

INTERNATIONAL STANDARD

**Coaxial communication cables –
Part 11: Sectional specification for semi-rigid cables with polyethylene (PE)
dielectric**

IECNORM.COM : Click to view the full PDF of IEC 61196-11:2016



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2016 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IECNORM.COM : Click to view the full PDF IEC 61996-11:2016

INTERNATIONAL STANDARD

**Coaxial communication cables –
Part 11: Sectional specification for semi-rigid cables with polyethylene (PE)
dielectric**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.120.10

ISBN 978-2-8322-3091-6

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	7
4 Materials and cable construction	7
4.1 Cable construction	7
4.2 Inner conductor	7
4.2.1 Conductor material	7
4.2.2 Conductor construction	7
4.3 Dielectric	8
4.4 Outer conductor	8
4.5 Sheath	8
5 Standard rating and characteristics	9
5.1 Nominal characteristic wave impedance	9
5.2 Rated temperature range	9
5.3 Operating frequency	9
5.4 Average and peak power	9
6 Identification, marking and labelling	9
6.1 Cable identification	9
6.2 Cable marking	9
6.3 Labelling	9
7 Requirements of finished cables	9
7.1 General	9
7.2 Electrical requirements	10
7.3 Environmental requirements	11
7.4 Mechanical requirements	12
7.5 Fire performance requirements	13
8 Quality assessment	13
9 Delivery and storage	13
Table 1 – Rated temperature	9
Table 2 – Electrical requirements	10
Table 3 – Environmental requirements	11
Table 4 – Mechanical requirements	12
Table 5 – Fire performance requirements	13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COAXIAL COMMUNICATION CABLES –

**Part 11: Sectional specification for semi-rigid cables
with polyethylene (PE) dielectric**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61196-11 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.

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

FDIS	Report on voting
46A/1280/FDIS	46A/1291/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.

It is to be read in conjunction with IEC 61196-1:2005, on which it is based.

A list of all parts in the IEC 61196 series, 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.

IECNORM.COM : Click to view the full PDF of IEC 61196-11:2016

COAXIAL COMMUNICATION CABLES –

Part 11: Sectional specification for semi-rigid cables with polyethylene (PE) dielectric

1 Scope

This part of IEC 61196 applies to semi-rigid coaxial communication cables with polyethylene (PE) dielectric and tubular outer conductor. These cables are intended for use in microwave and wireless equipments or other signal transmission equipments or units at frequencies above 500 MHz.

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.

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

IEC 60096-0-1:2012, *Radio frequency cables – Part 1- 0: Guide to the design of detail specifications – Section 1 – Coaxial cables*

IEC 60096-0-1:2012/ AMD1:___¹

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 60811-406:2012, *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 60754-1, *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content*

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

IEC 61169-4, *Radio-frequency connectors – Part 4: RF coaxial connectors with inner diameter of outer conductor 16 mm (0,63 in) with screw lock – Characteristic impedance 50 Ω (type 7-16)*

IEC 61196-1 (all parts), *Coaxial communication cables*

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

¹ To be published.

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 61196-1-103, *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 61196-1-110, *Coaxial communication cables – Part 1-110: Electrical test methods – Test for continuity*

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

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 61196-1-119, *Coaxial communication cables – Part 1-119: Electrical test methods – RF power rating*

IEC 61196-1-201:2009, *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 61196-1-215, *Coaxial communication cables – Part 1-215: Environmental test methods – High temperature cable ageing²*

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

² To be published.

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

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 TR 62222:2012, *Fire performance of communication cables installed in buildings*

IEC 62037-4, *Passive RF and microwave devices, intermodulation level measurement – Part 4: Measurement of passive intermodulation in coaxial 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 as up to and above 3 GHz, triaxial method*

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

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*

3 Terms and definitions

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

4 Materials and cable construction

4.1 Cable construction

The cable construction shall be in accordance with 4.2 to 4.5 of this part of IEC 61196 and the requirements stated in the detail specification.

4.2 Inner conductor

4.2.1 Conductor material

Subclause 4.4.1 of IEC 61196-1:2005 applies.

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

4.2.2 Conductor construction

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

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

The inner conductor diameter 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 of the inner conductor shall be specified in the detail specification.

4.3 Dielectric

The material of dielectric shall be polyethylene (PE).

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

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

For cable with corrugated outer conductor, the nominal diameter of dielectric shall be specified in the detail specification.

For cable with smooth tube out conductor, the diameter and tolerance of dielectric 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 conductor shall consist of a corrugated or smooth tube.

In addition, the requirements of 4.6.1 of IEC 61196-1:2005 apply.

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

For corrugated outer conductor, peak diameter and root diameter and pitch shall be as 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 4.7 of IEC 61196-1:2005 with the following amendments and additions:

- a) The material of cable sheath shall be specified in the detail specification.
- b) The diameter and minimum thickness and tolerance of sheath shall be as stated in the detail specification.
- c) For cables intended for outdoor use or exposed to sunlight, the cable shall pass the UV stability test according to EN 50289-4-17, an IEC test procedure is under consideration.
- d) For special cable constructions, a sheath may not be necessary.

5 Standard rating and characteristics

5.1 Nominal characteristic wave impedance

The nominal characteristic impedance shall be 50 Ω .

5.2 Rated temperature range

The ratings temperature range applicable to each cable shall be specified herein or in the detail specification. See Table 1.

Table 1 – Rated temperature

Parameter	Requirements/remarks
Operational temperature range	Specified in the detail specification
Storage temperature range	Specified in the detail specification
Installation temperature range	Specified in the detail specification

5.3 Operating frequency

Operating frequency range shall be specified in the detail specification.

5.4 Average and peak power

Average and peak power shall be specified herein or in the detail specification.

6 Identification, marking and labelling

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.

6.3 Labelling

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

7 Requirements of finished cables

7.1 General

For finished cables, the requirements given below shall apply when they are tested in accordance with the IEC 61196-1 series or Clause 8 of this part of IEC 61196.

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-n series and other test methods specified herein.

7.2 Electrical requirements

Electrical measurements are given in Table 2.

Table 2 – Electrical requirements

Subclause	Test procedure	Parameter	Requirements/Remarks
7.2.1	IEC 61196-1-110	Continuity	Inner conductor shall be continuous. Outer conductor shall be continuous.
7.2.2	IEC 61196-1-101	Inner and outer conductor direct current resistance	Value in accordance with the detail specification
7.2.3	IEC 61196-1-105	Withstand voltage of dielectric	Value in accordance with the detail specification
7.2.4	IEC 61196-1-106 (or IEC 62230)	Withstand voltage of sheath (or spark test)	Unless otherwise specified in the detail specification, the following test voltage shall be applied for one minute. 2 kV r.m.s. for sheath thickness over 0,5 mm and less than 0,8 mm. 3 kV r.m.s. for sheath thickness over 0,8 mm and less than 1,0 mm. 5 kV r.m.s. for sheath thickness over 1,0 mm. (Spark test voltage and duration in accordance with the detail specification)
7.2.5	IEC 61196-1-102	Insulation resistance	$\geq 104 \text{ M}\Omega \cdot \text{km}$
7.2.6	IEC 61196-1-103	Capacitance	Value in accordance with the detail specification
7.2.7	IEC 61196-1-108	Mean characteristic wave impedance	50 Ω , tolerance shall be in accordance with the detail specification
7.2.8	IEC 61196-1-115	Regularity of impedance	Value in accordance with the detail specification
7.2.9	IEC 61196-1-112	Return loss	Value in accordance with the detail specification
7.2.10	IEC 61196-1-113	Attenuation constant	Value in accordance with the detail specification
7.2.11	IEC 61196-1-215	High temperature cable aging (Attenuation stability)	See 7.3.1
7.2.12	IEC 62037-4	Passive intermodulation (IM)	When required, both ends of the specimen should be attached with suitable RF connectors (recommended type 7-16 connectors, according to IEC 61169-4). Input signal frequencies and power of f_1 and f_2 and the minimum PIM requirement shall be specified in the relevant detail specification.
7.2.13	IEC 61196-1-119	RF power rating	When required, value in accordance with the detail specification
7.2.14	IEC 60096-0-1	Peak power	When required, value in accordance with the detail specification
7.2.15	IEC 62153-4-3	Transfer impedance	If applicable, value in accordance with the relevant detail specification. If not otherwise specified in the detail specification, the transfer impedance shall be tested after completion of the cable bending test (IEC 61196-1-314) to the detail specification.
7.2.16	IEC 62153-4-4	Screening attenuation	If applicable, value in accordance with the relevant detail specification. If not otherwise specified in the detail specification, the screening attenuation shall be tested after completion of the cable bending test (IEC 61196-1-314) to the detail specification. An alternative test method can be used when specified in the detail specification.

7.3 Environmental requirements

Environmental requirements are given in Table 3.

Table 3 – Environmental requirements

Subclause	Test procedure	Parameter	Requirements/remarks
7.3.1	IEC 61196-1-215	Ageing	<p>When applicable, the temperature value is:</p> <p>98 °C ± 2 °C (PVC sheath)</p> <p>90 °C ± 2 °C (LSZH and PE sheath)</p> <p>Duration: 168 h or as specified in detail specification.</p> <p>Requirements after ageing and cooling down to standard atmospheric conditions for testing in accordance with Clause 5 of IEC 60068-1: 2013:</p> <p>a) The return loss shall remain within the specified limits in Table 2.</p> <p>b) The attenuation shall remain within the specified limits in Table 2.</p> <p>c) No cracks in the inner conductor (when needed) and sheath.</p> <p>d) No visible black spots in the outer conductor.</p>
7.3.2	Method C of IEC 61196-1-201: 2009	Cold bend performance	<p>The temperature at bend shall be defined in the detail specification.</p> <p>No cracks, flaws or other damage in the jacket material and outer conductor.</p>
7.3.3	IEC 61196-1-203	Water penetration	When required, in accordance with the detail specification
7.3.4	IEC 61196-1-206	Climatic sequence	<p>When required, <i>CUT</i> shall be specified in the detail specification.</p> <p>T_A = minimum environmental rated temperature</p> <p>T_B = maximum environmental rated temperature</p> <p>t_1 = 16 h, unless otherwise specified in the detail specification.</p> <p>Humidity: 55 °C, 93 % RH 1 day (after cold and heat)</p> <p>Number of cycles: 2, unless otherwise specified in the detail specification.</p> <p>No physical damages shall be visible in cable.</p> <p>The return loss shall remain within the specified limits in Table 2.</p>
7.3.5	IEC 60811-406	Environmental stress cracking	No physical damages shall be visible in cable.
7.3.6	EN 50289-4-17	Ultraviolet stability of the sheath	<p>When applicable (see 4.5), the test procedure shall be specified in the detail specification</p> <p>Requirements:</p> <ul style="list-style-type: none"> – no visual cracks; – changes in elongation and tensile strength after test shall be specified in the detail specification.

7.4 Mechanical requirements

Mechanical requirements of the finished cables are given in Table 4.

Table 4 – Mechanical requirements

Subclause	Test methods	Parameter	Requirements/remarks
7.4.1	4.2 of IEC 61196-1:2005	Visual examination	The sheath shall be free of cracks, splits, irregularities, and imbedded foreign material. The outer conductor shall be free of black spots or cracks.
7.4.2	4.3 of IEC 61196-1:2005	Dimensional examination	Value in accordance with the detail specification
7.4.3	IEC 61196-1-301	Ovality of inner conductor	When applicable, value in accordance with the detail specification
7.4.4	IEC 61196-1-302	Eccentricity of dielectric	When applicable, value in accordance with the detail specification
7.4.5	IEC 61196-1-313	Adhesion of dielectric	When applicable, value in accordance with the detail specification
7.4.6	IEC 61196-1-314	Cable bending	One of the following methods and requirements shall be specified in the detail specification. a) Single bending (Clause 4, Procedure 2):single bend radius. b) Repeated bending (Clause 5):multiple bend radius and number of bends. Requirements: <ul style="list-style-type: none"> The maximum impedance irregularity shall be ≤ 1 %, when measured in accordance with IEC 61196-1-115. The return loss shall remain within the specified limits in Table 2. No physical damage in cable. When applicable, PIM shall remain within the specified limits in Table 2.
7.4.7	IEC 61196-1-316	Tensile strength of cable (longitudinal pull)	The force shall be specified in the detail specification. Requirements: <ul style="list-style-type: none"> The maximum impedance irregularity shall be ≤ 1 %, when measured in accordance with IEC 61196-1-115. The return loss shall remain within the specified limits in Table 2. No physical damage in cable.
7.4.8	IEC 61196-1-317	Crush resistance of cable	When applicable, the load shall be specified in the detail specification, applied for 2 min. Requirements: <ul style="list-style-type: none"> The maximum impedance irregularity shall be ≤ 1 %, when measured in accordance with IEC 61196-1-115. The return loss shall remain within the specified limits in Table 2. No physical damage of the sheath.