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INTERNATIONAL STANDARD

Coaxial communication cables – Part 6-5: Detail specification for Type A quad-shield CATV drop cables with screening class A++

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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International Standard IEC 61196-6-5 has been prepared by subcommittee 46A: Coaxial cables, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
46A/1407/FDIS	46A/1412/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 61196 series, published under the general title *Coaxial communication cables*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

COAXIAL COMMUNICATION CABLES –

Part 6-5: Detail specification for Type A quad-shield CATV drop cables with screening class A++

1 Scope

This part of IEC 61196 applies to coaxial communication cables described in IEC 61196-6. It specifies the requirements for type A quad-shield CATV drop cables with screening class A++. These cables are used in CATV distribution systems, surveillance and control systems, satellite television receiving systems and bidirectional hybrid fibre coaxes (HFC). The operating frequency is up to 3000 MHz.

This part of IEC 61196 is to be used in conjunction with IEC 61196-1 and IEC 61196-6:2009.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE Documents which are needed to achieve the tests according to Clause 4, item [8] or item [9], respectively, are listed in IEC 61196-6.

IEC 60811-410, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 410: Miscellaneous tests – Test method for copper-catalyzed oxidative degradation of polyolefin insulated conductors*

IEC 61196-1, *Coaxial communication cables – Part 1: Generic specification – General, Definitions and requirements*

IEC 61196-1-115:2006, *Coaxial communication cables – Part 1-115: Electrical test methods – Test for regularity of impedance (pulse/step function return loss)*

IEC 61196-1-201:2009, *Coaxial communication cables – Part 1-201: Environmental test methods – Test for cold bend performance of cable*

IEC 61196-1-310, *Coaxial communication cables – Part 1-310: Mechanical test methods – Test for torsion characteristics of copper-clad metals*

IEC 61196-1-314:2015, *Coaxial communication cables – Part 1-314: Mechanical test methods – Test for bending*

IEC 61196-6:2009, *Coaxial communication cables – Part 6: Sectional specification for CATV drop cables*

IEC 62153-4-3, *Metallic communication cable test methods – Part 4-3: Electromagnetic compatibility (EMC) – Surface transfer impedance – Triaxial method*

IEC 62153-4-4, *Metallic communication cable test methods – Part 4-4: Electromagnetic compatibility (EMC) – Test method for measuring of the screening attenuation a_s up to and above 3 GHz, triaxial method*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Detail specification

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<tr><td colspan="2">[1] Prepared by:
IEC SC 46A</td><td></td><td colspan="2">[2] Document No.: IEC 61196-6-5
Issue: First
Date:</td></tr>
<tr><td colspan="2">[3] Available from:
IEC</td><td colspan="3">[4] Generic specification: IEC 61196-1
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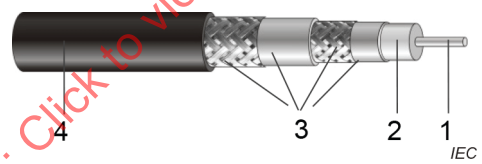
<tr><td colspan="5">[6] Cable construction</td></tr>
<tr><td colspan="5">Type A quad-shield CATV drop cables with screening class A++</td></tr>
<tr><td colspan="5"> 
</td></tr>
<tr><td colspan="2">Variants [a] constructions</td><td>75-3QYZA++</td><td>75-4QYZA++</td><td>75-5QYZA++</td></tr>
<tr><td rowspan="3">Inner conductor</td><td>Material</td><td colspan="3">BC or CCS</td></tr>
<tr><td>Diameter (mm)</td><td>0,58</td><td>0,81</td><td>1,02</td></tr>
<tr><td>Tolerance (mm)</td><td>±0,01</td><td>±0,01</td><td>±0,02</td></tr>
<tr><td rowspan="3">Dielectric</td><td>Material</td><td colspan="3">Foamed PE</td></tr>
<tr><td>Diameter (mm)</td><td>2,55</td><td>3,60</td><td>4,57</td></tr>
<tr><td>Tolerance (mm)</td><td>±0,13</td><td>±0,15</td><td>±0,15</td></tr>
<tr><td rowspan="3">Outer conductor or shield</td><td>Material</td><td colspan="3">ALT+TC+ALT+TC or ALT+A+ALT+A</td></tr>
<tr><td>Nominal inner shield diameter (mm)</td><td>2,80</td><td>3,85</td><td>4,85</td></tr>
<tr><td>Maximum outer diameter (mm)</td><td>4,55</td><td>5,60</td><td>6,60</td></tr>
</table>

Sheath	Material	PVC or PE or LSZH		
	Minimum thickness (mm)	0,40	0,45	0,50
	Maximum outer diameter (mm)	5,80	7,20	8,00
NOTE BC — Bare copper wire CCS — Copper clad steel wire ALT — Aluminium-polymeric laminated tape TC — Tinned copper wire A — Aluminium alloy wire PE — Polyethylene PVC — Polyvinylchloride LSZH — Low smoke zero halogen polyolefin				
[a] Variants are shown in Annex A.				

[7] Engineering information (reference only)	
Operating temperature range	−40 °C to 85 °C (PE sheath) −20 °C to 70 °C (PVC sheath) −15 °C to 70 °C (LSZH sheath)
Operating frequency range	DC to 3 000 MHz
Nominal characteristic impedance	75 Ω
Minimum bending radius	10 D (D is the nominal cable outer diameter)
Relative propagation velocity	85 % (nominal)
Current carrying capacity	75-3QYZA++ 4 A (T_a = 20 °C); 2 A (T_a = 40 °C) for BC conductor 2 A (T_a = 20 °C); 1 A (T_a = 40 °C) for CCS conductor
	75-4QYZA++ 6 A (T_a = 20 °C); 4 A (T_a = 40 °C) for BC conductor 3 A (T_a = 20 °C); 2 A (T_a = 40 °C) for CCS conductor
	75-4QYZA++ 8 A (T_a = 20 °C); 6 A (T_a = 40 °C) for BC conductor 4 A (T_a = 20 °C); 3 A (T_a = 40 °C) for CCS conductor
Cable identification and marking	See Annex A

[8] Parameter or characteristic	[9] Subclause of IEC 61196-6:2009	[10] Value	[11] Remarks
Electrical testing of finished cable	7.1		
Low-frequency and DC electrical measurements	7.1.1		
Conductor resistance Inner conductor Outer conductor	7.1.1.1	a) BC conductor ≤65,30 Ω/km (75-3QYZA++) ≤33,46 Ω/km (75-4QYZA++) ≤21,10 Ω/km (75-5QYZA++) b) CCS conductor ≤310,90 Ω/km (75-3QYZA++) ≤159,32 Ω/km (75-4QYZA++) ≤102,00 Ω/km (75-5QYZA++) c) ALT+TC+ALT+TC ≤12,00 Ω/km (75-3QYZA++) ≤9,00 Ω/km (75-4QYZA++) ≤7,50 Ω/km (75-5QYZA++) ALT+AL+ALT+AL ≤21,00 Ω/km (75-3QYZA++) ≤18,00 Ω/km (75-4QYZA++) ≤15,50 Ω/km (75-5QYZA++)	20 °C
Insulation resistance	7.1.1.2	≥ 10 000 MΩ•km	
Withstand voltage of dielectric	7.1.1.3	1,5 kV AC.,1 min or 2,5 kV AC., 2 s	
Withstand voltage of sheath	7.1.1.4	2,5 kV AC.,1 min or 3,5 kV AC., 2 s	
Current carrying capacity	7.1.1.5		See [7]
Spark test	7.1.1.6	2,5 kV AC	
High-frequency electrical and transmission measurements	7.1.2		
Characteristic impedance	7.1.2.1	75,0 Ω ± 3,0 Ω	200 MHz
Relative propagation velocity	7.1.2.2		See [7]

[8] Parameter or characteristic	[9] Subclause of IEC 61196-6:2009	[10] Value	[11] Remarks
Return loss	7.1.2.3	≥20 dB (5 MHz to 1000 MHz) ≥18 dB (1 000 MHz to 2 000 MHz) ≥16 dB (2 000 MHz to 3 000 MHz)	The measurement inaccuracy $a_{r,f}$ shall be better than 1 dB
Attenuation constant, α	7.1.2.4	No more than the values in Annex B	20 °C
Regularity of impedance	7.1.2.5	≥ 40 dB resp. ≤ 1 %	Perform on both ends of tested cable Test procedure: IEC 61196-1-115:2006, Procedure A
Transfer impedance after flex	7.1.2.6	Screening class A++: ≤ 0,9 mΩ/m from 5 MHz to 30 MHz	The flexure test according to IEC 61196-1-314:2015, 8.3.3, Procedure 2: a) Radius: 10 × cable diameter b) Tension: 5 N c) Speed: ≤ 1 m/s d) Number of cycles: 3 After flexure test, measure the transfer impedance according to IEC 62153-4-3
Screening attenuation after flex	7.1.2.7	Screening class A++: ≥ 105 dB from 30 MHz to 1 000 MHz ≥ 95 dB from 1 000 MHz to 2 000 MHz ≥ 85 dB from 2 000 MHz to 3 000 MHz	The flexure test according to IEC 61196-1-314:2015, 8.3.3, Procedure 2: a) Radius: 10 × cable diameter b) Tension: 5 N c) Speed: ≤ 1 m/s d) Number of cycles: 3 After flexure test, measure the screening attenuation according to IEC 62153-4-4
Environmental testing of finished cable	7.2		
Cold bend	7.2.1	No visible physical damages of the sheath	a) Test method: IEC 61196-1-201:2009, method B b) Mandrel diameter: 20 × cable diameter c) Test temperature: PE sheath: –40 °C ± 2 °C PVC sheath: –20 °C ± 2 °C LSZH sheath: –15 °C ± 2 °C
Water penetration	7.2.2	Not applicable	

[8] Parameter or characteristic	[9] Subclause of IEC 61196-6:2009	[10] Value	[11] Remarks
Climatic sequence	7.2.3	a) No visible physical damages of the sheath b) Magnitude of change in attenuation constant is no more than 10 % in Annex B	a) Test temperature: PE sheath: T_A = –40 °C, T_B = 70 °C PVC sheath: T_A = –20 °C, T_B = 70 °C LSZH sheath: T_A = –15 °C, T_B = 70 °C b) t_1: 24 h c) Number of cycles: 3
Damp heat (steady state)	7.2.4	a) No visible physical damages of the sheath b) Insulation resistance is no less than 10 000 MΩ•km c) Magnitude of change in attenuation constant is no more than 10 % in Annex B	
Ultraviolet stability of sheath or jacket	7.2.5	a) No visual cracks b) Magnitude of change in elongation ≤ 20 % c) Magnitude of change in tensile strength ≤ 20 %	Test times: 720 h
Thermal ageing	7.2.6	a) No visible physical damages of the sheath b) Magnitude of change in attenuation constant is no more than 10 % in Annex B	a) Test temperature: 80 °C ± 2 °C b) Test times: 168 h
Oxidation induction time (OIT)	IEC 60811-410	a) OIT initial (before aging): 20 minutes minimum b) OIT (after aging): Minimum 70 percent of OIT initial value	a) Test method: IEC 60811-410 b) Aging: 90 °C,14 days c) Test temperature: 180 °C ± 2 °C
Mechanical characteristics of finished cable	7.3		
Ovality of dielectric	7.3.1	≤ 7 %	
Ovality of sheath	7.3.2	≤ 7 %	
Eccentricity of dielectric	7.3.3	≤ 10 %	
Eccentricity of sheath	7.3.4	≤ 10 %	
Carbon black content, where applicable	7.3.5	≥ 2 %	Only applicable to PE sheath

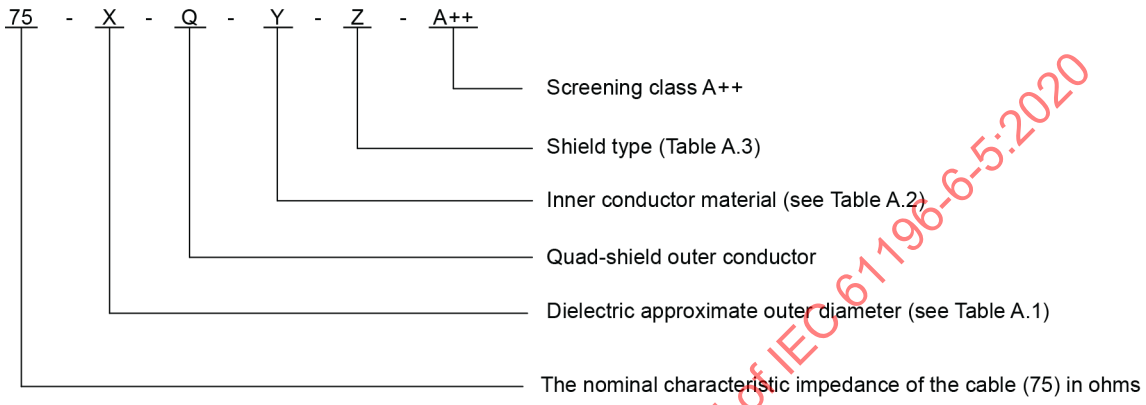
[8] Parameter or characteristic	[9] Subclause of IEC 61196-6:2009	[10] Value	[11] Remarks
Tensile strength and elongation of the copper or copper-clad metals	7.3.6	a) CCS inner conductor Tensile strength: ≥ 792 MPa Elongation: ≥ 1,0 % b) BC inner conductor Tensile strength: under consideration Elongation: ≥ 25 %	
Torsion test for copper-clad metals	7.3.7	CCS inner conductor shall meet the requirement: After 20 twists, the examination of the surface shall not reveal any seams, pits or slivers of sufficient magnitude inherent defects. After continued twisting the wire to destruction, the examination of the ends shall not reveal any separation between the copper and the metal core wire.	Only applicable to CCS inner conductor, test method: IEC 61196-1-310
Adhesion testing: Inner conductor to dielectric	7.3.8	22 N ~ 89 N (75-3QYZA++) 22 N ~ 89 N (75-4QYZA++) 22 N ~ 111 N (75-5QYZA++)	a) Test temperature: 20 °C ± 5 °C b) L = 50 mm
Bending characteristic	7.3.9	a) No physical damage of the sheath b) Screening attenuation shall be ≥ 95 dB from 30 MHz to 1 000 MHz	The bending test according to IEC 61196-1-314:2015, Clause 5: a) Test mandrel radius: 10 × cable diameter b) Number of cycles: 50 c) Test angle: ±90° d) Test temperature: 20 °C ± 5 °C e) Load: 10 N After bending, measure the screening attenuation according to IEC 62153-4-4
Tensile strength of cable (longitudinal pull)	7.3.10	Not applicable	
Crush resistance of cable	7.3.11	a) No physical damage of the sheath b) The maximum impedance irregularity shall be ≤ 1 %	a) Test load: 400 N (75-3QYZA++) 500 N (75-4QYZA++ 700 N (75-3QYZA++) b) Test time: 2 min
Abrasion resistance	7.3.12	Not applicable	

Annex A
(normative)

Cable identification and marking

A.1 Cable identification

Cables type shall be identified by the following:



where

"X" represents the dielectric approximate outer diameter (see Table A.1).

Table A.1 – Variants of dielectric diameter

"X"	Dielectric diameter of cable
3	Nominal dielectric diameter: 2,55 mm
4	Nominal dielectric diameter: 3,60 mm
5	Nominal dielectric diameter: 4,57 mm

"Y" represents the outer conductor or shield type (see Table A.2).

Table A.2 – Inner conductor material

"Y"	Inner conductor material
BC	Bare copper
CCS	Copper clad steel

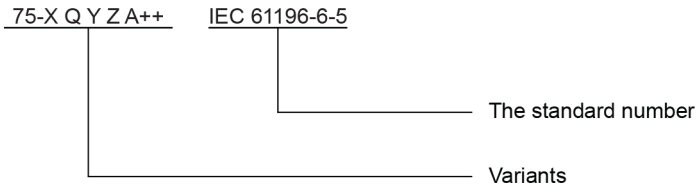
"Z" represents the variants of shield type (see Table A.3).

Table A.3 – Variants of shield type

"Z"	Outer conductor or shield type
TC	Aluminium-polymeric laminated tape + Tinned copper wire +Aluminium-polymeric laminated tape + Tinned copper wire (ALT+TC+ALT+TC)
AL	Aluminium-polymeric laminated tape + Aluminium alloy wire+ Aluminium-polymeric laminated tape + Aluminium alloy wire (ALT+A+ALT+A)

A.2 Cable marking

Cable marking shall consist of cable type and IEC standard number, as follows:



For example:

75-3 Q CCS AL A++ 61196-6-5 means the nominal characteristic impedance of the cable in 75 ohm, 3 mm dielectric approximate outer diameter, ALT+TC+ALT+TC quad-shield outer conductor, CATV drop cables with screening class A++ according to IEC 61196-6-5.

Annex B
(normative)

Attenuation

Maximum attenuation can be calculated using the following formulae (B.1), (B.2), (B.3):

1) 75-3QYZA++

$$\left[\alpha_1 = 1{,}12 \times \sqrt{f} + 0{,}0013 \times f + \frac{1{,}35}{\sqrt{f}} + 0{,}055\right] \quad \text{(B.1)}$$

2) 75-4QYZA++

$$\left[\alpha_2 = 0{,}80 \times \sqrt{f} + 0{,}0013 \times f + \frac{2{,}12}{\sqrt{f}} + 0{,}055\right] \quad \text{(B.2)}$$

3) 75-5QYZA++

$$\left[\alpha_3 = 0{,}64 \times \sqrt{f} + 0{,}0013 \times f + \frac{1{,}05}{\sqrt{f}} + 0{,}055\right] \quad \text{(B.3)}$$

where

α is the attenuation at 20 °C, in dB/100 m;

f is the frequency, in MHz.

Maximum attenuation constant in the typical frequency is given in Table B.1: