IEC 61196-8

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Coaxial communication cables – Part 8: Sectional specification for semi-flexible cables with polytetrafluoroethylene (PTFE) dielectric

Câbles coaxiaux de communication – Partie 8: Spécification intermédiaire pour câbles semi-flexibles avec diélectrique en polytétrafluoroéthylène (PTFE)

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FOREWORD

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International Standard IEC 61196-8 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/1059/FDIS	46A/1073/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 is to be read in conjunction with IEC 61196-1.

This publication 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 publication will remain unchanged until the stability date indicated on the IEC web site 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- withdrawn,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.

COAXIAL COMMUNICATION CABLES –

Part 8: Sectional specification for semi-flexible cables with polytetrafluoroethylene (PTFE) dielectric

1 Scope

This part of IEC 61196 applies to semi-flexible coaxial communication cables with polytetrafluoroethylene (PTFE) dielectric and tin soaked copper wire braid outer conductor. These cables are intended for use in microwave and wireless equipments or other signal transmission equipments or units at frequencies from 500 MHz up to 18 GHz. This document is read in conjunction with IEC 61196-1.

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 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment 1 (1992)

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

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 61196-1:2005, *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 61196-1-103, *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 61196-1-108, *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 61196-1-301, *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 61196-1-313, *Coaxial communication cables – Part 1-313: Mechanical test methods – Adhesion of dielectric and sheath*

IEC 61196-1-314:2006, *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 62037-1, *Passive r.f. and microwave devices, intermodulation level measurement – Part 1: General requirements and measuring methods*[1]

IEC 62037-4, *Passive r.f. and microwave devices, intermodulation level measurement – Part 4: Measurement of passive intermodulation in coaxial cables*[2]

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

IEC 62230, *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 apply.

3.1
pinhole
any hole in the outer shield (tin soaked copper wire braid) with a diameter of ≥ 0,05 mm

3.2
semi-flexible coaxial communication cable
coaxial line not intended for applications requiring repeated flexure in service

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1 To be published.

2 To be published.

Bending or forming is however permissible to facilitate installation. The typical construction for this type of cables is a solid wire as inner conductor, polytetrafluoroethylene (PTFE) dielectric and a tin soaked copper wire braid for the outer shield.

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 relevant detail specification.

4.2 Inner conductor

The inner conductor shall be a solid silver plated copper wire or solid silver plated copper clad steel wire according to 4.4.1 of IEC 61196-1 or any other appropriate material as stated in the relevant detail specification. The minimum thickness of the silver coating shall be 1 μm.

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

The tolerance of the diameter shall be ± 3 %.

The inner conductor shall be smooth and continuous.

4.3 Dielectric

The construction of the dielectric shall be one of the materials listed below or a combination of the following:

- solid polytetrafluoroethylene (PTFE) dielectric,
- expanded polytetrafluoroethylene (PTFE) dielectric,
- profiled (extruded) polytetrafluoroethylene (PTFE) dielectric,

or any other appropriate PTFE type material as stated in the relevant detail specification.

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

The tolerance shall be ± 3 %.

4.4 Outer conductor

The construction of the outer conductor should be a smooth and continuous tin soaked copper wire braid. It consists of two layers:

a) Braid

The copper wire braid shall be designed in a way to guarantee the mechanical, environmental and electrical requirements of the cable. It shall also allow a correct tin soaking without an excessive number of pinholes. This is in general achieved by a braid having a coverage of ≥ 95 % and a braid angle in the order of 45 °. The braid design is calculated according to 3.2 of IEC 61196-1.

b) Tin soaking

The copper wire braid is tin soaked in a way to guarantee the mechanical, environmental and electrical requirements of the cable. The surface of the tin soaking shall be without black spots, cracking and an excessive number of pinholes.

The tolerance of the diameter of the outer conductor shall be ± 3 %.

4.5 Sheath

The sheath of a cable is optional and shall be in accordance with 4.7 of IEC 61196-1 with the following amendments and additions.

- the outer sheath of a cable shall be a thermoplastic material as specified in the relevant detail specification, including the material type;
- 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 tolerance of the diameter of the sheath shall be ± 4 %.

5 Standard rating and characteristics

5.1 Characteristic impedance

The characteristic impedance is specified in the relevant detail specification.

5.2 Rated temperature range

The rated temperature range is specified in the relevant detail specification.

6 Identification, marking and labeling

6.1 Cable identification

6.1.1 Type name

Cables shall be identified by the following:

a) a number giving the nominal characteristic impedance of the cable in ohms, for example,"50";
b) a number that corresponds to the nominal diameter measured over the outer conductor in inch, i.e. the nominal diameter measured over the outer conductor, in mm, multiplied by 39,38, for example,"141" which means the nominal diameter of the outer conductor is 3,58 mm.

6.1.2 Variants

The variant of cables should be identified by the following:

a) type name: see 6.1.1;
b) distinguishing number: It should consist of three digital characters (XYZ) which distinguish the different construction and material of the various cables.

   The “X” specifies the material type of the inner conductor.

   The “Y” specifies the material type of the dielectric.

   The “Z” specifies the material type of the sheath.

   The details are listed in Table 1.

Table 1 – Material number

"X"	Material of Inner conductor	"Y"	Material of the dielectric	"Z"	Material of sheath
1	Silver plated copper wire	S	Solid PTFE	1	Fluorinated ethylene propylene (FEP)
2	Silver plated copper clad steel wire	E	Expand PTFE	2	Polyvinylchloride (PVC)
3	Other material	P	Profiled PTFE	3	Low smoke, zero-halogen polyolefin (LSZH)
		O	Other material	4	Other sheath material
				5	No sheath

6.2 Cable marking

The cable marking shall be applied to the outer conductor (when there is no sheath) or sheath. The marking shall comply with 6.2 of this document or any other marking as specified in the relevant detail specification.

Cable marking shall be made up of the following elements:

a) variants naming (see Clause 6);

b) the number of the IEC sectional specification.

For example: 50-141-1S2 IEC 61196-8 means 50 Ω semi-flexible cable with silver plated copper conductor, solid PTFE dielectric, PVC sheath, 3,58 mm outer conductor nominal diameter according to IEC 61196-8.

6.3 Labeling

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

7 Tests for finished cables

The cable shall be 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.

7.1 Electrical testing of the finished cable (see Table 2)

Table 2 – Electrical measurements

No.	IEC test procedure	Parameter	Requirements/Remarks
7.1.1	61196-1-101	Conductor direct current resistance	Value in accordance with the relevant detail specification
7.1.2	61196-1-103	Capacitance	Value in accordance with the relevant detail specification, typical values are for: 50 Ω and solid PTFE dielectric: 97 pF/m 50 Ω and expanded PTFE dielectric: 88 pF/m 75 Ω and solid PTFE dielectric: 63 pF/m 75 Ω and expanded PTFE dielectric: 58 pF/m

No.	IEC test procedure	Parameter	Requirements/Remarks
7.1.3	61196-1-105	Withstand voltage of dielectric	Value in accordance with the relevant detail specification
7.1.4	62230 (spark test)	Withstand voltage of sheath	Value in accordance with the relevant detail specification
7.1.5	61196-1-108	Mean characteristic impedance	Value in accordance with the relevant detail specification. Typical values are 35 Ω, 50 Ω, 60 Ω, 75 Ω, 100 Ω
7.1.6	61196-1-115	Regularity of impedance	Value in accordance with the relevant detail specification
7.1.7	61196-1-108	Relative propagation velocity (velocity ratio)	Value in accordance with the relevant detail specification. Typical values are for: solid PTFE dielectric: 70 % expanded or profiled PTFE dielectric: 80 %
7.1.8	61196-1-112	Return loss	Value in accordance with the relevant detail specification
7.1.9	61196-1-113	Attenuation	Value in accordance with the relevant detail specification
7.1.10	62037-1 62037-4	Intermodulation (IM3)	This test is only applicable to 50 Ω type cables. Both ends of the specimen should be attached with type 7-16 connectors (according to IEC 61169-4). Input signal frequencies and power of f_1 and f_2 and the minimum IM requirement shall be specified in the relevant detail specification.
7.1.11	62153-4-4	Screening attenuation	Test frequency range: 500 MHz ≤ f ≤ 3 GHz Requirement ≥100 dB If not otherwise specified in the relevant detail specification, the screening attenuation shall be tested after a repeated bending according to IEC 61196-1-314 Clause 6 with following parameters: a) the angle of displacement: 90 ° b) number of cycles: 35 c) mass of the weight: 2 kg d) bending radius R: 10 times the diameter over the outer conductor e) test temperature: 20 °C ± 5 °C NOTE An alternative test method (GTEM method) is under consideration.
7.1.12	61196-1-102	Insulation resistance	≥ 10^4 MΩ·km