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Fibre optic interconnecting devices and passive components – Vocabulary for passive optical devices

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –

Vocabulary for passive optical devices

FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62627-09, which is a Technical Specification, has been prepared by subcommittee SC 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
86B/3993/DTS	86B/4016/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62627 series, published under the general title *Fibre optic interconnecting devices and passive components*, 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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

SC 86B, Fibre optic interconnecting devices and passive components, specifies several passive optical devices. Each passive optical device has generic specification and performance specifications. Generic specifications define terms, definitions and requirements (classifications, documentations, standardization systems and so on). Some basic terms and definitions are defined and used in two or more generic specifications. In order to harmonize terms and definitions in generic specifications, this technical specification defines terms and definitions commonly used in multiple generic specifications.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –

Vocabulary for passive optical devices

1 Scope

This part of IEC 62627, which is a Technical Specification, applies to passive optical devices (components). It provides the definitions which are commonly used in the generic specifications, performance standards and tests and measurement standards for passive optical devices (components) prepared by SC 86B. It has the following three types of terms and definitions:

- basic terms and definitions;
- component terms and definitions;
- performance parameter terms and definitions.

The generic specifications for passive optical devices (components) are listed in Annex A.

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.

This document contains no normative references.

3 Terms, definitions and abbreviated terms

3.1 General

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

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

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

3.2 Basic terms and definitions

3.2.1
port
optical fibre or fibre optic connector attached to a passive component for the entry and/or exit of optical power

[SOURCE: IEC 60876-1:2014, 3.1.1]

3.2.2
input port
port where the optical power enters the device

3.2.3
output port
port where the optical power exits the device

3.2.4
transfer matrix
$n \times n$ matrix of coefficients where n is the number of ports, and the coefficients represent the fractional optical power transferred between designated ports

Note 1 to entry: In general, the transfer matrix T is:

$$T = \begin{bmatrix} t_{11} & t_{12} & .... & t_{1n} \\ & t_{22} & & \\ & & t_{ij} & \\ t_{n1} & t_{n2} & & t_{nn} \end{bmatrix} \quad (1)$$

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:

$$t_{ij} = \frac{P_{ij}}{P_i} \quad (2)$$

[SOURCE: IEC 60875-1:2015, 3.1.3, modified – The definition has been rephrased, the last sentence in note 1 has been deleted, as well as notes 2 and 3.]

3.2.5
transfer coefficient
element t_{ij} of the transfer matrix

[SOURCE: IEC 60875-1: 2015, 3.1.4]

3.2.6
logarithmic transfer matrix
$n \times n$ matrix of logarithmic transfer coefficients of a_{ij} where n is the number of ports

Note 1 to entry: In general, the logarithmic transfer matrix A is:

$$A = \begin{bmatrix} a_{11} & a_{12} & ... & a_{1n} \\ & a_{22} & & \\ & & a_{ij} & \\ a_{n1} & a_{n2} & & a_{nn} \end{bmatrix} \quad (3)$$

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

$$a_{ij} = -10 \log_{10} t_{ij} \quad (4)$$

where t_{ij} is the transfer coefficient.

3.2.7
logarithmic transfer coefficient
element a_{ij} of the logarithic transfer matrix

3.2.8
conducting port pair
two ports i and j between which t_{ij} is nominally greater than zero

Note 1 to entry: For optical switches of conducting ports, conducting port pair is defined at a specified switching state. For wavelength-selective branching devices and fibre optic filters, conducting port pair is defined at a specific wavelength. For wavelength switches, conducting port pair is defined at a specific switching state and a specified wavelength.

3.2.9
isolated port pair
two ports i and j between which t_{ij} is nominally zero, and a_{ij} is nominally infinite

Note 1 to entry: For optical switches of isolated ports, isolated port pair is defined at a specified switching state. For wavelength-selective branching devices and fibre optic filters, isolated port pair is defined at a specific wavelength. For wavelength switches, isolated port pair is defined at a specific switching state and a specified wavelength.

3.2.10
port configuration
relation of connection which satisfies the following requirements, between the M port group possessing M ports and the N port group possessing N ports for passive device possessing n ports ($n = M + N$):

a) any port of the M port group is not the relation of conducting, attenuating, splitting, and coupling with the others of M port group;
b) any port of the N port group is not the relation of conducting, attenuating, splitting, and coupling with the others of N port group;
c) any port of the M port group can be connected to conducting, attenuating, splitting, and coupling with any port of N port group;
d) any port of the N port group can be connected to conducting, attenuating, splitting, and coupling with any port of M port group

Note 1 to entry: In the case of a branching device composed of an input port group possessing M ports and the output port group possessing N ports, $M \times N$ is often expressed even if M is more than N.

Note 2 to entry: In the case of wavelength selective branching device, the connection as conducting, attenuating, splitting and coupling is for any passband.

Note 3 to entry: In the case of optical switch, the connection as conducting, attenuating, splitting and coupling is for any state.

Note 4 to entry: The port configuration is expressed as $M \times N$. Unless otherwise noted, N is equal to or larger than M.

3.3 Component terms and definitions

3.3.1
passive optical device
optical device (component), other than an optical dynamic device or an optical active device, which does not require external power for its operation, unless to control the stability of its own characteristics

Note 1 to entry: Passive optical devices (components) may comprise optical detectors for monitoring purposes only.

[SOURCE: IEC TS 62538:2008, 2.1.3, modified – The term has been changed from "optical passive device" to "passive optical device", and the bracket "(component)" has been added to the definition and the note.]

3.3.2
fibre optic power control device
passive optical device (component) which controls a transmittance with a designed wavelength independent transfer coefficient

Note 1 to entry: Transfer coefficient may be controlled for all intensity of input power or for input power over a threshold power.

3.3.3
optical attenuator
passive optical device (component), which produces a wavelength independent controlled signal attenuation in an optical fibre transmission line

[SOURCE: IEC 60869-1:2012, 3.2.1, modified – The definition has been rephrased.]

3.3.4
fibre optic isolator
non-reciprocal passive optical device (component) intended to suppress backward transmittance along an optical fibre transmission line while the forward direction is the direction for which optical power transmission is intended

Note 1 to entry: Fibre optic isolators are commonly used to avoid reflections back into laser diodes and optical amplifiers, which can make the laser and amplifiers oscillate unstably, and cause noise in the fibre optic transmission system.

[SOURCE: IEC 61202-1:2009, 3.2.1, modified – The definition has been rephrased.]

3.3.5
fibre optic circulator
passive optical device (component) possessing three or more ports which input and output are cyclic

Note 1 to entry: In the case of 3 ports circulator with port 1, port 2 and port 3, supposing optical power is transmitted from port 1 to port 2, optical power from port 2 is transmitted to port 3.

[SOURCE: IEC 62077:2015, 3.2.1, modified – The term "optical device" and the brackets have been added.]

3.3.6
optical switch
passive optical device (component) processing two or more ports which selectively transmits, redirects or blocks optical power in an optical fibre transmission line

[SOURCE: IEC 60876-1:2014, 3.2.1, modified – The term "optical device" and the brackets have been added.]

3.3.7
wavelength switch
optical switch which is designed to operate in two of more defined wavelength bands of operation and which can selectively route or block light in one or more of the bands of operation as a function of the wavelength band

[SOURCE IEC 62099:2001, 1.3.2, modified – The adjective "optical" has been added to the term "switch" in the definition.]