

INTERNATIONAL STANDARD

**Coaxial communication cables –
Part 5: Sectional specification for CATV trunk and distribution cables**

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IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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**Coaxial communication cables –
Part 5: Sectional specification for CATV trunk and distribution cables**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COAXIAL COMMUNICATION CABLES –

**Part 5: Sectional specification for CATV trunk
and distribution cables**

FOREWORD

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IEC 61196-5 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. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2018. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Clause 4: complete revision;
- b) Annex A: cable identification and marking has been added;
- c) Annex B: Table B.1, cable types have been added.

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

Draft	Report on voting
46A/1605/FDIS	46A/1610/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

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

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

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COAXIAL COMMUNICATION CABLES –

Part 5: Sectional specification for CATV trunk and distribution cables

1 Scope

This part of IEC 61196, which is a sectional specification, applies to coaxial cables for analogue and digital one- and two-way signal transmission, for example for cable networks for television signals, sound signals and interactive services in accordance with IEC 60728-1, IEC 60728-1-1, IEC 60728-101, IEC 60728-10, ISO/IEC 11801-1 and ISO/IEC 11801-4. This includes also the transmission of BCT signals provided by a CATV, MATV or SMATV cable networks.

This document specifies the test procedures and requirements for trunk and distribution cables for temperatures between $-40\text{ }^{\circ}\text{C}$ and $+65\text{ }^{\circ}\text{C}$ and in the frequency range of 5 MHz to 2 000 MHz.

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.

IEC 60068-1:2012, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60096-0-1, *Radio Frequency cables – Part 0-1: Guide to the design of detail specifications – Coaxial cables*

IEC 60728-1, *Cable networks for television signals, sound signals and interactive services – Part 1: System performance of forward paths*

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 60811-605, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 605: Physical tests – Measurement of carbon black and/or mineral filler in polyethylene compounds*

IEC 61196-1:2005, *Coaxial communication cables – Part 1: Generic specification – General, definitions and requirements*

IEC 61196-1-1, *Coaxial communication cables – Part 1-1: Capability approval for coaxial cables*

IEC 61196-1-101, *Coaxial communication cables – Part 1-101: Electrical test methods – Test for conductor d.c. resistance of cable*

IEC 61196-1-102, *Coaxial communication cables – Part 1-102: Electrical test methods – Test for insulation resistance of cable dielectric*

IEC 61196-1-105, *Coaxial communication cables – Part 1-105: Electrical test methods – Test for withstand voltage of cable dielectric*

IEC 61196-1-106, *Coaxial communication cables – Part 1-106: Electrical test methods – Test for withstand voltage of cable sheath*

IEC 61196-1-108, *Coaxial communication cables – Part 1-108: Electrical test methods – Test for characteristic impedance, phase and group delay, electrical length and propagation velocity*

IEC 61196-1-112, *Coaxial communication cables – Part 1-112: Electrical test methods – Test for return loss (uniformity of impedance)*

IEC 61196-1-113, *Coaxial communication cables – Part 1-113: Electrical test methods – Test for attenuation constant*

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

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

IEC 61196-1-203, *Coaxial communication cables – Part 1-203: Environmental test methods – Test for water penetration of cable*

IEC 61196-1-206, *Coaxial communication cables – Part 1-206: Environmental test methods – Climatic sequence*

IEC 61196-1-209, *Coaxial communication cables – Part 1-209: Environmental test methods – Thermal cycling*

IEC 61196-1-212, *Coaxial communication cables – Part 1-212: Environmental test methods – UV stability*

IEC 61196-1-301, *Coaxial communication cables – Part 1-301: Mechanical test methods – Test for ovality*

IEC 61196-1-302, *Coaxial communication cables – Part 1-302: Mechanical test methods – Test for eccentricity*

IEC 61196-1-308, *Coaxial communication cables – Part 1-308: Mechanical test methods – Test for tensile strength and elongation for copper-clad metals*

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

IEC 61196-1-313, *Coaxial communication cables – Part 1-313: Mechanical test methods – Adhesion of dielectric and sheath*

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

IEC 61196-1-316, *Coaxial communication cables – Part 1-316: Mechanical test methods – Test of maximum pulling force of cable*

IEC 61196-1-317, *Coaxial communication cables – Part 1-317: Mechanical test methods – Test for crush resistance of cable*

IEC 61196-1-324, *Coaxial communication cables – Part 1-324: Mechanical test methods – Test for abrasion resistance of cable*

IEC 62153-1-1, *Metallic communication cables test methods – Part 1-1: Electrical – Measurement of the pulse/step return loss in the frequency domain using the Inverse Discrete Fourier Transformation (IDFT)*

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 as up to and above 3 GHz, triaxial method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61196-1 and IEC 60728-1 apply.

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 Materials and cable construction

4.1 Cable construction

The cable construction shall be in accordance with 4.2 to 4.6 of this document and the requirements stated in the relevant detail specification.

Table B.1 (Annex B) indicates typical cables and properties, for informative purposes, with copper conductors.

4.2 Inner conductor

4.2.1 Conductor material

IEC 61196-1:2005, 4.4.1 applies. The conductor material shall be as stated in the relevant cable detail specification.

4.2.2 Conductor construction

The conductor shall consist of a single strand or tube.

In addition, IEC 61196-1:2005, 4.4.1 applies.

The centre conductor diameter shall be stated in the relevant detail specification. The tolerance on the centre conductor shall be $\pm 0,03$ mm for conductors with a diameter ≤ 4 mm. For conductors with a diameter above 4 mm, the tolerance shall be as stated in the detail specification.

4.3 Dielectric

The construction of the dielectric shall be one of the following:

- solid dielectric,
- air-spaced dielectric,
- semi air-spaced dielectric,
- gas-injected cellular polymer dielectric.

Life expectancy of the dielectric is proved by an oxidative induction time (OIT) test before and after ageing in accordance with IEC 60811-410.

4.4 Outer conductor or screen

The type, material, nominal thickness and diameter of the outer conductor or screen shall be specified in the relevant detail specification. The tolerance of the outer conductor shall be $\pm 0,05$ mm for constructions in accordance with IEC 61196-1:2005, 4.6.1 c), excluding corrugated designs. The tolerance for all other constructions, including corrugated designs, shall be $\pm 0,3$ mm in accordance with all other designs noted in IEC 61196-1:2005, 4.6.1.

The construction and material of the outer conductor or screen shall be as stated in the relevant detail specification. The construction shall be in accordance with IEC 61196-1:2005, 4.6.1 c), or IEC 61196-1:2005, 4.6.1 f) or IEC 61196-1:2005, 4.6.1 g).

For constructions with metal foil and/or braid, the braid angle shall be between 15° and 45°. Coverage factor shall be as specified in the detail specification.

4.5 Filling compounds

When required by the relevant specification, a layer between the outer conductor or screen and the cable sheath shall be filled continuously with a compound suitable to prevent water penetration within the cable.

Longitudinal water tightness may be achieved also by other solutions such as swelling powder, yarns, or tapes.

4.6 Moisture barriers

To minimize moisture permeation through the sheath, a longitudinal overlapped metallic tape may be used that is bonded to the inner surface of an extruded plastic sheath.

4.7 Wrapping layers

Not applicable.

4.8 Sheath

IEC 61196-1:2005, 4.7 applies with the following amendments and additions:

Cables without an outer sheath shall not be subject to 4.5 of this document.

The outer sheath of the cable shall be a thermoplastic material as specified in the relevant detail specification.

The nominal sheath thickness shall be as stated in the relevant detail specification.

The nominal diameter of the sheath shall be as stated in the relevant detail specification.

The maximum allowable tolerance of the diameter shall be as stated in the relevant detail specification.

The maximum allowable values for ovality and eccentricity are given in Table 4 of this document.

For aerial cables or cables for outdoor use with a black polyethylene sheath, the carbon black content shall be as specified in Table 4.

For other sheath material and colours of cables for outdoor use, the cable shall pass the UV stability test in accordance with IEC 61196-1-212.

The messenger type shall be specified in the relevant detail specification and shall include as a minimum the following criteria: type and material, tensile strength, corrosion properties and elongation.

4.9 Metallic protection

When applicable, metallic protection shall meet the requirements of the relevant detail specification

4.10 Cable integral suspension strand (messenger wire)

When applicable, messenger wires shall meet the requirements of the relevant detail specification.

4.11 Oversheath

When applicable, oversheaths shall meet the requirements of the relevant detail specification

4.12 Fauna proofing

When applicable, fauna proofing shall meet the requirements of the relevant detail specification.

4.13 Chemical and/or environmental proofing

Not applicable.

4.14 Cable identification

4.14.1 General

IEC 61196-1:2005, 6.1 applies

4.14.2 Sheath marking

Unless otherwise specified in the detail specification, sheath marking shall be achieved as a non-degradable print containing the minimum information:

- a number giving the nominal characteristic impedance of the cable in ohms, for example "75",
- a number that corresponds to the approximate dielectric outer diameter in mm, for example, the nominal dielectric diameter 3,66 mm shall be expressed by "4",
- a letter that corresponds to the different outer conductor construction types,
- a letter that corresponds to the different inner conductor types,
- a letter that corresponds to the different outer conductor construction types,
- letters that correspond to the different outer conductor materials,

- a number that corresponds to the different screening classes,
- the number of the IEC standard (61196-7),
- the name of the supplier,
- the length of cable.

EXAMPLE: 75-4T-BC-ALT/BC/ALT-A – <xxx> – IEC 61196-5

More detailed information is given in Annex A.

4.14.3 Labelling

Unless otherwise specified in the detail specification, drums or coils shall be provided with a label with non-degradable print containing the minimum information given in A.1.1.

4.15 Completed cable

The nominal dimensions and tolerances shall be stated in the detail specification.

4.16 Standard ratings and characteristics

The ratings and characteristics applicable to each cable shall be specified herein or in the relevant detail specification.

5 Tests for completed cables

5.1 General

When tested in accordance with the IEC 61196-1 series, the requirements of 5.2 to 5.5 shall apply.

Unless otherwise specified, all measurements shall be carried out under standard atmospheric conditions for testing in accordance with IEC 60068-1:2012, Clause 5.

Applicable test methods shall be in accordance with the IEC 61196-1-100 series, the IEC 61196-1-200 series, the IEC 61196-1-300 series, and the IEC 62153 series.

5.2 Electrical testing of the finished cable

5.2.1 Low-frequency and DC electrical measurements

Low-frequency and DC electrical test procedures and requirements are given in Table 1.

Table 1 – Low-frequency and DC test procedures and requirements

No.	IEC test procedure	Parameter	Requirements/remarks
5.2.1.1	61196-1-101	Inner conductor resistance	Applicable, value in accordance with the detail specification
5.2.1.2	61196-1-101	Outer conductor resistance	$\leq 15 \text{ m}\Omega/\text{m}$
5.2.1.3	61196-1-102	Insulation resistance	$\geq 104 \text{ M}\Omega \times \text{km}$
5.2.1.4	61196-1-105	Withstand voltage of dielectric	2 kV d.c. or 1,5 kV a.c. for 1 min, unless otherwise specified in the relevant detail specification
5.2.1.5	61196-1-106	Withstand voltage of sheath (RMS)	Unless otherwise specified in the relevant detail specification, Sheath thickness up to and including 0,5 mm = 1 kV Sheath thickness over 0,5 mm and up to and including 0,8 mm = 2 kV Sheath thickness over 0,8 mm and up to and including 1,0 mm = 3 kV Sheath thickness over 1,0 mm = 5 kV
5.2.1.6	60096-0-1	Current carrying capacity	Value in accordance with the detail specification

5.2.2 High-frequency electrical and transmission test procedures and requirements

High-frequency electrical and transmission test procedures and requirements are given in Table 2.

Table 2 – High-frequency electrical and transmission test procedures and requirements

No.	IEC test procedure	Parameter	Requirements/remarks
5.2.2.1	61196-1-108	Characteristic impedance	$75 \Omega \pm 2 \Omega$, unless the tolerance is otherwise specified in the relevant detail specification
5.2.2.2	61196-1-108	Relative propagation velocity (velocity ratio)	May be specified for information purposes only in the detail specification
5.2.2.3	61196-1-112	Return loss	$RL \geq 26$ dB from 5 MHz to 470 MHz, $RL \geq 23$ dB from 470 MHz to 1 000 MHz $RL \geq 20$ dB from 1 000 MHz to 2 000 MHz The measurement inaccuracy $\Delta a_{r,f}$ shall be < 1 dB
5.2.2.4	61196-1-113	Attenuation constant	The maximum value at any frequency shall not be greater than calculated with the following formula: $\alpha = 10 \times \lg(P_1 / P_2) \times 100 / l \text{ (in dB/100 m).}$ where α is the attenuation constant in dB/100 m (frequency dependent); P_1 is the output power of a source where the load impedance and the source impedance are equal and of the same value as the nominal value of the specimen; P_2 is the output power measured when the specimen is inserted into the test system, where the load impedance and the source impedance are equal and of the same value as the nominal value of the specimen. l is the physical length of the specimen in metres (m).
5.2.2.5	61196-1-115	Regularity of impedance	Perform on both ends of tested cable Regularity ≥ 40 dB respectively ≤ 1 % Test procedure: IEC 61196-1-115 (time domain) or IEC 62153-1-1 (transformation from frequency domain into time domain by IDFT)
5.2.2.6	62153-4-3	Transfer impedance	Class A: ≤ 5 mΩ/m from 5 MHz to 30 MHz Class A+: $\leq 2,5$ mΩ/m from 5 MHz to 30 MHz Class A++: $\leq 0,9$ mΩ/m from 5 MHz to 30 MHz Test procedure in accordance with IEC 62153-4-3, triaxial method, after completion of the bending test in accordance with 5.4.8, values according to the relevant detail specification.
5.2.2.7	62153-4-4	Screening attenuation	Class A: ≥ 85 dB from 30 MHz to 1 000 MHz ≥ 75 dB from 1 000 MHz to 2 000 MHz Class A+: ≥ 95 dB from 30 MHz to 1 000 MHz ≥ 85 dB from 1 000 MHz to 2 000 MHz Class A++: ≥ 105 dB from 30 MHz to 1 000 MHz ≥ 95 dB from 1 000 MHz to 2 000 MHz Test procedure in accordance with IEC 62153-4-4, triaxial method, after completion of the bending test in accordance with 5.4.8, values according to the relevant detail specification.

5.3 Environmental test procedures and requirements of the finished cable

Environmental test procedures and requirements are given in Table 3.

Table 3 – Environmental test procedures and requirements of the finished cable

No.	IEC test procedure	Parameter	Requirements/remarks
5.3.1	61196-1-201	Cold bend performance	Test method A, B, or C as specified in the relevant detail specification. The test temperature shall be stated in the relevant detail specification. No physical damages of conductors, dielectric and sheath.
5.3.2	61196-1-203	Water penetration	When required, in accordance with the relevant detail specification.
5.3.3	61196-1-206	Climatic sequence	$T_A = -40\text{ °C}$; $T_B = +65\text{ °C}$; $t_1 = 24\text{ h}$, unless otherwise specified in the detail specification. Number of cycles: 3 Influenced mechanical and electrical characteristics shall be tested and defined in the relevant detail specification.
5.3.4	60068-2-78	Damp heat (steady state)	Influenced mechanical and electrical characteristics shall be tested and defined in the relevant detail specification. 1) Test temperature: 2) Percentage relative humidity: 3) Test duration:
5.3.5	61196-1-212	Ultraviolet stability of the sheath or jacket	All cables for outdoor or other applications that are subjected to UV radiation shall meet the following requirements. No visual cracks – change in elongation $\pm 20\%$ max. after 720 h – change in tensile strength $\pm 20\%$ max. after 720 h
5.3.6	61196-1-209	Thermal ageing	Transmission characteristics shall remain within the specified limits as defined in the relevant detail specification
5.3.7	60811-410	Oxidative Induction time (OIT)	Requirements for OIT – Initial: 20 min minimum, after aging: 70 % of initial value
5.3.8	60811-605	Carbon black content	Only for cables with black PE; $\geq 2,0\%$ ^{a)}
^{a)} In some regions, a value of carbon black content of $2,5\% \pm 0,5\%$ of the sheath is required. In this case, UV stability test is not necessary.			

5.4 Test procedures and requirements of mechanical characteristics of the finished cable

Test procedures and requirements for mechanical characteristics of the finished cable are given in Table 4.

Table 4 – Test procedures and requirements of mechanical characteristics of the finished cable

No.	IEC test procedure	Parameter	Requirements/remarks
5.4.1	61196-1-301	Ovality of outer conductor or screen	$\leq 7 \%$
5.4.2	61196-1-301	Ovality of the sheath	$\leq 7 \%$
5.4.3	61196-1-302	Eccentricity of dielectric	$\leq 10 \%$
5.4.4	61196-1-302	Eccentricity of the sheath	$\leq 10 \%$
5.4.5	61196-1-308	Tensile strength and elongation of the copper or copper-clad inner conductor	Shall be in accordance with IEC 61196-1:2005, 4.4.1
5.4.6	61196-1-310	Torsion test for copper-clad metals	The surface shall not reveal any irregular seams, pits or slivers of sufficient magnitude or inherent defects.
5.4.7	61196-1-313	Adhesion testing	Inner conductor to dielectric, sample length = 50 mm Pressure force F_a required to remove dielectric shall be $0,1 \text{ MPa} \leq F_a \leq 1,0 \text{ MPa}$. a) b)
5.4.8	61196-1-314	Bending characteristics	Single bending: according to the detail specification Multiple bending: test method to be performed as per 8.3.2, procedure 1 Radius of mandrel: as specified by the manufacturer Tension: according to the detail specification Speed: $\leq 1 \text{ m/s}$ Number of cycles: 3
5.4.9	61196-1-316	Tensile strength of cable (longitudinal pull)	According to the detail specification
5.4.10	61196-1-317	Crush resistance of cable	Load = according to the detail specification, applied for 2 min After a 2 min recovery time, the maximum impedance irregularity shall be $\leq 1 \%$, when measured in accordance with IEC 61196-1-115. No physical damage of the sheath or jacket
5.4.11	61196-1-324	Abrasion resistance	According to the detail specification
a) The adhesion of the dielectric to the inner conductor, F_a, is given in MPa by the following formula: $F_a = \frac{F}{\pi \cdot d \cdot l}$ where F is the force, d is the diameter of inner conductor, l is the length of the sample. b) Other values can be required if special tools for preparing connector mountings are used (see relevant detail specification). Limits should be given in the detail specification.			

5.5 Fire performance

When intended to be installed in buildings, these cables may fall under the requirements of local, regional or governmental fire and safety standards as outlined in Table 5.

Table 5 – Fire performance requirements

No.	Test method/standard	Parameter	Requirements/remarks – according to the relevant detail specification
5.5.1		Flame propagation	
5.5.2		Acid gas emission	
5.5.3		Smoke generation	
5.5.4		Toxic gas emission	
5.5.5		To be defined (as required)	

6 Quality assessment

When specified in the sectional or detail specifications, quality procedures shall be in accordance with IEC 61196-1-1.

7 Delivery and storage

Delivery of cables shall be in accordance with IEC 61196-1:2005, Clause 9.

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Annex A (normative)

Cable identification and marking

A.1 Cable identification

A.1.1 Type name

Cable type shall be identified by the following:

- a number giving the nominal characteristic impedance of the cable in ohms, for example "75",
- a number that corresponds to the approximate dielectric outer diameter in mm, for example, the nominal dielectric diameter 3,66 mm shall be expressed by "4",
- a letter that corresponds to the different outer conductor construction types, see A.1.2,
- letters that correspond to the different inner conductor types, see A.1.2,
- letters that correspond to the different outer conductor construction types, see A.1.2,
- letters that correspond to the different outer conductor materials, see A.1.2,
- a designation of the different screening classes, see A.1.2,
- the name of the supplier,
- the number of the IEC standard (61196-5).

A.1.2 Variants

The variant of cables should be identified by the following:

- 1) type name (75),
- 2) approximate dielectric outer diameter (4),
- 3) outer conductor construction distinguishing letters:
 - S – standard shield outer conductor (tape, overlapped or welded, /foil and braid),
 - T – tri-shield shield outer conductor (foil/braid/foil),
 - Q – quad-shield shield outer conductor (foil/braid/foil/braid).
- 4) inner conductor material:
 - BC – bare copper, tube or solid,
 - CCS – copper clad steel,
 - CCA – copper clad aluminium.
- 5) outer conductor material:
 - a) ALT – aluminium-polymeric laminated tape,
 - b) AL – aluminium alloy wire,
 - c) CuT – copper tape,
 - d) TC – tinned copper wire,
 - e.g. CuT or ALT/TC/ALT
- 6) screening class (same class for transfer impedance and screening attenuation):
 - a) A++, A+, A.