65		1.25	3.7	29.6
47		X	7	006/(20)	19×0.20(1)	0.99	0.6	38		1.48	4.4	47.8
48	X		1	-/(30)	7×0.102	0.32	0.057	375	0.063	0.78	1.1	2.6
49	X		1	-/(28)	7×0.127	0.47	0.09	253	0.079	0.87	1.2	3.3
50	X		1	001/(26)	19×0.1(1)	0.57	0.15	157	0.079	0.96	1.3	4.1
51	X		1	002/(24)	19×0.12(1)	0.58	0.25	111	0.079	1.13	1.5	4.8
52	X		1	004/(22)	19×0.15(1)	0.76	0.4	58	0.079	1.25	1.6	6.3
53	X		1	006/(20)	19×0.2(1)	0.99	0.6	32	0.079	1.48	1.9	9.1
54	X		1	012/(16)	19×0.3(1)	1.49	1.2	14	0.079	1.98	2.4	16.8
55	X		1	030/(12)	37×0.32(1)	2.18	3	7	0.079	2.73	3.1	31.7
56	X		2	-/(30)	7×0.102	0.32	0.057	383	0.063	0.78	1.9	5.1
57	X		2	-/(28)	7×0.127	0.47	0.09	258	0.079	0.87	2.1	6.1
58	X		2	001/(26)	19×0.1(1)	0.57	0.15	170	0.079	0.96	2.3	7.7
59	X		2	002/(24)	19×0.12(1)	0.58	0.25	120	0.079	1.13	2.7	9.5
60	X		2	004/(22)	19×0.15(1)	0.76	0.4	63	0.079	1.25	2.9	13.4
61	X		2	006/(20)	19×0.2(1)	0.99	0.6	35	0.079	1.48	3.3	19.6
62	X		2	012/(16)	19×0.3(1)	1.49	1.2	15	0.079	1.98	4.3	35



Variant No.	Shielded		No. of Cores	Wire Size ISO / (AWG)	Stranding No. of Strands × Diameter (mm)	Conductor Characteristics			Shield Strand Ø (mm)	Core Max Ø (mm)	Finished Wire/Cable Characteristics	
	Yes	No				Max Ø (mm)	Nom Section (mm <sup>2</sup> )	Max Ohmic Resistance (Ω/km)			Max Ø (mm)	Max Weight (kg/km)
63	X		2	030/(12)	37×0.32(1)	2.18	3	7.5	0.079	2.73	5.8	67
64	X		3	-/(30)	7×0.102	0.32	0.057	385	0.063	0.78	2	6.1
65	X		3	-/(28)	7×0.127	0.47	0.09	259	0.079	0.87	2.3	8.3
66	X		3	001/(26)	19×0.1(1)	0.57	0.15	171	0.079	0.96	2.4	10.3
67	X		3	002/(24)	19×0.12(1)	0.58	0.25	121	0.079	1.13	2.8	13.2
68	X		3	004/(22)	19×0.15(1)	0.76	0.4	64	0.079	1.25	3.1	18
69	X		3	006/(20)	19×0.2(1)	0.99	0.6	37	0.079	1.48	3.6	26.8
70	X		3	012/(16)	19×0.3(1)	1.49	1.2	15	0.079	1.98	4.6	51
71	X		3	030/(12)	37×0.32(1)	2.18	3	7.5	0.079	2.73	6.2	99
72	X		4	-/(30)	7×0.102	0.32	0.057	386	0.063	0.78	2.2	7.6
73	X		4	-/(28)	7×0.127	0.47	0.09	260	0.079	0.87	2.5	10.4
74	X		4	001/(26)	19×0.1(1)	0.57	0.15	171	0.079	0.96	2.7	12.2
75	X		4	002/(24)	19×0.12(1)	0.58	0.25	122	0.079	1.13	3.1	16.4
76	X		4	004/(22)	19×0.15(1)	0.76	0.4	64	0.079	1.25	3.4	22.9
77	X		4	006/(20)	19×0.2(1)	0.99	0.6	37	0.079	1.48	3.9	34.4
78	X		4	012/(16)	19×0.3(1)	1.49	1.2	16	0.079	1.98	5.1	63
79	X		4	030/(12)	37×0.32(1)	2.18	3	7.9	0.079	2.73	6.9	124
80	X		5	-/(28)	7×0.127	0.47	0.09	260	0.079	0.87	2.7	12.5
81	X		5	001/(26)	19×0.1(1)	0.57	0.15	172	0.079	0.96	2.9	15.8
82	X		5	002/(24)	19×0.12(1)	0.58	0.25	123	0.079	1.13	3.4	20.4
83	X		5	004/(22)	19×0.15(1)	0.76	0.4	64	0.079	1.25	3.7	28.4



Variant No.	Shielded		No. of Cores	Wire Size ISO / (AWG)	Stranding No. of Strands × Diameter (mm)	Conductor Characteristics			Shield Strand Ø (mm)	Core Max Ø (mm)	Finished Wire/Cable Characteristics	
	Yes	No				Max Ø (mm)	Nom Section (mm <sup>2</sup> )	Max Ohmic Resistance (Ω/km)			Max Ø (mm)	Max Weight (kg/km)
84	X		5	006/(20)	19×0.2(1)	0.99	0.6	37	0.079	1.48	4.4	43
85	X		6	- / (28)	7×0.127	0.47	0.09	261	0.079	0.87	3	14.8
86	X		6	001/(26)	19×0.1(1)	0.57	0.15	172	0.079	0.96	3.2	18.8
87	X		6	002/(24)	19×0.12(1)	0.58	0.25	124	0.079	1.13	3.8	24.3
88	X		6	004/(22)	19×0.15(1)	0.76	0.4	65	0.079	1.25	4.1	34
89	X		6	006/(20)	19×0.2(1)	0.99	0.6	38	0.079	1.48	4.8	58.2
90	X		7	- / (28)	7×0.127	0.47	0.09	261	0.079	0.87	3	15.7
91	X		7	001/(26)	19×0.1(1)	0.57	0.15	172	0.079	0.96	3.2	20.1
92	X		7	002/(24)	19×0.12(1)	0.58	0.25	124	0.079	1.13	3.8	26
93	X		7	004/(22)	19×0.15(1)	0.76	0.4	65	0.079	1.25	4.1	37
94	X		7	006/(20)	19×0.2(1)	0.99	0.6	38	0.079	1.48	4.8	57

**NOTES:**

1. According to ISO 2635 (AWG sizes are given for information).

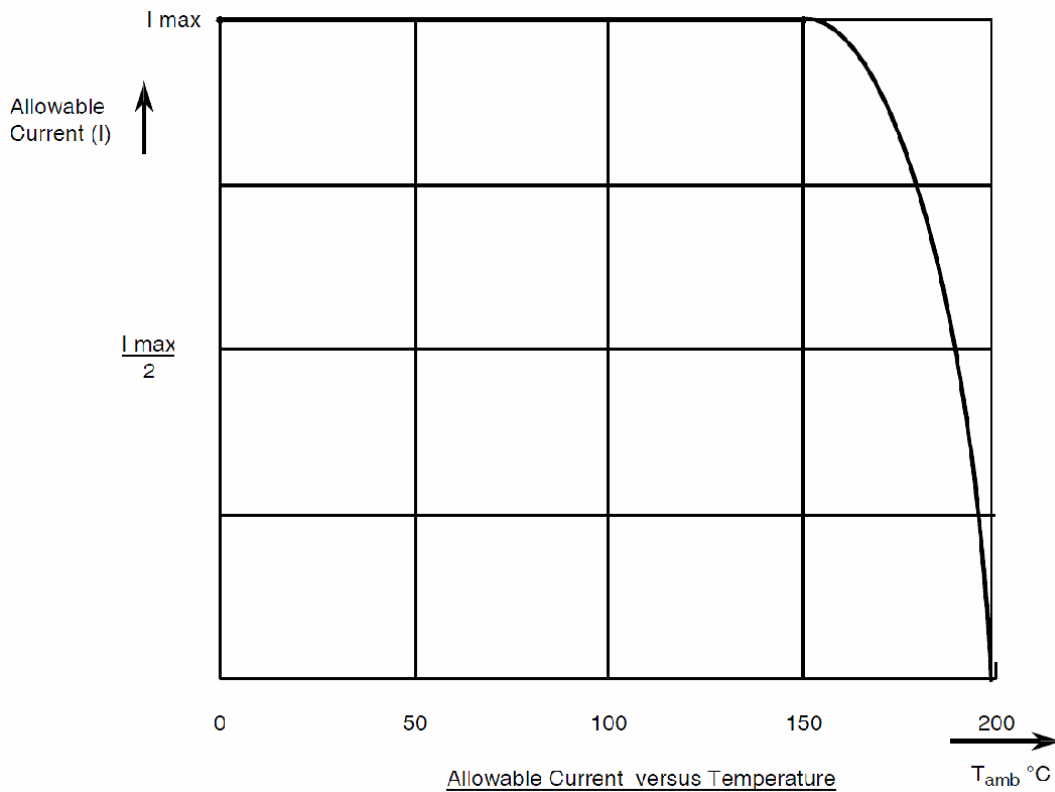
**TABLE 1(b) – MAXIMUM RATINGS**

No.	Characteristics	Symbol	Maximum Rating	Unit	Remarks
1	Voltage	$V_P$	600	$V_{rms}$	
2	Maximum Current (each finished wire/core) (Note 1)	$I_{max}$	1.3 1.5 2.5 3.5 5 7.5 13 23	A	For AWG: 30 28 26 24 22 20 16 12
3	Operating Temperature Range	$T_{amb}$	-200 to +200	°C	
4	Storage Temperature Range	$T_{stg}$	-200 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 WIRE / CORE

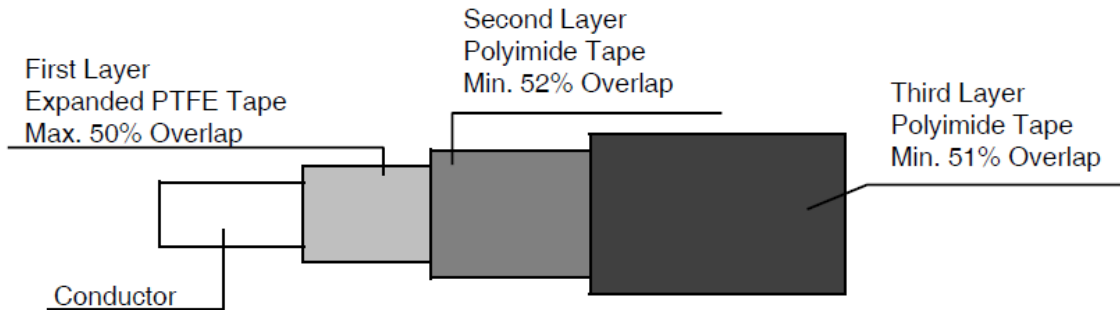
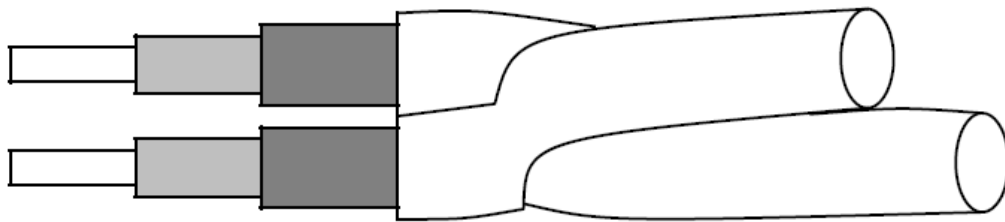


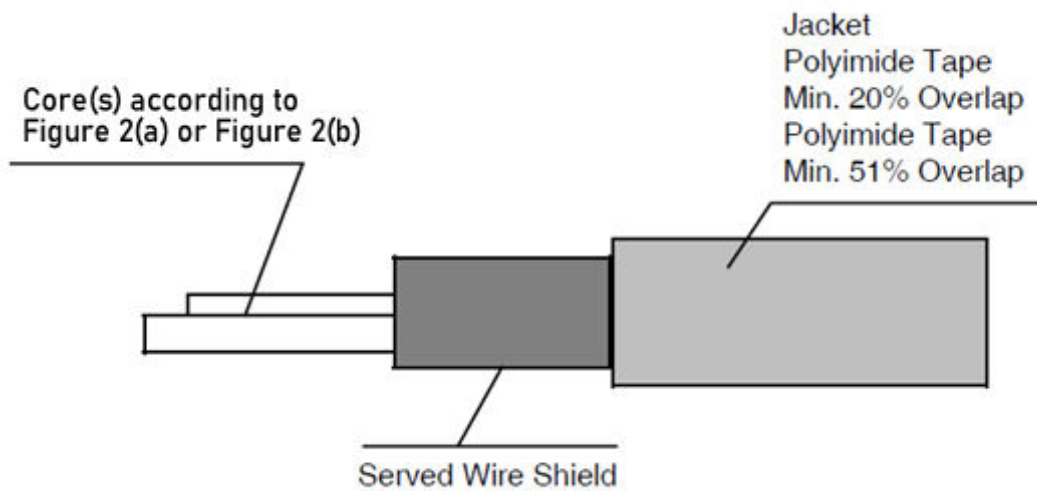
FIGURE 2(b) – MULTICORE CABLE WITHOUT A JACKET



**NOTES:**

- Using finished wire/core according to Figure 2(a).

FIGURE 2(c) – SHIELDED AND JACKETED CABLES



## 2 **APPLICABLE DOCUMENTS**

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

- (a) ESCC Generic Specification No. [3901](#), Wires and Cables, Electrical, 600V, Low Frequency.
- (b) MIL-STD-104, Limits for Electrical Insulation Colours.
- (c) ISO 2635, Aircraft: Conductors for general purpose aircraft electrical cables and aerospace applications: Dimensions and characteristics

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

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. [21300](#) and ESCC Generic Specification No. [3901](#) shall apply.

## 4 **REQUIREMENTS**

### 4.1 **GENERAL**

The complete requirements for procurement of the finished wires/cables specified herein are stated in this specification and ESCC 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 ESCC 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 in accordance with Para. 4.8.11 of this specification.

#### 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/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
<b><u>COMPOSITION</u></b>			
Number of conductors	X		
Gauge	X		
Shielding	X		
Jacket		X	
<b><u>CONDUCTOR</u></b>			
Nature			X
Outer diameter	X		
Number of strands	X		
Strand diameter	X		
Length of lay			X
Plating thickness			X
<b><u>INSULATION</u></b>			
Composition and Colour		X	X
Thickness			X
Concentricity			X
Outer diameter	X		
Core identification			X
<b><u>SHIELDING</u></b>			
Number of strands	X		
Type of shielding			X
Strand diameter	X		
Nature		X	
Shield strand adhesion			X
Shielding lay			X
Shield coverage			X
<b><u>JACKET</u></b>			
Composition and Colour		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/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 finished wires/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 for ISO 004, 006, 012 and 030, and silver-coated, high strength copper alloy for ISO 001 and 002 and AWG 28 inclusive.

On silver-coated strands, the thickness of the 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/mm<sup>2</sup> in tensile strength.

For determination of the conductor resistance at +20°C, as mentioned in Para 9.5 of ESCC Generic Specification No. 3901, the  $\alpha$  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 Finished Wire/Core 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 finished wire/core and the conductor shall be evenly centred in the insulation.

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

##### 4.4.3 Shield

###### 4.4.3.1 *Material*

Shield strands shall be silver-coated, annealed copper as specified in Para. 4.4.1.1 of this specification, but the thickness of silver shall be 2.5 microns minimum.



#### 4.4.3.2 Construction

Shields shall be closely and helically wound around the single insulated finished wire or twisted bundle of insulated finished wires (core) and provide not less than 92% coverage as calculated by the following formula:

$$K = \frac{n \times d_w \sqrt{(\pi D)^2 + P^2}}{P \pi D} \times 100(\%)$$

where:

- K = coverage (%)
- n = number of serving shield strands
- $d_w$  = shield strand diameter (mm)
- D = diameter of core (mm)
- P = serving pitch (mm)

#### 4.4.4 Jacket

All shielded cables shall be provided with jackets of wrapped polyimide tapes as specified in Figure 2(c). 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.

#### 4.4.5 Construction of Multicore Cables

Multicore cables shall be constructed by twisting the required number and size of finished wires/cores to form a uniform cable without high strands, bends or other irregularities. Finished wires/cores 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 jacketed cable. The construction of shielded and jacketed cables is shown in Figure 2(c).

Fillers shall not be used in the construction of multicore cables except for the 5- and 6-core cable, where the 5/6 finished wires/cores shall be twisted around a round, uncoloured filler made of polytetrafluoroethylene. The diameter of the filler shall be 0.7 times the diameter of the finished wires used in the cable for the 5-core cable and the same diameter of the finished wire for the 6-core cable.

#### 4.4.6 Colour Coding

##### 4.4.6.1 Finished Wire Colour Coding

The colour of the finished wires shall be the natural colour of the top wrap on the insulation except when colouring is specifically required in the contract.

Colours:

- **Black** (not to be preferred)
- **Brown**
- **Red**
- **Orange** (not to be preferred)
- **Yellow**
- **Green**
- Natural

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

4.4.6.2 *Multicore Cable Colour Coding*

If the contract does not define any specific colour coding, all individual cores in multicore cables shall have the natural colour. If colour coding is desired, it is proposed that the individual cores in such cables shall be coloured according to the following scheme:

No. of Cores in Cable	Colour of Respective Cores						
2	red	natural					
3	red	natural	yellow				
4	red	natural	yellow	green			
5	red	natural	yellow	green	brown		
6	red	natural	yellow	green	brown	black	
7	red	natural	yellow	green	brown	black	orange

4.4.6.3 *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 wires and cables delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700.

Each spool shall be marked in respect of:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number (see Note 1)
- (c) Traceability Information.
- (d) Additional Marking.

**NOTES:**

1. Whenever more than one length of finished wire/cable is wound on a single spool, the full marking for each length including the ESCC Component Numbers shall be marked on the spool. The characteristic code(s) for each length (see Para. 4.5.2.1(a)) may be marked separately on the spool.

4.5.2 The ESCC Component Number

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

Example: 390101902B100m

- Detail Specification Reference: 3901019
- Component Type Variant Number (see Table 1(a)): 02 (as required)
- Testing level (B is mandatory): B
- Characteristic code: wire/cable length: 100m (as required; see Para. 4.5.2.1(a))

#### 4.5.2.1 *Characteristics Codes*

Characteristics to be codified as part of the ESCC Component Number shall be as follows:

(a) Finished Wire/Cable Length:

The required length of the finished wire/cable wound on each spool expressed by means of the following codes. The unit quantity shall be metre (m).

Nominal Length (m)	Code
X	00Xm
XX	0XXm
XXX	XXXm

#### 4.5.3 Traceability Information

Each spool shall be marked in respect of traceability information in accordance with the requirements of ESCC Basic Specification No. [21700](#).

#### 4.5.4 Additional Marking

Each spool shall bear the finished wire/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  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ .

#### 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: +230 ±5°C.

The mandrel diameters and applied loads for testing of finished wires and multicore cables without a jacket are given in Table A.

**TABLE A – ACCELERATED AGEING / WRAP TEST AT AMBIENT TEMPERATURE / BLOCKING / LONG TERM AGEING: MANDREL DIAMETERS AND LOADS FOR FINISHED WIRES / MULTICORE CABLES WITHOUT A JACKET**

Wire Size ISO/(AWG)	Mandrel Diameter (mm)	Applied Weight (kg)
-(30)	5	0.15
-(28)	6	0.25
001/(26)	6	0.25
002/(24)	6	0.25
004/(22)	6	0.4
006/(20)	6	0.4
012/(16)	10	0.5
030/(12)	20	1

4.8.3 Wrap Test at Ambient Temperature

The mandrel diameters and applied loads for testing of finished wires and multicore cables without a jacket are given in Table A. The mandrel diameters and applied loads for testing of shielded and jacketed cables are given in Table B.

**TABLE B - WRAP TEST AT AMBIENT TEMPERATURE / BLOCKING: MANDREL DIAMETERS AND LOADS FOR SHIELDED AND JACKETED CABLES**

Cable Size ISO/(AWG)	Number of Cores	Mandrel Diameter (mm)	Applied Weight (kg)
-(30)	1	8	0.15
-(28)	1	8	0.25
001/(26)	1	10	0.25
002/(24)	1	12	0.25
004/(22)	1	15	0.5
006/(20)	1	15	0.5
012/(16)	1	20	1
030/(12)	1	20	1
-(30)	2	10	0.25
-(28)	2	10	0.5
001/(26)	2	15	0.5
002/(24)	2	15	0.5
004/(22)	2	20	0.8
006/(20)	2	20	0.8
012/(16)	2	25	1
030/(12)	2	30	1

Cable Size ISO/(AWG)	Number of Cores	Mandrel Diameter (mm)	Applied Weight (kg)
-(30)	3	12	0.25
-(28)	3	12	0.5
001/(26)	3	15	0.75
002/(24)	3	15	0.75
004/(22)	3	20	1.2
006/(20)	3	20	1.2
012/(16)	3	30	1.5
030/(12)	3	40	1.5
-(30)	4	15	0.5
-(28)	4	15	0.8
001/(26)	4	15	1
002/(24)	4	20	1
004/(22)	4	20	1.5
006/(20)	4	25	1.5
012/(16)	4	30	1.5
030/(12)	4	40	1.5
-(28)	5	15	1
001/(26)	5	20	1.5
002/(24)	5	20	1.5
004/(22)	5	25	2
006/(20)	5	30	2
-(28)	6/7	20	1
001/(26)	6/7	20	1.5
002/(24)	6/7	20	1.5
004/(22)	6/7	25	2
006/(20)	6/7	30	2

4.8.4 Voltage Test

No particular conditions are applicable.

4.8.5 Shrinkage

The shrinkage temperature shall be +200 ±5°C.

4.8.6 Blocking

The blocking temperature shall be +230 ±5°C.

The mandrel diameters and applied loads for testing of finished wires and multicore cables without a jacket are given in Table A. The mandrel diameters and applied loads for testing of shielded and jacketed cables are given in Table B

4.8.7 Cold Bend Test

The test shall be performed on finished wires or all cores that have been extracted from the cable sample.

The mandrel diameters and loads for testing of finished wires/cores shall be as specified in Table C.

**TABLE C – COLD BEND TEST: MANDREL DIAMETERS AND LOADS FOR FINISHED WIRES / CORES**

Wire Size ISO/(AWG)	Mandrel Diameter (mm)	Applied Weight (kg)
-/(30)	5	0.15
-/(28)	6	0.25
001/(26)	6	0.25
002/(24)	6	0.25
004/(22)	6	0.4
006/(20)	6	0.4
012/(16)	10	0.5
030/(12)	20	1

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 ISO Requirements	-	-	001	002	004	006	012	030
(AWG)	(30)	(28)	(26)	(24)	(22)	(20)	(16)	(12)
Cut-through Load (kg)	9	11	11	11	21	26	35	50

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 not be performed.

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 ISO Requirements	-	-	001	002	004	006	012	030
(AWG)	(30)	(28)	(26)	(24)	(22)	(20)	(16)	(12)
Scrape Abrasion (Load in grammes)	350	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 Outgassing in Vacuum  
No particular conditions are applicable.
- 4.8.19 Long-term Ageing Test  
The long-term ageing temperature shall be +200°C.

The mandrel diameters and applied loads for testing of finished wires and multicore cables without a jacket are given in Table A.

- 4.8.20 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	ESCC No. 3901, Section 9	Para. 9.5	Table 1(a)	Ω/km
2	Spark Test	ESCC No. 3901, Section 9	Para. 9.6 Dry Test Insulation: 3kV Jacket: 1.5kV	No Breakdown	-
3	Voltage Test	ESCC No. 3901, Section 9	Para. 9.7	Para. 9.7	kV
4	Insulation Resistance	ESCC No. 3901, Section 9	Para. 9.8	Insulation: ≥ 750 Jacket: ≥ 30	MΩ.km MΩ.km
5	Surface Resistance	ESCC No. 3901, Section 9	Para. 9.22	> 125	MΩ.mm