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BSI Standards Publication

Fibre optic interconnecting devices and passive components — Fibre optic connector interfaces

Part 1: General and guidance

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National foreword

This British Standard is the UK implementation of EN 61754-1:2013. It is identical to IEC 61754-1:2013. It supersedes BS EN 61754-1:1997 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/2, Fibre optic interconnecting devices and passive components.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Lichtwellenleiter - Verbindungselemente und passive Bauteile - Steckgesichter von Lichtwellenleiter-Steckverbindern - Teil 1: Allgemeines und Leitfaden (IEC 61754-1:2013)

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Foreword

The text of document 86B/3503/CDV, future edition 2 of IEC 61754-1, prepared by subcommittee 86B “Fibre optic interconnecting devices and passive components” of IEC/TC 86 "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61754-1:2013.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-06-24
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2014-09-24

This document supersedes EN 61754-1:1997.

EN 61754-1:2013 includes the following significant technical changes with respect to EN 61754-1:1997:

a) general reconsideration of performance requirements;

b) addition of Figure 1.

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Endorsement notice

The text of the International Standard IEC 61754-1:2013 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61753 Series	NOTE	Harmonised in EN 61753 series (not modified).
IEC 61931	NOTE	Harmonised as EN 61931 (not modified).
ISO 1101	NOTE	Harmonised as EN ISO 1101 (not modified).
ISO 2692	NOTE	Harmonised as EN ISO 2692 (not modified).
ISO 5458	NOTE	Harmonised as EN ISO 5458 (not modified).
ISO 5459	NOTE	Harmonised as EN ISO 5459 (not modified).
ISO 7083	NOTE	Harmonised as EN ISO 7083 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-731 + Corr. July	1991 1992	International Electrotechnical Vocabulary (IEV) - Chapter 731: Optical fibre communication	-	-
IEC 60874-1	2011	Fibre optic interconnecting devices and passive components - Connectors for optical fibres and cables - Part 1: Generic specification	EN 60874-1	2012
IEC 61754	Series	Fibre optic interconnecting devices and passive components - Fibre optic connector interfaces	EN 61754	Series

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INTRODUCTION

An optical connector interface is a collection of physical features on a connector assembly that defines a specified style. It consists of those minimum features that are functionally critical (i.e. work together) during the mechanical mating and unmating sequences of the connector with its counterpart component. The interface defines the size, relative location and tolerance for each of the features. In addition, it defines the location for the optical datum target.

This part of IEC 61754 contains those interfaces that have been standardized for international use. It consists of individual sets of plug and adaptor interfaces. Each set contains at least two counterpart interfaces that mate together. The standards therefore only ensure that the two counterpart interfaces will mate together and that they will mate with a specified fit tolerance between the mating features.

It is important to emphasize that the standard interfaces define physical dimensions only and that no guarantee of performance is implied, nor should be assumed, for connectors that comply with the standards. Manufacturers using the standards are responsible for positioning the optical fibre or device port at the optical datum target location with the accuracy necessary to meet their required performance.

An optical connector, by definition, mates with another optical component. Typically, the mating component is another optical connector. In many cases, however, the mating component is not another connector but rather an optical component such as a switch, a branching device or an active device. The portion of the component that contains the mating features to receive and position the connector is called an adaptor.

This standard makes a distinction between a connector interface and an adaptor interface. An adaptor interface may not contain an optical datum target as in the case where two connector plugs are engaged and are aligned by an alignment sleeve. However, the adaptor does contain an optical datum target whenever it positions an optical fibre or optical fibre waveguide, as in an active device or branching device.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC CONNECTOR INTERFACES –

Part 1: General and guidance

1 Scope

This part of IEC 61754 covers general information on the subject of fibre optic connector interfaces. It includes references, definitions and rules for creating and interpreting the standard drawings.

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 60050-731:1991, *International electrotechnical vocabulary – Chapter 731: Optical fibre communication*

IEC 60874-1:2011, *Fibre optic interconnecting devices and passive components – Connectors for optical fibres and cables – Part 1: Generic specification*

IEC 61754 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector intefaces*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
adaptor
component that permits mating between a connector and another optical component such as a connector, an active device, a switch, a branching device, etc.

3.2
adaptor interface
features involved in the mating and unmating sequences of the adaptor with the mating connector

Note 1 to entry: This takes into account their size and relative locations.

Note 2 to entry: It may also include an optical datum target.

3.3
alignment device
mechanical device that aligns at least one connector plug ferrule

Note 1 to entry: It is generally contained in an adaptor for the purpose of aligning one or two mating connector plug ferrules coincident to a common optical datum target.

3.4
basic dimension
numerical value used to describe the theoretically exact size, profile, orientation, or location of a feature or datum target

Note 1 to entry: It is the basis from which permissible variations are established by tolerances on other dimensions in notes, or in feature control frames.

3.5
connector interface
features involved in the mating and unmating sequence of the connector with a counterpart component

Note 1 to entry: This takes into account their size and relative locations.

Note 2 to entry: It also includes the location of the optical datum target.

3.6
datum
theoretically exact point, axis or plane derived from geometric counterpart of a specified datum feature

Note 1 to entry: A datum is the origin from which location or geometric characteristics of features of a part are established.

3.7
datum target
specified point, line, or area on a part used to establish a datum

3.8
dimension
numerical value expressed in appropriate units of measure and indicated on a drawing along with lines, symbols, and notes to define the size or geometric characteristic, or both, of a part or part feature

3.9
feature
general term applied to a physical portion of a part, such as a surface, hole, or slot

3.10
feature of size
one cylindrical or spherical surface, or set of two plane parallel surfaces, each of which is associated with a size dimension

3.11
ferrule
mechanical fixture, generally a rigid tube, used to confine the stripped end of a fibre bundle or an optical fibre

[SOURCE: IEC 60050-731:1991, definition 731-05-02]

3.12
geometrical tolerances
general term applied to the category of tolerances used to control form, profile, orientation and runout

3.13
least material condition
LMC
condition in which a feature of size contains the least amount of material within the stated limits of size, e.g. maximum hole diameter or minimum shaft diameter are both least material conditions

3.14
mating features
features of a connector that fit with the features of the counterpart connector during the mating sequence

3.15
maximum material condition
MMC
condition in which a feature of size contains the maximum amount of material within the stated limits of size, e.g. minimum hole diameter or maximum shaft diameter

3.16
optical datum target
theoretical datum point on a connector interface where the optical fibre core centre should be positioned by the connector plug or by the adaptor receptacle

3.17
optical fibre connector
component normally attached to a cable or piece of apparatus for the purpose of providing interconnection and disconnection of fibre optic cables

[SOURCE: IEC 60050-731:1991, definition 731-05-01]

3.18
optical fibre connector set
complete assembly of components required to provide demountable coupling between two or more optical fibre cables

[SOURCE: IEC 60874-1:2011, definition 3.15]

3.19
optical port
location in an optical component through which optical energy enters and/or exits

3.20
plug connector
connector that is inserted into the receptacle interface of another optical component of the same interface such as a receptacle connector, an active device, a switch, a branching device, etc.

3.21
receptacle connector
female connector that receives the plug interface of another optical component of the same interface such as a plug connector, an active device, a switch, a branching device, etc.

3.22
single limit dimension
dimension that is designated by MIN or MAX (minimum or maximum) instead of being labelled by both

Note 1 to entry: Single limit dimensions may be used where the intent is clear and the unspecified limit can be zero or approach infinity without causing a condition that is detrimental to the design.

3.23
tolerance
total amount by which a specific dimension is permitted to vary

Note 1 to entry: The tolerance is the difference between the maximum and minimum limits.

3.24
true position
theoretically exact location of a feature established by basic dimensions.

Figure 1 shows examples of plug, adaptor and receptacle for a connector.

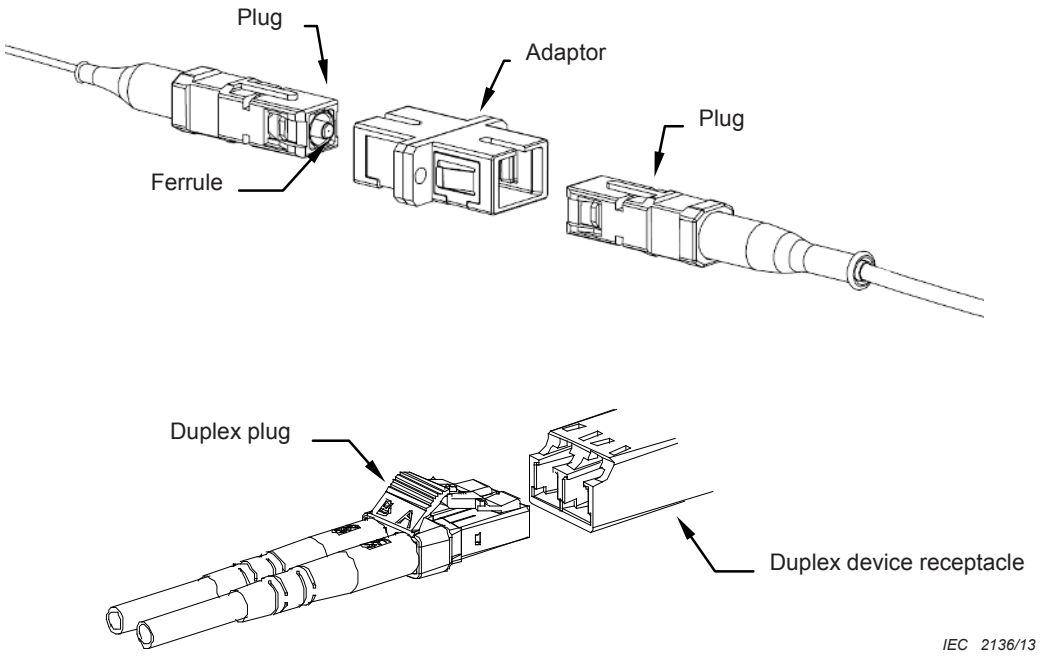

Figure 1 – Plug, adaptor and receptacle for a connector examples

4 Dimensioning system

The interface dimensions listed in subsequent parts of IEC 61754 are presented and interpreted using the tolerancing methods described in Annex A.

5 Gauges

This standard is not intended as a gauging standard. It is not intended that any gauges that are included as a method for specifying sizes and locations of features shall be designed exactly as illustrated, as long as the specified gauge dimensions are met.

6 Tolerance grades

Ferrules and alignment devices may be graded by tolerance. When grades are standardized, each grade tolerance is identified in the standard by a grade number (i.e. 1, 2, etc.). The grade number is annexed to the standard number.

Annex A
(normative)

Dimensioning connector interfaces

A.1 General

Annex A covers the dimensioning, tolerancing and related practices to be used on the connector interface drawings of IEC 61754. Uniform practices for stating and interpreting these drawings are established herein.

This annex is not intended to replace existing standards on dimensioning and tolerancing. Rather, it is intended to interpret and supplement, where necessary, the existing standards as they apply to connector interfaces.

A.2 Units

The interface drawings shall use the International System of Units (SI) [1][1].

A.3 Fundamental rules

Dimensioning and tolerancing shall clearly define the connector interface and shall conform to the following:

a) Each dimension shall be referenced on the interface drawing using a capital letter. The dimension values shall be tabulated in a supplementary table appearing with the drawing. In general, the same reference letter should be used for the counterpart features on the various drawings.

b) Each dimension shall have a tolerance, except for those dimensions specifically identified as maximum or minimum only. The tolerance may be applied directly to the dimension, or indirectly in the case of basic dimensions.

c) Dimensioning for size, form, and location of features shall be complete to the extent that there is full understanding of the characteristics of each feature.

d) A gauge definition may replace a direct dimension when direct dimensioning of a feature is impractical such as for resilient members, etc. When such dimensioning is used, a supplementary drawing of the gauge shall appear with the drawing and a note shall clearly state the use of the gauge.

e) Each mating feature for the interface shall be dimensioned. No more dimensions than those necessary for complete definition of the mechanical interface shall be given. The use of reference dimensions in the drawing shall be minimized.

f) Dimensions shall be selected and arranged to suit the function and mating relationships for the connectors and shall not be subject to more than one interpretation. The dimensions provided are intended to define specific features and not intended to be added or subtracted from other given dimensions in order to define undimensioned features.

g) The drawing shall define the interface without specifying manufacturing methods. Thus, only the diameter of a hole is given without indicating whether it is to be drilled, reamed, or made by any other operation.

h) Dimensions should be arranged to provide required information for optimum readability. Dimensions should be shown in true profile views and refer to visible outlines.

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1 References in square brackets refer to the Bibliography.

i) A 90° angle is implied where centre lines and lines depicting features are shown on the drawing at right angles and no angle is specified.

j) A 90° basic angle applies where centre lines of features in a pattern or surfaces shown at right angles on a drawing are located or defined by basic dimensions and no angle is specified.

k) All dimensions are applicable at 20 °C unless otherwise specified. Compensation may be made for measurements made at other temperatures.

l) Where a tolerance of form is not specified, the limits of the dimensions for a feature control the form as well as the size. The combined effect of size and form variations may not exceed the envelope of perfect form at maximum material condition (MMC).

m) Where interrelated features of size (features shown with a common axis or centre plane) have no geometric tolerance of location or runout specified, the limits of the dimensions of a feature control the location tolerance as well as the size. When interrelated features are at maximum material condition (MMC), they must be perfectly located to each other as indicated by the drawing.

n) Where perpendicular features (features shown at a right angle) have no geometric tolerance of orientation or runout specified, the limits of the dimensions for a feature control the orientation tolerance as well as the size. When perpendicular features are at maximum material condition (MMC), they have to fit perfectly orientated to each other as indicated by the drawing.

o) As the size of a feature departs from maximum material condition (MMC), variations in form, location and orientation are permissible.

Annex B
(informative)

Using interface standards

The interface standards given in the IEC 61754 series fully define and dimension the features that are essential for the mating and unmating of optical fibre connectors and other optical components. They also serve to position the optical datum target, where defined, relative to other reference datums.

The interface standards only ensure that connectors and adaptors that comply with the standard will fit together. The standards may also contain tolerance grades for the ferrules and alignment devices. Tolerance grades are used to provide different levels of alignment precision.

The combined interface dimensions of the counterpart components in the interface may also be used to design other components that will mate with other components of a connector interface set. For example, an active device mount can be designed using the adaptor interface dimensions. The use of these dimensions when combined with those of a standard counterpart component provides the designer with assurance that the standardized counterpart component will mate. The interface dimensions will also provide the mating force and location of the plug's optical datum target.

Many other uses for the standards can be envisioned. For example, the use of two different standard adaptor interfaces would allow the design of a between series adaptor (i.e. an SC to an LSA adaptor), in that it would provide details of the necessary features to allow the mating and unmating of the two different plugs on each side of the adaptor.

Standard interface dimensions do not, by themselves, assure optical performance. Optical performance is described in the IEC 61753 series [2]. They do however assure connector mating at a specified physical fit. Optical performance is defined by the manufacturing specification. Products from the same or different specifications using the same standard interface will always fit together. Obviously, an assurance of performance can be given for product delivered to the same specification. In addition, it can be reasonably expected that some level of performance will be attained by mating product from different specifications. However, this common level of performance cannot be expected to be any better than that of the lowest specified performance.

Bibliography

[1] *The International System of Units* (SI)

[2] IEC 61753 (all parts), *Fibre optic interconnecting devices and passive components performance standard*

Additional non-cited references

IEC 61931, *Fibre optic – Terminology*

ISO 1101, *Geometrical product specifications (GPS) – Geometrical tolerancing – Tolerancing of form, orientation, location and run-out*

ISO 2692, *Geometrical product specifications (GPS) – Geometrical tolerancing – Maximum material requirement (MMR), least material requirement (LMR) and reciprocity requirement (RPR)*

ISO 5458, *Geometrical Product Specifications (GPS) – Geometrical tolerancing – Positional tolerancing*

ISO 5459, *Geometrical product specifications (GPS) – Geometrical tolerancing – Datums and datum-systems*

ISO 7083, *Technical drawings – Symbols for geometrical tolerancing – Proportions and dimensions*

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