

Flanges for waveguides —

Part 1: General requirements

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Committees responsible for this British Standard

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- AEA Technology
- BEAMA Electrical Cable and Conductor Accessory Manufacturers
- British Non-Ferrous Metals Federation
- British Telecommunications plc
- Federation of the Electronics Industry
- Ministry of Defence
- National Supervisory Inspectorate
- Society of Cable Television Engineers

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National foreword

This British Standard has been prepared by Subcommittee EPL/46/2 and is the English language version of EN 60154-1:1994 *Flanges for waveguides Part 1: General requirements* including amendment A1:1994 published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 154-1:1982 and its amendment 1:1993 published by the International Electrotechnical Commission (IEC).

Within this standard several areas have been identified that require amendment or revision. These areas are being considered by the British national subcommittee (EPL/46/2) for submission as possible new work items to be included in the CENELEC/IEC work programmes.

Cross-references

Publication referred to	Corresponding British Standard
	BS 4727 <i>Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms</i>
IEC 50 (726):1982	Part 3: <i>Terms particular to telecommunications and electronics</i>
	Group 09:1991 <i>Transmission lines and waveguides</i>
HD 323 (IEC 68)	BS EN 60068 <i>Environmental testing</i>

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

English version

Flanges for waveguides Part 1: General requirements

(IEC 154-1:1982 + A1:1993)

Brides pour guides d'ondes
Première partie: Prescriptions générales
(CEI 154-1:1982 + amendment 1:1993)

Flansche für Hohlleiter
Teil 1: Allgemeine Anforderungen
(IEC 154-1:1982 + amendment 1:1993)

This European Standard was approved by CENELEC on 1994-07-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

At the request of CENELEC 78th Technical Board, HD 129.1 S2:1984 (IEC 154-1:1982) was submitted to the CENELEC voting procedure for conversion into a European Standard.

The text of the International Standard was approved by CENELEC as EN 60154-1 on 5 July 1994.

The following dates were fixed:

- latest date of publication of a harmonized national standard (dop) 1995-07-15
- latest date of withdrawal of conflicting national standards (dow) —

Annexes designated “normative” are part of the body of the standard. In this standard, annex ZA is normative.

Foreword to amendment A1

The CENELEC questionnaire procedure, performed for finding out whether or not amendmnet 1:1993 to the International Standard IEC 154-1:1982 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members formal vote and was approved by CENELEC as amendment A1 to EN 60154-1 on 5 July 1994.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1995-07-15
- latest date of withdrawal of conflicting national standards (dow) 1995-07-15

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This standard takes into account, when necessary, IEC Publication 68: Basic Environmental Testing Procedures and shall be used in conjunction with IEC Publication 153: Hollow Metallic Waveguide, and ISO Recommendation R 286.

When there is a difference between the general requirements and the relevant specifications, the latter shall prevail.

Scope

This standard relates to the dimensions of waveguide flanges for use in electronic equipment.

It covers requirements for flanges drilled before or after mounting on waveguides. It should be noted that for optimum electrical performance, post-drilling of the alignment holes after mounting is recommended.

Object

The aim of this standard is to specify for waveguide flanges the mechanical requirements necessary to ensure compatibility and, as far as practicable, interchangeability as well as to ensure adequate electrical performance.

1 General

1.1 Terminology

In accordance with IEC Publication 50(726): International Electrotechnical Vocabulary (I.E.V.), Chapter 726: Transmission Lines and Waveguides.

1.2 Flange designation

Waveguide flanges covered by this standard shall be indicated by a reference number comprising the following information:

- a) the number of the present IEC publication (154);
- b) the letters "IEC";
- c) a dash;
- d) a letter relating to the basic construction of the flange style, i.e.:

P = a flange having a gasket groove but no choke groove (formerly called pressurizable);

C = a choke flange with a gasket groove (formerly called choke, pressurizable);

U = a flange having neither a gasket groove nor a choke groove (formerly called un-pressurizable¹⁾).

e) a letter for the type according to the drawing. Flanges with the same letter and of the same waveguide size can be mated;

f) the letter and number of the waveguide for which the flange is designed.

Example: 154 IEC — CBR 100 denotes a choke flange of type B for ordinary rectangular waveguide 153 IEC — R 100.

1.3 Standard atmospheric conditions for testing

1.3.1 Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC Publication 68.

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

1.3.3 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.

1.4 Visual inspection

Waveguide flanges shall be uniform in composition. There shall be no burrs, cracks, die marks, dirt, grease, scale nor splinters.

Contact surfaces shall have a clean appearance in accordance with good current practice.

Compliance is checked by visual inspection.

2 Mechanical requirements

2.1 General requirements both for mounted and unmounted flanges

2.1.1 Holes

Holes which are intended as alignment holes shall be precision drilled and clearly indicated on the drawing.

Holes which are not intended for alignment, i.e. attachment holes, may be less accurately located than are the alignment holes, but shall then be of correspondingly larger diameter to ensure mating of the flanges (see Sub-clause 2.1.3).

¹⁾ All flat flanges shall have this designation, including those that can be made pressure tight by using gaskets.

2.1.2 Shank diameter of bolts used for alignment

The following basic shank diameters are standardized:

mm	in
8.0	0.315 ^a
6.35	0.250
5.0	0.197
4.17	0.164
4.0	0.158
3.0	0.118

^a This value has been standardized for flanges originally designed to take bolts with 0.3125 in basic shank diameter. However, clearance and positional tolerance for the general purpose flanges are so chosen that bolts with 0.3125 in (7.94 mm) as well as 8.0 mm (0.315 in) shank can be used without violating the electrical requirements.

The deviation on the basic shank diameter shall be according to ISO fit h8.

2.1.3 Relation between shank and alignment hole diameters

For each individual flange, the proper mating of two flanges is ensured by specifying:

- the location and the basic diameters of the holes and the deviations thereon;
- the basic diameters of the shanks of coupling bolts with the appropriate fit.

The basic diameter of the holes shall be the same as that of the corresponding bolt shank.

The deviation on the hole diameter shall be specified for an ISO grade 9 fit for the alignment holes and for the corresponding ISO grade 15 fit for the attachment holes.

The positional tolerance on the holes shall be specified using either the rectilinear or the circular tolerancing method. Depending upon which method is used, the clearance between the maximum shank diameter ($d_{\max}$) and the minimum hole diameter ($D_{\min}$) shall conform to one of the following (the inequality sign prevents the possibility of an interference fit):

Rectilinear tolerances

$$D_{\min} - d_{\max} > (2\sqrt{2})\delta$$

where:

δ = the hole position tolerance in both directions.

NOTE The multiplication factor of $\sqrt{2}$ takes into account the displacement in two directions perpendicular to each other.

Circular tolerances

$$D_{\min} - d_{\max} > Z$$

where:

Z = the diameter of the circular tolerance zone.

2.1.4 Overall dimensions and thickness of flanges

The values quoted are taken from established designs and it should be noted that these values are based in general on the use of brass, but for other materials other values might be more appropriate.

2.1.5 Surface roughness of contact area of contact flanges

For subsequent study.

2.1.6 Flatness of contact area

The requirements on the flatness of the contact area shall be specified in the relevant specification.

2.1.7 Perpendicularity of the axis of the holes

The perpendicularity of the axis of the holes to the contact area of the flange shall be $90 \pm \frac{1}{4}^\circ$.

NOTE When the circular tolerancing method is applied to the position of the holes, a perpendicularity requirement is implied.

2.2 General requirements for mounted flanges (assemblies)

2.2.1 Positioning of the holes

Positioning of the holes shall be based on the theoretical symmetry lines of the inside cross-section of the waveguide.

2.2.2 Perpendicularity of the contact area

The perpendicularity of the contact area of the flange to the axis of the waveguide shall be $90 \pm \frac{1}{4}^\circ$.

2.3 Additional requirements for unmounted flanges

2.3.1 General

The drawings shown are for mounted flanges.

In the individual drawings one or more methods are shown for the mounting of flanges to the waveguide by way of example.

This, however, does not exclude other methods of mounting.

2.3.2 Shape of aperture

The requirements for the dimensions of the aperture in the flange only apply to that part which affects mating between the flange and the waveguide.

The basic dimensions of the flange aperture shown in the tables are equal to the basic outside dimensions of the tubes according to the IEC Publication 153 series.

The deviation on the dimensions of the aperture will depend on the materials and the assembly methods and shall therefore be agreed upon between purchaser and manufacturer.

NOTE For socket-types, the front-aperture shall have dimensions within the tolerances specified for the inside cross-section of the appropriate size of waveguide.

2.3.3 Positioning of the holes

Positioning of the holes is based on the symmetry lines of the aperture of the flange.

2.3.4 Ordering information

When ordering unmounted flanges, an allowance should be made on certain specified dimensions to permit, if necessary, machining after mounting.

3 Metric thread precision shoulder bolts and precision pins used for alignment of flanges

The shank diameter of the alignment shafts contained herein is identical with the diameter of the alignment bolts in this standard. Alignment bolt lengths have been so chosen to permit the use of additional hardware such as washers, lockwashers, and either plain or self-locking nuts.

When ordering, the designation comprises the following:

- For type of alignment shaft:
B = bolt
P = pin
- For size:
bolts: M followed by a number [X] M[X] = size
pins: M followed by a number [X] M[X] = size
- For material:
A = stainless steel
X = material agreed upon between user and manufacturer
- A letter indicating finish:
U = untreated
T = tin
Z = zinc
C = cadmium
X = alternative finish agreed upon between user and manufacturer.
- For bolts, additional numbers to indicate the overall length and the length of the unthreaded portion:

Example: BM 4 AU 18 × 9 is a bolt size M4 made from stainless steel, untreated, overall length of 18 mm and the length of the unthreaded portion 9 mm.

It should be noted that the bolts for R 100, 120, 140 and 180 are of the same length, but the bolts for R 100 have a larger (4,152 mm) diameter plain shank. When ordering these, therefore, it should be indicated for which flange/waveguide size they are to be used.