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Edition 2.0 2016-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Hollow metallic waveguides –
Part 1: General requirements and measuring methods

Guides d'ondes métalliques creux –
Partie 1: Exigences générales et méthodes de mesure

IEC 60153-1:2016-05(en-fr)

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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOLLOW METALLIC WAVEGUIDES –

Part 1: General requirements and measuring methods

FOREWORD

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International Standard IEC 60153-1 has been prepared by subcommittee 46F: RF and microwave passive components, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories.

This second edition cancels and replaces the first edition published in 1964. This edition constitutes a technical revision.

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

a) expand the operation frequency range;
b) revise the equation of attenuation.

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

CDV	Report on voting
46F/302/CDV	46F/316/RVC

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 60154: Flanges for waveguides.

A list of all 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 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,
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INTRODUCTION

This International Standard relates to straight hollow metallic tubing for use as waveguides in electronic equipment. In recent years, the operation frequency of waveguide components and systems has been extended to 1 THz and above. However, the first edition of the IEC 60153 series of standards only specified the aperture dimensions for ordinary rectangular waveguide for frequencies up to 325 GHz. In addition, the first edition of the IEC 60153 series of standards, dating from the 1960's, does not meet the needs of the current applications. This new edition of IEC 60153-1 addresses these two issues by extending the frequency coverage to 3 300 GHz and by addressing current applications for this type of waveguide.

This standard takes into account IEC 60068 when necessary.

When there is a difference between the general requirements and the relevant specification sheet, the latter prevails.

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HOLLOW METALLIC WAVEGUIDES –

Part 1: General requirements and measuring methods

1 Scope

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

It covers:

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.

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

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 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org/)

IEC 60068 (all parts), *Environmental testing*

IEC 60154, *Flanges for 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, as well as the following apply.

3.1
type test
complete series of tests to be carried out on a number of specimens representative of the type, with the object of determining whether a particular manufacturer can be considered to be able to produce products meeting the specification

3.2
type approval
decision by the proper authority (the customer himself or his nominee) that a particular manufacturer can be considered to be able to produce in reasonable quantities the type meeting the specification

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3.3
acceptance tests
tests carried out to determine the acceptability of a consignment on the basis of an agreement between customer and manufacturer

Note 1 to entry: The agreement shall cover:

a) the sample size,

b) the selection of tests,

c) the extent to which the specimens shall conform to the requirements for the selected tests of the specification.

Note 2 to entry: In cases of divergent test results, the IEC standard test methods shall be used for acceptance tests.

As these recommendations only cover type tests, these definitions are included only for brief information of testing specification.

3.4
factory tests
tests carried out by the manufacturer to verify that their products meet the specification

4 Type designation

4.1 Type

Type of products comprises similar design features manufactured by the same techniques and falling within the manufacturer's usual range of ratings for these products.

NOTE 1 Mounting accessories are ignored, provided they have no significant effect on the test results.

NOTE 2 Ratings cover the combination of:

a) electrical ratings,

b) sizes,

c) environmental group.

NOTE 3 The limits of the range of ratings shall be agreed between customer and manufacturer.

4.2 Designation

The reference indication for waveguides covered by this specification shall comprise the following:

a) the number of the IEC publication (60153);

b) the letters “IEC";

c) a hyphen;

d) a letter indicating the shape of the inside cross-section of the waveguide:

R = ordinary rectangular (with a ratio of height to width of approximately 1:2)

F = flat rectangular

C = circular.

For other types of waveguides this letter indication shall be in accordance with the relevant specification sheets;

e) a number characterizing a particular size of waveguide. This number indicates a frequency characteristic of the waveguide;

f) where necessary, an additional indication as indicated on the relevant specification sheets. The letter “P" shall be used to indicate close tolerance types.

Example:

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"60153 IEC-R 100" denotes a 22,860 mm × 10,160 mm (0,900 in × 0,400 in) ordinary rectangular waveguide with a centre frequency of approximately 10 GHz in the dominant mode.

5 Standard atmospheric conditions for testing

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 60068.

Before the measurements are made, the waveguide shall be stored at the measuring temperature for a time sufficient to allow the entire waveguide to reach this temperature.

When measurements are made at a temperature other than the specified temperature, the results shall, where necessary, be corrected to the specified temperature. The ambient temperature at which the measurements are made shall be stated in the test report.

As these recommendations only cover type tests, these definitions are included only for brief information of testing conditions.

6 Visual inspection

The waveguides shall be uniform in composition and in wall thickness and shall be straight and smooth from end to end. There shall be no burrs, cracks, die marks, chatter marks, dirt, grease or other irregularities of the surface.

Both inner and outer surface shall have a clean bright appearance in accordance with good current practice.

7 Mechanical requirements

7.1 Dimensions

7.1.1 General

The dimensions of the waveguides and the tolerances thereon shall be in accordance with the values given on the relevant specification sheets. Dimensions and tolerance shall be given both in millimetres and inches, indicating in which system of units the dimensions were originated.

Independent of the system of units, the nominal dimensions of the inside and outside cross section shall be given in such a way that the values, the first digit of which is 3 to 9, should be given by 4 significant figures and those with first digits being 1 or 2 by 5 significant figures. In principle, internal nominal dimensions shall be rounded off to the nearest 0,001 mm or 0,0001 in and external dimensions should be rounded off to the nearest 0,01 mm or 0,001 in.

NOTE When these rules are applied, a junction of two hypothetical waveguides each with a nominal value in one of the systems will produce a calculated reflection of less than –70 dB for ordinary rectangular waveguides, except for the smaller types.

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