

FINAL VERSION

VERSION FINALE

**Radio frequency cables –
Part 0-1: Guidelines to the design of detail specifications – Coaxial cables**

**Câbles pour fréquences radioélectriques –
Partie 0-1: Lignes directrices pour la conception des spécifications particulières –
Câbles coaxiaux**



CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Symbols and numbering	6
3.1 Register of symbols used.....	6
3.2 Numbering of construction elements	8
4 Material constants	9
4.1 Table of material constants relating to dielectric and sheath and their values for different materials.....	9
4.2 Tables of material constants relating to conductors.....	11
4.3 Construction constants	12
4.3.1 Table of construction constants relating to inner conductor	12
4.3.2 Table of construction constants relating to braided outer conductors and screens.....	12
4.4 Table of braid wire dimensions of outer conductor and screen	13
4.5 Attenuation factors.....	13
4.6 Maximum permissible input power	14
5 Standard values of characteristic impedance and outer diameter of dielectric.....	14
5.1 Nominal characteristic impedance of coaxial cables.....	14
5.2 Nominal diameters over dielectric of coaxial cables	15
6 Cable construction details	16
6.1 General.....	16
6.2 Inner conductor.....	17
6.3 Stranded inner conductor.....	17
6.4 Braided outer conductors	17
6.5 Medium between outer conductor and screen	18
6.6 Braided screen.....	18
6.7 Sheath diameters.....	18
6.8 Weight calculation.....	18
7 Calculation of electrical properties.....	19
7.1 DC resistance of conductors and screen, per unit length.....	19
7.2 Attenuation	20
7.3 Nominal characteristic impedance Z_0 and capacitance C_2 per unit length.....	20
7.4 Power rating	20
7.4.1 Average power rating.....	20
7.4.2 Peak power rating.....	21
7.5 Permissible voltages.....	22
7.5.1 Test voltage, dielectric, U_t	22
7.5.2 Discharge test voltage, dielectric, U_d	22
7.5.3 Maximum permissible operating voltage, U_0	22
7.5.4 Test voltage, sheath	23
7.6 Insulation resistance	23
7.7 Current carrying capacity of coaxial cables	23
7.7.1 Principle	23
7.7.2 Definitions	23
7.7.3 Requirements	24

Figure 1 – Graph for calculation of maximum permissible input power	14
Table 1 – Example of use of k_x factor	8
Table 2 – Example of use of k_{xy} factor	8
Table 3 – Material constants relating to dielectric and sheath and their values for different materials	9
Table 4 – Conductivity (at 20 °C) and density	11
Table 5 – Coating factor ^a	11
Table 6 – Tinned copper wire.....	11
Table 7 – Copper clad steel wire.....	12
Table 8 – Construction constants relating to inner conductor	12
Table 9 – Construction constants relating to braided outer conductors and screens	13
Table 10 – Braid wire dimensions of outer conductor and screen	13
Table 11 – Factor relating to calculation of attenuation – examples	13
Table 12 – Nominal diameters D_2 over dielectric and the tolerances.....	15
Table 13 – Special design features	16
Table 14 – Special design features	17
Table 15 – Braided outer conductors	17
Table 16 – Medium between outer conductor and screen.....	18
Table 17 – Braided screen	18
Table 18 – Sheath diameters	18
Table 19 – Weight calculation	19
Table 20 – Electrical properties.....	19
Table 21 – Factors for calculation of attenuation.....	20
Table 22 – Test voltages for PVC sheaths	23

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIO FREQUENCY CABLES –

Part 0-1: Guidelines to the design of detail specifications – Coaxial 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.
- 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.

DISCLAIMER

This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.

This Consolidated version of IEC 60096-0-1 bears the edition number 3.1. It consists of the third edition (2012-10) [documents 46A/1043/FDIS and 46A/1064/RVD] and its amendment 1 (2017-01) [documents 46A/1317/FDIS and 46A/1321/RVD]. The technical content is identical to the base edition and its amendment.

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

International standard IEC 60096-0-1 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 constitutes a technical revision.

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

- tables of material constants and factors and have been updated, different equations have been updated and corrected;
- a subclause dealing with the calculation of “Current carrying capacity of coaxial cables” has been added as Subclause 7.7.

A list of all the parts in the IEC 60096 series, published under the general title *Radio frequency cables*, can be found on the IEC website.

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

The committee has decided that the contents of the base publication and its amendment 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.

RADIO FREQUENCY CABLES –

Part 0-1: Guidelines to the design of detail specifications – Coaxial cables

1 Scope

This part of IEC 60096 provides guidance for the design of radio frequency coaxial cables with braid, metallic tapes or tubular outer conductors.

2 Normative references

Void.

3 Symbols and numbering

3.1 Register of symbols used

Symbol	Designation	Unit
α	Total attenuation per unit length, 20 °C	dB/100 m
α_T	Total attenuation per unit length, $T \neq 20$ °C	dB/100 m
α_x	Attenuation due to element x, 20 °C	dB/100 m
β_x	Braid angle of element x	° (degree)
γ_x	Density of the material of element x	g/cm ³
δ_x	Loss angle of the material of element x	rad
ε_x	Relative dielectric permittivity of the material of element x	–
χ_x	Conductivity of the material of element x, 20 °C	m/Ωmm ²
σ_x	Thermal resistivity of the material of element x	K·m/W
B_x	Braid coverage concerning element x	–
c_0	Velocity of propagation in free space	m/s
C	Dielectric diameter	mm
C_x	Capacitance of element x, per unit length	pF/m
d_x	Diameter of individual wires of element x	mm
D_x	Outer diameter of element x	mm
D_{xe}	Electrical effective diameter of element x	mm
D_{xm}	Mean diameter of element x	mm
D	Sheath diameter	mm
D_s	Outer conductor diameter	mm
d	Center conductor diameter	mm
E_2	Maximum permissible voltage gradient of dielectric (peak value)	kV/mm
ε	Surface emissivity (sheathed=0,95, bare=0,35)	
f	Frequency	MHz
h_x	Coating thickness concerning element x	mm
I	Current carrying capacity (Amperes)	
k_x, k_{xy}	Calculation factors according to Tables 1 and 2	–
L_x	Braid lay length concerning element x	mm