

INTERNATIONAL STANDARD



Coaxial communication cables –
Part 4: Sectional specification for radiating cables
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IEC 61196-4:2015

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COAXIAL COMMUNICATION CABLES –**Part 4: Sectional specification for radiating cables****FOREWORD**

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International Standard IEC 61196-4 has been prepared by subcommittee 46A: Coaxial cables, of IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories.

This third edition cancels and replaces the second edition published in 2004. This edition constitutes a technical revision.

The main changes with respect to the previous edition are as follows:

- a definition for coupling loss was added,
- Clause 4 "Materials and cable construction" was added,
- rated temperature range, operating frequency and radiating characteristics as standard rating and characteristics were added,
- identification, marking and labeling was added,

- the tables of test procedures were revised,
- quality assessment and packaging was added,
- Annex C, “Coupling loss around circumferential orientation of radiating cable” was added
- Annex D “Radiating intensity around circumferential orientation of radiating cable” was added.

The text of this standard is based on the following documents:

FDIS	Report on voting
46A/1256/FDIS	46A/1273/RVD

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

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

This publication is to be read in conjunction with IEC 61196-1:2005.

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 publication will remain unchanged until the stability date indicated on the IEC website under “<http://webstore.iec.ch>” in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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

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COAXIAL COMMUNICATION CABLES –

Part 4: Sectional specification for radiating cables

1 Scope

This part of IEC 61196 applies to radiating coaxial communication cables. These cables are intended for use in wireless communication systems, such as tunnels, railways, highways, subways, elevators and other installations in which conventional antenna transmission is not satisfactory or even impossible.

It is to be read in conjunction with IEC 61196-1:2005.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-61, *Environmental testing – Part 2-61: Test methods: Test Z/ABDM: Climatic sequence*

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IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC TS 60695-7-50, *Fire hazard testing – Part 7-50: Toxicity of fire effluent – Estimation of toxic potency – Apparatus and test method*

IEC TS 60695-7-51, *Fire hazard testing – Part 7-51: Toxicity of fire effluent – Estimation of toxic potency: Calculation and interpretation of test results*

IEC 60754-1, *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content*

IEC 60811-406, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 406: Miscellaneous tests – Resistance to stress cracking of polyethylene and polypropylene compounds*

IEC 61034-2:2005, *Measurement of smoke density of cables burning under defined conditions – Part 2: Test procedure and requirements*

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 61196-1-100, *Coaxial communication cables – Part 1-100: Electrical test methods – General requirements*

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 61196-1-103, *Coaxial communication cables – Part 1-103: Electrical test methods – Test for capacitance of cable*

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

IEC 61196-1-200, *Coaxial communication cables – Part 1-200: Environmental test methods – General requirements*

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

IEC 61196-1-300, *Coaxial communication cables – Part 1-300: Mechanical test methods – General requirements*

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 61196-1-314:2006, *Coaxial communication cables – Part 1-314: Mechanical test methods – Test for bending*

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

IEC TR 62222, *Fire performance of communication cables installed in buildings*

IEC 62230:2006, *Electric cables – Spark-test method*

3 Terms and definitions

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

3.1

radiating (coaxial) cable

coaxial communication cable with outer conductors that are intentionally not completely closed, so that part of the electromagnetic wave energy transmitted or received through the cable is coupled by a bidirectional transmission system formed by the outer conductor of the cable and the external environment

Note 1 to entry: The coupling intensity between cable and mobile equipment depends on:

- construction of the cable;
- characteristics of antenna (such as the type, the orientation, gain, etc.);
- distance and orientation of the mobile antenna from the cable;
- nature of ambient atmosphere;
- operating frequency range;
- manner of installation of the cable;
- shape, material and size of surrounding buildings.

3.2

coupling loss

L_c

ratio of the power P_t transmitted into the radiating cable at one point to the power P_r received by a half-wavelength dipole antenna located at a distance from the radiating cable at the same point (see formula 1)

Note 1 to entry: It is an important parameter of radiating coaxial cables to distinguish it from general coaxial communications cables.

$$L_c = 10 \log_{10} \frac{P_t}{P_r} \quad (1)$$

where

L_c is the coupling loss, in dB;

P_t is the transmission power in the radiating cable at one point, in W;

P_r is the receiving power of the half-wavelength dipole antenna at a distance from the radiating cable at the same point, in W.

4 Materials and cable construction

4.1 Cable construction

The cable construction shall be in accordance with 4.2 to 4.5 of this standard and the requirements stated in the detail specification.

4.2 Inner conductor

4.2.1 Conductor material

Subclauses 4.4.1 to 4.4.3 of IEC 61196-1:2005 apply.

The conductor material shall be as stated in the relevant cable detail specification.

4.2.2 Conductor construction

The conductor shall consist of a solid wire or corrugated or smooth tube, etc.

In addition, 4.4.4 of IEC 61196-1:2005 applies.

The inner conductor diameter (and thickness for smooth tube inner conductor) shall be stated in the detail specification.

For corrugated inner conductor, peak diameter and root diameter and pitch shall be specified in the detail specification.

The tolerance on the inner conductor shall be specified in the detail specification.

4.3 Dielectric

The dielectric material shall be as stated in the relevant cable detail specification.

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

- solid dielectric,
- air spaced dielectric,
- semi air spaced dielectric (e.g. cellular polymer dielectric).

The diameter and tolerance shall be stated in the detail specification.

4.4 Outer conductor

The outer conductor material shall be as stated in the relevant cable detail specification.

The typical structure of outer conductor shall be braiding with lower coverage, or slotted tape(s) rounding, or slotted corrugated tube, or slotted smooth tube, etc.

For corrugated outer conductor, peak diameter and root diameter and pitch shall be as specified in the detail specification.

The diameter and thickness of the outer conductor shall be specified in the detail specification.

The tolerance on the outer conductor shall be specified in the detail specification.

4.5 Sheath

The sheath of a cable shall be in accordance with Subclause 4.7 of IEC 61196-1:2005 with the following amendments and additions:

- a) The outer sheath of the cable shall be as specified in the detail specification.
- b) The diameter and thickness and tolerance of sheath shall be as stated in the detail specification.
- c) For self-supporting cable, the cable design will be an 8-figure design including a messenger wire. The messenger wire position versus the coupling holes will be such that it favours the foreseen radiating pattern.
- d) For cables intended for outdoor use or exposed to sunlight, the cable shall pass the UV stability test according to IEC specification. (A respective UV test procedure is under consideration.)
- e) A non-conductive ribbon or tape under the sheath may be permitted.

5 Standard rating and characteristics

5.1 Nominal characteristic impedance

The nominal characteristic impedance shall be specified in the detail specification. Typical impedance should be 50 Ω and 75 Ω .

5.2 Rated temperature range

The operational, storage, and installation temperature range shall be specified in the detail specification.

5.3 Operating frequency

Operating frequency range shall be specified in the detail specification.

6 Identification, marking and labeling

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. 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 marking when specified in the detail specification.

When applicable, the marking of installation or radiating direction shall be specified in the detail specification.

6.3 Labelling

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

7 Tests of finished 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, IEC 61196-1-200, IEC 61196-1-300 series according to Clause 2 and other test methods specified herein.