IEC 60153-4

Edition 3.0 2017-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Hollow metallic waveguides –
Part 4: Relevant specifications for circular waveguides

Guides d'ondes metalliques creux –
Partie 4: Spécifications particulières pour les guides d'ondes circulaires

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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOLLOW METALLIC WAVEGUIDES –

Part 4: Relevant specifications for circular waveguides

FOREWORD

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International Standard IEC 60153-4 has been prepared by subcommittee 46F: RF and microwave passive components, of IEC technical committee TC:46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories.

This third edition cancels and replaces the second edition published in 1973-1. This edition constitutes a technical revision.

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

a) Expand and revise the operation frequency range for waveguides;
b) Revise the allowance of aperture dimensions;
c) Revise the test method for aperture dimensions;
d) Revise the equation of attenuation.

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

CDV	Report on voting
46F/344/CDV	46F/356/RVC

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.

A list of all the parts in the IEC 60153 series, published under the general title *Hollow metallic waveguides*, 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- withdrawn,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.

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HOLLOW METALLIC WAVEGUIDES –

Part 4: Relevant specifications for circular waveguides

1 Scope

This part of IEC 60153 specifies straight hollow metallic tubing of circular waveguides for use as waveguides in electronic equipment.

The aim of this recommendation is to specify for hollow metallic waveguides:

a) the details necessary to ensure compatibility and, as far as essential, interchangeability;

b) test methods;

c) uniform requirements for the electrical and mechanical properties.

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 60050-726:1982, *International Electrotechnical Vocabulary. Transmission lines and waveguides*

IEC 60261, *Sealing test for pressurized waveguide tubing and assemblies*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-726:1982 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 General

4.1 Standardized types

The series of circular waveguides covered by this publication are shown in Tables 1 and 2. The preferred types are shown in Table 2. As it might be desirable to use circular waveguides of intermediate sizes, Table 3 has been added in which the latter types are included.

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4.2 Type designation

For these waveguides, the type designation comprises:

- The code: 60153 IEC-C
- A number characterizing a particular size of waveguide. This number expresses ‘approximately in multiples of 100 MHz the geometric mean frequency in the H_{11} (TE_{11}) mode.

4.3 Frequency range

In Table 2, the cut-off frequencies are shown for the following modes:

TE_{11}, TM_{01}, TE_{21}, TE_{01} and TE_{02}.

5 Mechanical requirements

5.1 General

It should be noted that no recommendations are made for the materials to be used for waveguides. The choice of material must be agreed between customer and manufacturer.

5.2 Dimensions

5.2.1 Basic diameter and deviations

The basic diameters (inner diameters) and the deviations are specified in Table 1.

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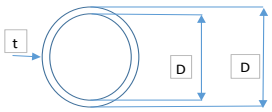
Table 1 – Basic diameter and deviations



Dimensions in millimetres

Type	Cut-off frequency in GHz for the mode					Inside cross-section		Basic wall thicknss	Outside cross-section		Theoretical value of attenuation in dB/m				
designation 60153 IEC	TE11	TM01	TE21	TE01	TE02	Basic diameter D	Deviation		Basic diameter	Dcviation	Frequency in GHz	Standard Cupper	Alminium	Gold	Brass
C 3.3	0.27	0.35	0.45	0.56	1.03	647.90	0.64				0.325	0.0007	0.00084	0.00077	0.00102
C 4	0.32	0.41	0.53	0.66	1.21	553.49	0.56				0.38	0.0009	0.0011	0.0010	0.00129
C 4.5	0.37	0.48	0.62	0.77	1.42	472.85	0.48				0.446	0.0011	0.0013	0.0012	0.0016
C 5.3	0.43	0.57	0.72	0.90	1.66	403.94	0.41				0.522	0.0014	0.0017	0.0015	0.0021
C 6.2	0.51	0.66	0.84	1.06	1.94	345.06	0.36				0.611	0.0017	0.0021	0.0020	0.0026
C 7	0.60	0.78	0.99	1.24	2.27	294.79	0.30		For subsequent study		0.715	0.0022	0.0027	0.0025	0.0033
C 8	0.70	0.91	1.16	1.45	2.66	251.84	0.25				0.838	0.0028	0.0034	0.0031	0.0042
C 10	0.82	1.07	1.35	1.70	3.11	215.14	0.22				0.98	0.0035	0.0044	0.0040	0.0053
C 12	0.96	1.25	1.59	1.99	3.64	183.77	0.18				1.147	0.0045	0.0055	0.0051	0.0067
C 14	1.12	1.46	1.86	2.33	4.26	157.00	0.16				1.343	0.0056	0.0070	0.0064	0.0085
C 16	1.31	1.71	2.17	2.73	4.99	134.11	0.13				1.572	0.007	0.0089	0.0081	0.0108
C 18	1.53	2.00	2.54	3.19	5.84	114.58	0.11	3.3	121.21	0.13	1.8410	0.009	0.011	0.010	0.0136
C 22	1.79	2.34	2.98	3.74	6.84	97.87	0.10	3.3	104.50	0.10	2.1540	0.011	0.014	0.013	0.017
C 25	2.10	2.74	3.49	4.37	8.01	83.617	0.081	3.3	90.20	0.10	2.5210	0.015	0.018	0.016	0.022
C 30	2.46	3.21	4.08	5.12	9.37	71.425	0.071	3.3	78.029	0.089	2.9520	0.018	0.023	0.021	0.028
C 35	2.88	3.76	4.77	5.99	11.00	61.036	0.061	3.3	67.640	0.089	3.4550	0.023	0.029	0.026	0.035
C 40	3.38	4.41	5.61	7.03	12.90	51.994	0.051	2.5	57.074	0.089	4.0560	0.030	0.037	0.034	0.045
C 48	3.95	5.16	6.56	8.23	15.10	44.450	0.043	2.5	49.530	0.076	4.7440	0.037	0.046	0.042	0.056
C 56	4.61	6.02	7.65	9.60	17.60	38.100	0.038	2.0	42.164	0.076	5.5340	0.047	0.059	0.053	0.071
C 65	5.40	7.05	8.96	11.20	20.60	32.537	0.033	2.0	36.601	0.076	6.4800	0.060	0.074	0.068	0.090
C 76	6.32	8.26	10.50	13.20	24.10	27.788	0.028	1.7	31.090	0.076	7.5880	0.08	0.094	0.086	0.114
C 89	7.37	9.63	12.20	15.30	28.10	23.825	0.023	1.7	27.127	0.064	8.8500	0.10	0.12	0.11	0.144
C 104	8.68	11.30	14.40	18.10	33.10	20.244	0.020	1.3	22.784	0.064	10.42	0.12	0.15	0.14	0.18
C 120	10.00	13.10	16.70	20.90	38.30	17.475	0.018	1.3	20.015	0.064	12.07	0.15	0.19	0.17	0.23
C 140	11.60	15.20	19.30	24.20	44.40	17.628	0.015	1.0	17.120	0.051	13.98	0.11	0.13	0.12	0.16
C 165	13.80	18.10	22.90	28.80	52.70	12.700	0.013	1.0	14.732	0.051	16.61	0.25	0.30	0.28	0.37
C 190	15.80	20.60	26.20	32.90	60.20	11.125	0.010	1.0	13.106	0.051	18.95	0.30	0.37	0.34	0.45
C 220	18.40	24.10	30.60	38.40	70.30	9.525	0.010	0.76	11.049	0.051	22.14	0.38	0.47	0.43	0.57
C 255	21.10	27.50	35.00	43.90	80.40	8.3312	0.0076	0.76	9.855	0.051	25.31	0.46	0.57	0.52	0.69
C 290	24.60	32.20	40.80	51.20	93.80	7.1374	0.0076	0.76	8.661	0.051	29.54	0.58	0.72	0.66	0.88
C 330	27.70	36.10	45.90	57.60	105.00	6.3500	0.0076	0.51	7.366	0.051	33.20	0.7	0.86	0.79	1.04
C 380	31.60	41.30	52.40	65.70	120.00	5.5626	0.0076	0.51	6.579	0.051	37.91	0.8	1.0	0.96	1.27
C 430	36.80	48.10	61.00	76.60	140.00	4.7752	0.0076	0.51	5.791	0.051	44.16	1.1	1.3	1.2	1.6
C 495	40.20	52.50	66.70	83.70	153.00	4.3688	0.0076	0.51	5.385	0.051	48.26	1.2	1.5	1.4	1.8
C 580	49.10	64.10	81.40	102.00	187.00	3.5814	0.0076	0.51	4.597	0.051	58.88	1.6	2.0	1.9	2.5
C 660	55.30	72.30	91.80	115.00	211.00	3.1750	0.0076	0.38	3.937	0.051	66.41	2.0	2.4	2.2	3.0
C 765	63.50	82.90	105.00	132.00	242.00	2.7686	0.0076	0.38	3.531	0.051	76.15	2.4	3.0	2.7	3.6
C 890	73.60	96.10	122.00	153.00	280.00	2.3876	0.0076	0.38	3.150	0.051	88.30	3.0	3.7	3.4	4.5
C1040	86.8	113	144	181	331	2.0244	0.0076				104.16	3.9	4.8	4.4	5.8
C1650	100	131	167	209	383	1.7475	0.0076				120	4.9	6.1	5.5	7.4
C 1400	116	152	193	242	444	1.7628	0.0076				139.2	3.4	4.2	3.8	5.1
C 1650	138	181	229	288	527	1.2700	0.0076				165.6	7.8	9.7	8.9	11.8
C 1900	158	206	262	329	602	1.1125	0.0076				189.6	9.5	11.7	10.7	14.2
C 2200	184	241	306	384	703	0.9525	0.0076				220.8	12.0	14.9	13.6	18.1
C 2550	211	275	350	439	804	0.8331	0.0076				253.2	14.6	18.1	16.5	21.9
C 2900	246	322	408	512	938	0.7137	0.0076				295.2	18.5	22.9	20.9	27.8
C 3300	277	361	459	576	1050	0.6350	0.0076				332.4	21.9	27.1	24.8	32.9
C 3800	316	413	524	657	1200	0.5563	0.0076				379.2	26.7	33.2	30.3	40.2
C 4300	368	481	610	766	1400	0.4775	0.0076				441.6	33.6	41.7	38.1	50.6
C 4950	402	525	667	837	1530	0.4369	0.0076	If necessary, outside dimension			482.4	38.5	47.8	43.6	58.0
C 5800	491	641	814	1020	1870	0.3581	0.0076	should specified.			589.2	51.7	64.1	58.5	77.8
C 6600	553	723	918	1150	2110	0.3175	0.0076				663.6	62.2	77.2	70.5	93.6
C 7650	635	829	1050	1320	2420	0.2769	0.0076				762	76	94.4	86.2	114.5
C 8900	736	961	1220	1530	2800	0.2388	0.0076				883.2	95	118	108	143.2
C10400	868	1130	1440	1810	3310	0.2024	0.0076				1041.6	122	151	138	183
C16500	1000	1310	1670	2090	3830	0.1748	0.0076				1200	155	192	175	233
C 14000	1160	1520	1930	2420	4440	0.1763	0.0076				1392	107	133	122	162
C 16500	1380	1810	2290	2880	5270	0.1270	0.0076				1656	247	307	280	372
C 19000	1580	2060	2620	3290	6020	0.1113	0.0076				1896	299	371	339	450
C 22000	1840	2410	3060	3840	7030	0.0953	0.0076				2208	381	472	431	573
C 25500	2110	2750	3500	4390	8040	0.0833	0.0076				2532	461	572	522	694
C 29000	2460	3220	4080	5120	9380	0.0714	0.0076				2952	584	724	661	878

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