

Fibre optic branching devices —

Part 1: Generic specification

The European Standard EN 60875-1:1998 has the status of a
British Standard

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National foreword

This British Standard is the English language version of EN 60875-1:1998. It was derived by CENELEC from IEC 60875-1:1996.

The CENELEC common modifications have been implemented at the appropriate places in the text and are indicated by a side line in the margin.

The UK participation in its preparation was entrusted by Technical Committee EPL/86, Fibre optics, to Subcommittee EPL/86/2, Interconnecting devices and passive components, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Cross-references

Attention is drawn to the fact that CEN and CENELEC standards normally include an annex which lists normative references to international publications with their corresponding European publications. The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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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 24 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.

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English version

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(IEC 60875-1:1996)

Dispositifs de couplage pour fibres optiques
Partie 1: Spécification générique
(CEI 60875-1:1996)

Lichtwellenleiter-Verzweiger
Teil 1: Fachgrundspezifikation
(IEC 60875-1:1996)

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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, Czech Republic, 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

The text of the International Standard IEC 60875-1:1996, prepared by SC 86B, Fibre optic interconnecting devices and passive components, of IEC TC 86, Fibre optics, was submitted to the formal vote and was approved by CENELEC as EN 60875-1 on 1998-04-01 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1998-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1998-12-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annex A and Annex B are informative.

Annex ZA has been added by CENELEC.

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Introduction

This part of IEC 875 is divided into four clauses. The first clause is titled “General” and contains general information which pertains to this generic specification.

The second clause is titled “Requirements” and contains all the requirements which shall be met by branching devices covered by this standard. The requirements for classification, the IEC specification system, documentation, materials, workmanship, quality, performance, identification, and packaging are covered.

The third clause is titled “Quality assessment procedures” and contains all of the procedures which must be followed for proper quality assessment of products covered by this standard.

The fourth clause is titled “Measurement and environmental test procedures” and refers to IEC 1300 series.

1 General

1.1 Scope

This part of IEC 875 applies to fibre optic branching devices. These have all of the following general features:

- they are passive, in that they contain no optoelectronic or other transducing elements;
- they have three or more ports for the entry and/or exit of optical power, and share optical power among these ports in a predetermined fashion;
- the ports are optical fibres, or optical fibre connectors.

This standard establishes uniform requirements for the following:

- optical, mechanical, and environmental properties;
- measurement and test procedures for quality assessment.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 875. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 875 are encouraged to apply the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC QC 001002:1986, *Rules of Procedure of the IEC Quality Assessment System for Electronic Components (IECQ)*.

IEC 27, *Letter symbols to be used in electrical technology*.

IEC 50(731):1991, *International Electrotechnical Vocabulary (IEV) — Chapter 731: Optical fibre communication*.

IEC 68-1:1988, *Environmental testing — Part 1: General and guidance*.

IEC 68-2-1:1990, *Environmental testing — Part 2: Tests — Tests A: Cold*.

IEC 68-2-2:1974, *Environmental testing — Part 2: Tests — Tests B: Dry heat*.

IEC 68-2-3:1969, *Environmental testing — Part 2: Tests — Test Ca: Damp heat, steady state*.

IEC 68-2-5:1975, *Environmental testing — Part 2: Tests — Test Sa: Simulated solar radiation at ground level*.

IEC 68-2-6:1995, *Environmental testing — Part 2: Tests — Test Fc: Vibration (sinusoidal)*.

IEC 68-2-7:1983, *Environmental testing — Part 2: Tests — Test Ga and guidance: Acceleration, steady state*.

IEC 68-2-9:1975, *Environmental testing — Part 2: Tests — Guidance for solar radiation testing*.

IEC 68-2-10:1988, *Environmental testing — Part 2: Tests — Test J and guidance: Mould growth*.

IEC 68-2-11:1981, *Environmental testing — Part 2: Tests — Test Ka: Salt mist*.

IEC 68-2-13:1983, *Environmental testing — Part 2: Tests — Test M: Low air pressure*.

IEC 68-2-14:1984, *Environmental testing — Part 2: Tests — Test N: Change of temperature*.

IEC 68-2-17:1994, *Environmental testing — Part 2: Tests — Test Q: Sealing*.

IEC 68-2-27:1987, *Environmental testing — Part 2: Tests — Test Ea and Guidance: Shock*.

IEC 68-2-29:1987, *Environmental testing — Part 2: Tests — Test Eb and Guidance: Bump*.

IEC 68-2-30:1980, *Environmental testing — Part 2: Tests — Test Db and Guidance: Damp heat, cyclic (12 + 12-hour cycle)*.

IEC 68-2-38:1974, *Environmental testing — Part 2: Tests — Test Z/AD: Composite temperature/humidity cyclic test*.

IEC 68-2-42:1982, *Environmental testing — Part 2: Tests — Test Kc: Sulphur dioxide test for contacts and connections*.

IEC 410:1973, *Sampling plans and procedures for inspection by attributes*.

IEC 617, *Graphical symbols for diagrams*.

IEC 695-2-2:1991, *Fire hazard testing — Part 2: Test methods — Section 2: Needle-flame test*.

IEC 825-1:1993, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide*.

IEC 875-1-1:1996, *Fibre optic branching devices — Part 1-1: Blank detail specification*.

IEC 1300, *Fibre optic interconnecting devices and passive components — Basic test and measurement procedures*.

ISO 129:1985, *Technical drawings — Dimensioning — General principles, definitions, methods of execution and special indications*.

ISO 286-1:1988, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits*.

ISO 370:1975, *Toleranced dimensions — Conversion from inches into millimeters and vice versa*.

ISO 1101:1983, *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings*.

ISO 8601:1988, *Data elements and interchange formats — Information interchange — Representation of dates and times*.

1.3 Definitions

For the purposes of this part of IEC 875, the definitions given in IEC 50(731) apply, except for the following definitions:

1.3.1

branching device

a passive component possessing three or more ports which shares optical power among its ports in a predetermined fashion, without any amplification, switching, or other active modulation

1.3.2

coupler

a term which is frequently used as a synonym for a branching device. The term is also used to define a structure for transferring optical power between two fibres or between an active device and a fibre. It will not be used in the generic specification or the detail specifications for fibre optic branching devices

1.3.3

port

an optical fibre or optical fibre connector attached to a passive component for the entry and/or exit of the optical power

1.3.4

transfer matrix

the optical properties of a fibre optic branching device can be defined in terms of an $n \times n$ matrix of coefficients. $2n$ is the number of ports, and the coefficients represent the fractional optical power transferred between designated ports. In general, the transfer matrix T is:

$$T = \begin{bmatrix} t_{11} & t_{12} & \cdot & \cdot & \cdot & t_{1n} \\ t_{21} & & & & & \\ \cdot & & & & & \\ \cdot & & & t_{ij} & & \\ \cdot & & & & & \\ t_{n1} & & & & & t_{nn} \end{bmatrix}$$

where t_{ij} is the ratio of the optical power P_{ij} transferred out of port j with respect to input power P_i into port i , that is:

$$t_{ij} = P_{ij}/P_i$$

the transfer matrix is used to classify the different types of branching devices which are specified in this generic specification

in a branching device, the coefficients t_{ij} may be a function of the input wavelength, input polarization, or modal power distribution. The values of these parameters will be provided in the detail specification, when necessary

single-mode branching devices may operate in a coherent fashion with respect to multiple inputs.

Consequently, the transfer coefficients may be affected by the relative phase and intensity of simultaneous coherent optical power inputs at two or more ports

1.3.5

transfer coefficient

an element t_{ij} of the transfer matrix

1.3.6

logarithmic transfer matrix

in general, the logarithmic transfer matrix is:

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdot & \cdot & \cdot & a_{1n} \\ a_{21} & & & & & \\ \cdot & & & & & \\ \cdot & & & a_{ij} & & \\ \cdot & & & & & \\ a_{n1} & & & & & a_{nn} \end{bmatrix}$$

where a_{ij} is the optical power reduction in decibels out of port j with unit power into port i , that is:

$$a_{ij} = -10 \log t_{ij}$$

where t_{ij} is the transfer matrix coefficient