IEC 60875-1

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Fibre optic interconnecting devices and passive components – Non-wavelength-selective fibre optic branching devices – Part 1: Generic specification

Dispositifs d'interconnexion et composants passifs fibroniques – Dispositifs de couplage fibroniques ne dépendant pas de la longueur d'onde – Partie 1: Spécification générique

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – NON-WAVELENGTH-SELECTIVE FIBRE OPTIC BRANCHING DEVICES –

Part 1: Generic specification

FOREWORD

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IEC 60875-1 has been prepared by IEC technical committee 86B: Fibre optic interconnecting devices and passive components. It is an International Standard.

This seventh edition cancels and replaces the sixth edition published in 2015. This edition constitutes a technical revision.

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

a) removal of variant and reference extensions in clause classification
b) removal of specification system in clause documentation

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c) removal of interface standards, reliability standards and interlinking in clause standardization system

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

Draft	Report on voting
86B/4868/FDIS	86B/4903/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60875 series, published under the general title *Fibre optic interconnecting and passive components – Non-wavelength-selective fibre optic branching devices*, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – NON-WAVELENGTH-SELECTIVE FIBRE OPTIC BRANCHING DEVICES –

Part 1: Generic specification

1 Scope

This part of IEC 60875 applies to non-wavelength-selective fibre optic branching devices, all exhibiting the following features:

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

This document establishes uniform requirements for the optical, mechanical and environmental 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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050-731, *International Electrotechnical Vocabulary – Chapter 731: Optical fibre communication*

IEC 60617 (all parts), *Graphical symbols for diagrams*

IEC 60695-11-5, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60825 (all parts), *Safety of laser products*

IEC 61300 (all parts), *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*

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

IEC TR 61930, *Fibre optic graphic symbology*

IEC TS 62627-09, *Fibre optic interconnecting devices and passive components – Vocabulary for passive optical devices*

ISO 129-1, *Technical product documentation (TPD) – Presentation of dimensions and tolerances – Part 1: General principles*

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ISO 286-1, *Geometrical product specifications (GPS) – ISO code system for tolerances on linear sizes – Part 1: Basis of tolerances, deviations and fits*

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

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-731 and IEC TS 62627-09 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1 Basic terms and definitions

3.1.1
optical pigtail
fibre or cable terminated with or without a connector at the end forming an optical port for an optical component

3.2 Component definitions

3.2.1
non-wavelength-selective branching device
<optical> coupler
<optical> splitter
bidirectional passive component possessing three or more ports which operates non-selectively over a specified range of wavelengths, divides or combines optical power coming into one or more input port(s) among its one or more output port(s) in a predetermined fashion, without any amplification, switching, or other active modulation

3.2.2
bidirectional non-wavelength-selective branching device
device whose transfer matrix element of t_{ij} is equal to t_{ji} for all i and j

3.2.3
non-bidirectional non-wavelength-selective branching device
device which at least one transfer matrix element of t_{ij} is not equal to t_{ji}

3.2.4
balanced coupler
non-wavelength-selective branching device designed to ensure that the power at each output port from the same input port is equal

3.2.5
unbalanced coupler
non-wavelength-selective branching device designed to ensure that the power at each output port from the same input port is not equal

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3.2.6
tap-coupler
unbalanced coupler

Note 1 to entry: Typically the coupling ratio is from 1 % to 20 %.

3.3 Performance parameter definitions

3.3.1
uniformity
U
difference between the maximum and minimum attenuation measured for all output ports for one input port

Note 1 to entry: For each input port, it is the maximum value over the operating wavelength range or ranges. The uniformity for a device with more than one input port is defined as the maximum value of uniformities of all input ports.

Note 2 to entry: Uniformity is expressed as difference of maximum and minimum value of each attenuation (insertion loss) from a common input port. It is expressed in decibels.

Note 3 to entry: Generally, uniformity for a passive device is defined as maximum value of uniformities of all ports.

3.3.2
coupling ratio
splitting ratio
CR
for a given input port i, the ratio of light at a given output port k to the total light from all output ports where j represents the operational output ports

Note 1 to entry: Coupling ratio is calculated by

$$CR_{ik} = t_{ik} \Big/ \sum_{j} t_{ij}$$

where t_{ij} is a transmission element from port i to port j.

4 Requirement

4.1 Classification

4.1.1 General

Several technologies exist for the manufacturing of non-wavelength-selective branching devices. Typical technologies of non-wavelength selective branching devices are:

– Fused biconic taper;
– Planar lightwave circuit.

Some examples are given in Annex A.

Non-wavelength-selective branching devices shall be classified as follows:

– type;
– style.

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4.1.2 Types

The main characteristics of each type are as follows:

– transmissive;
– reflective.

4.1.3 Style

Non-wavelength-selective branching devices may have fibre or cable type pigtails with or without optical connectors. If equipped with optical connectors, the optical connectors shall meet the requirements of IEC 61754 series.

4.2 Documentation

4.2.1 Symbols

Graphical and letter symbols should, whenever possible, be taken from IEC 60027 series, IEC 60617 series and IEC TR 61930.

4.2.2 Drawings

4.2.2.1 General

The drawings and dimensions given in detail specifications shall not restrict themselves to details of construction, nor shall they be used as manufacturing drawings.

4.2.2.2 Projection system

Either first angle or third angle projection shall be used for the drawings in documents covered by this specification. All drawings within a document shall use the same projection system and the drawings shall state which system is used.

4.2.2.3 Dimensional system

All dimensions shall be given in accordance with ISO 129-1, ISO 286-1 and ISO 1101.

The metric system shall be used in all specifications.

Dimensions shall not contain more than five significant digits.

When units are converted, a note shall be added in each relevant specification and the conversion between systems of units shall use a factor of 25,4 mm to 1 inch.

4.2.3 Measurements

4.2.3.1 Measurement method

The measurement method for optical, mechanical, climatic, and environmental characteristics of branching devices to be used should be defined and selected preferentially from the IEC 61300 series.

The size measurement method to be used shall be specified in the detail specification for any dimensions which are specified within a total tolerance zone of ≤0,01 mm.

4.2.3.2 Reference components

Reference components for measurement purposes, if required, shall be specified in the relevant IEC standards or industrial specifications.

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4.2.4 Test data sheets

Test data sheets shall be prepared for each test conducted as required by a relevant IEC standard or industrial specification. The data sheets shall be included in the qualification report and in the periodic inspection report.

Data sheets shall contain the following information as a minimum:

– title of test and date;
– specimen description including the type of fibre;
– test equipment used and date of latest calibration;
– all applicable test details;
– all measurement values and observations;
– sufficiently detailed documentation to provide traceable information for failure analysis.

4.2.5 Instructions for use

Instructions for use, when required, shall be given by the manufacturer and shall include:

– assembly and connection instructions;
– cleaning method;
– safety aspects;
– additional information as necessary.

4.3 Standardization system of performance standards

Performance standards contain a series of tests and measurements (which can be grouped into a specified schedule depending on the requirements of that standard) with clearly defined conditions, severities and pass/fail criteria. The tests are intended to be run on a "once-off" basis to prove any product's ability to satisfy the "performance standards" requirements of a market sector, user group or system location. A product that has been shown to meet all the requirements of a performance standard can be declared as complying with a performance standard but should then be controlled by a quality assurance or quality conformance programme.

A key point of the test and measurement standards for their application (particularly with regard to attenuation (insertion loss) and return loss) in conjunction with the interface standards of interproduct compatibility can be defined. Conformity of each individual product to this document will be ensured.

4.4 Design and construction

4.4.1 Materials

4.4.1.1 Corrosion resistance

All materials used in the construction shall be corrosion resistant or suitably finished to meet the requirements of the relevant IEC standard or industrial specification.

4.4.1.2 Non-flammable materials

When non-flammable materials are required, the requirement shall be specified. IEC 60695-11-5 should be used as the reference, unless otherwise specified.

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