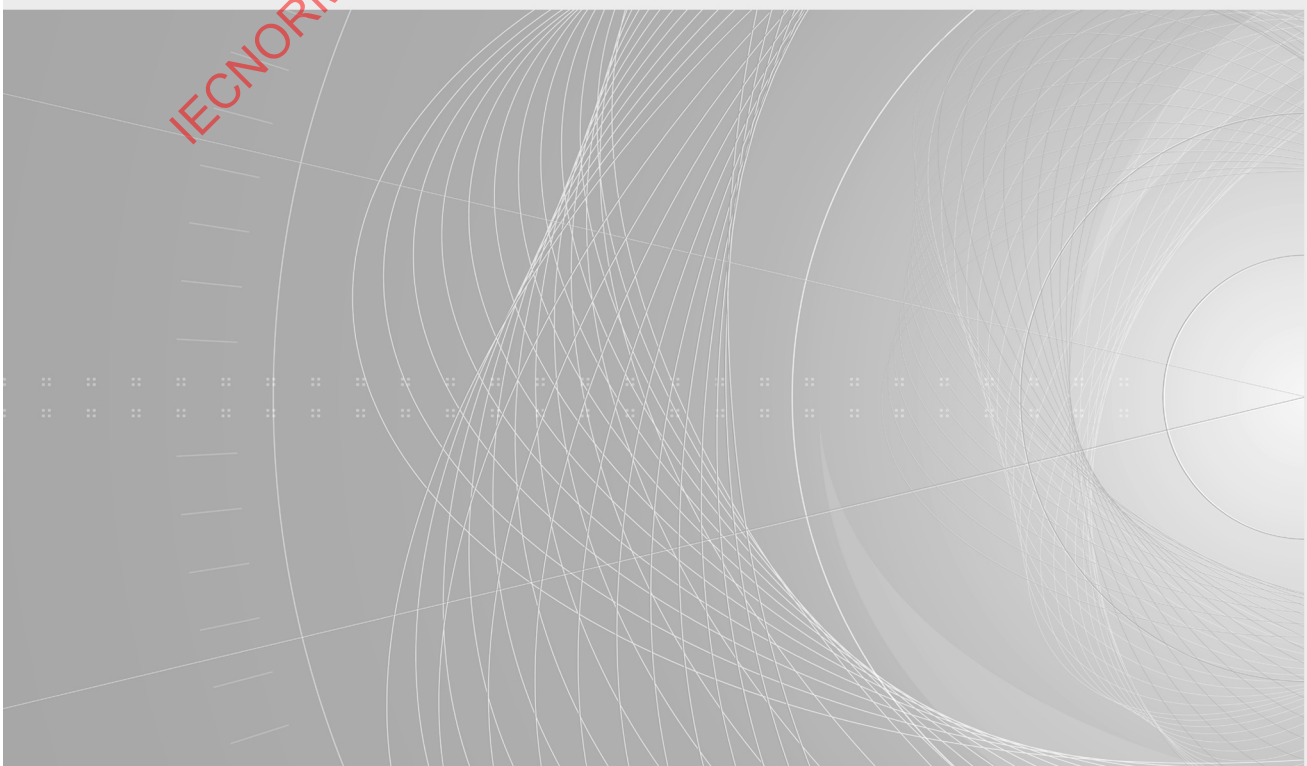
IEC 61196-5

Edition 3.0 2018-01

INTERNATIONAL STANDARD

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



IEC 61196-5:2018-01(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.10

ISBN 978-2-8322-5258-1

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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COAXIAL COMMUNICATION CABLES –

Part 5: Sectional specification for CATV trunk and distribution cables

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard 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.

This third edition cancels and replaces the second edition published in 2012. This edition constitutes a technical revision.

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

a) 1 Scope: revised, frequency range extended to 2 000 MHz;
b) 4.3 Dielectric: life expectancy of the dielectric is proved by oxidative induction time (OIT) test before and after ageing according to IEC 60811-410;
c) Annex A: Table A.1, Cable types added.

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

FDIS	Report on voting
46A/1351/FDIS	46A/1357/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.

This International Standard is to be used in conjunction with IEC 61196-1:2005.

A list of all parts of 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.

A bilingual version of this publication may be issued at a later date.

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, e.g. 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 °C and +65 °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 60068-1:2013, *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 ageing*

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*

EN 50289-4-17, *Communication cables – Specifications for test methods – Part 4-17: Test methods for UV resistance evaluation of the sheath of electrical and optical fibre cable*[1]

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 Subclauses 4.2 to 4.6 and the requirements stated in the relevant detail specification.

4.2 Inner conductor

4.2.1 Conductor material

Subclause 4.4.1 of 61196-1:2005 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, 4.4.1 of IEC 61196-1:2005 applies.

The centre conductor diameter shall be stated in the relevant detail specification. The tolerance on the centre conductor shall be ± 0,03 mm for conductors with a diameter ≤ 4 mm.

[1] An IEC test procedure for UV stability is under consideration.

For conductors with a diameter above 4 mm, the tolerance shall be 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 proven by the oxidative induction time (OIT) test, before and after ageing, according to 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 ± 0,05 mm for constructions in accordance with 4.6.1 c) of IEC 61196-1:2005, excluding corrugated designs. The tolerance for all other constructions, including corrugated designs, shall be ± 0,3 mm in accordance with all other designs noted in 4.6.1 of IEC 61196-1:2005.

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 4.6.1 c) or 4.6.1 f) or 4.6.1 g) of IEC 61196-1:2005.

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

4.5 Sheath

Subclause 4.7 of IEC 61196-1:2005 applies with the following amendments and additions.

Cables without an outer sheath shall not be subject to this subclause.

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

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

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

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

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

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 according to EN 50289-4-17.

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.

4.6 Completed cable

The nominal dimensions and tolerances shall be stated in the detail specification. Preferred nominal dimensions and ratings are given in Annex A, Table A.1.

5 Standard ratings and characteristics

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

6 Identification and marking

6.1 Cable identification

Subclause 6.1 of IEC 61196-1:2005 applies.

6.2 Cable marking

The cable marking shall be applied to the sheath or to the outer conductor when a sheath is not present. The marking shall consist of the IEC cable type number as given in 6.1.1 of IEC 61196-1:2005 and/or the manufacturer's designated markings when specified in the relevant cable specification.

6.3 Labelling

Labelling shall be provided in accordance with 6.3 of IEC 61196-1:2005 and the relevant detail specification.

7 Tests for completed cables

7.1 General

When tested in accordance with the IEC 61196-1 series, the requirements given below shall apply.

Unless otherwise specified, all measurements shall be carried out under standard atmospheric conditions for testing in accordance with Clause 5 of IEC 60068-1:2013.

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

7.2 Electrical testing of the finished cable

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
7.1.1.1.1	61196-1-101	Inner conductor resistance	Applicable, value in accordance with the detail specification
7.1.1.1.2	61196-1-101	Outer conductor resistance	≤ 15 mΩ/m
7.1.1.2	61196-1-102	Insulation resistance	≥ 104 MΩ × km
7.1.1.3	61196-1-105	Withstand voltage of dielectric	2 kV DC or 1,5 kV AC for 1 min, unless otherwise specified in the relevant detail specification
7.1.1.4	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
7.1.1.5	60096-0-1	Current carrying capacity	Value in accordance with the detail specification

7.3 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
7.1.2.1	61196-1-108	Characteristic impedance	75 Ω ± 2 Ω, unless the tolerance is otherwise specified in the relevant detail specification
7.1.2.2	61196-1-108	Relative propagation velocity (velocity ratio)	May be specified for information purposes only in the detail specification
7.1.2.3	61196-1-112	Return loss	RL ≥ 26 dB from 5 MHz to 470 MHz, RL ≥ 23 dB from 470 MHz to 1 000 MHz RL ≥ 20 dB from 1 000 MHz to 2 000 MHz The measurement inaccuracy $\Lambda a_{r,f}$ shall be < 1 dB
7.1.2.4	61196-1-113	Attenuation constant	The maximum value at any frequency shall not be greater than calculated with the following formula: $\alpha = 10 \times \lg(P_1 / P_2) \times 100/l$ [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 valueas the nominal value of the specimen. l is the physical length of the specimen in metres (m).

No.	IEC test procedure	Parameter	Requirements/remarks
7.1.2.5	61196-1-115	Regularity of impedance	Perform on both ends of tested cable Regularity ≥ 40 dB resp. ≤ 1 % Test procedure: IEC 61196-1-115 (time domain) or IEC 62153-1-1 (transformation from frequency domain into time domain by IDFT)
7.1.2.6	62153-4-3	Transfer impedance After multiple bending: see 7.3.9	Class A: ≤ 5 mΩ/m from 5 MHz to 30 MHz Class A+: ≤ 2,5 mΩ/m from 5 MHz to 30 MHz Class A++: ≤ 0,9 mΩ/m from 5 MHz to 30 MHz Test procedure according to IEC 62153-4-3, triaxial method, after completion of the flexure test according to the relevant detail specification.
7.1.2.7	62153-4-4	Screening attenuation After multiple bending: see 7.3.9	Class A: ≥ 85 dB from 30 MHz to 1 000 MHz ≥ 75 dB from 1 000 MHz to 2000 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 according to IEC 62153-4-4 (triaxial method) after completion of the flexure test according to the relevant detail specification.

7.4 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
7.2.1	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.
7.2.2	61196-1-203	Water penetration	When required, in accordance with the relevant detail specification.
7.2.3	61196-1-206	Climatic sequence	T_A = −40 °C; T_B = +65 °C; t_1 = 24 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.
7.2.4	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

No.	IEC test procedure	Parameter	Requirements/remarks
7.2.5	EN 50289-4-17[a]	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 ± 20 % max. after 720 h – change in tensile strength ± 20 % max. after 720 h
7.2.6	61196-1-209	Thermal ageing	Transmission characteristics shall remain within the specified limits as defined in the relevant detail specification
7.2.7	60811-410	Oxidative Induction time (OIT)	Requirements for OIT – Initial: 20 min minimum, after aging: 70 % of initial value
7.2.8	60811-605	Carbon black content	Only for cables with black PE; ≥ 2,0 % [a]
[a] In some regions, a value of carbon black content of (2,5 % ± 0,5 %) of the sheath is required. In this case, UV stability test is not necessary.			

7.5 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
7.3.1	61196-1-301	Ovality of outer conductor or screen	≤ 7 %
7.3.2	61196-1-301	Ovality of the sheath	≤ 7 %
7.3.3	61196-1-302	Eccentricity of dielectric	≤ 10 %
7.3.4	61196-1-302	Eccentricity of the sheath	≤ 10 %
7.3.5	61196-1-308	Tensile strength and elongation of the copper or copper-clad inner conductor	Shall be in accordance with 4.4.1 of IEC 61196-1:2005
7.3.6	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.
7.3.7	61196-1-313	Adhesion testing	Inner conductor to dielectric, sample length = 50 mm Pressure force Fa required to remove dielectric shall be 0,1 MPa ≤ F_a ≤ 1,0 MPa.[a, b]
7.3.8	61196-1-314	Bending characteristics	Single bending: According to the detail specification Multiple bending: Test method to be performed per 8.3.2, procedure 1 Radius of mandrel: as specified by the manufacturer Tension: as defined in row 7.3.10 of Table 4. Speed: ≤ 1 m/s Number of cycles: 3
7.3.9	61196-1-316	Tensile strength of cable (longitudinal pull)	According to the detail specification