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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Fibre optic interconnecting devices and passive components – Fibre optic tuneable bandpass filters – Generic specification

Dispositifs d'interconnexion et composants passifs fibroniques – Filtres fibroniques passe-bande accordables – Spécification générique

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CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 6
3 Terms and definitions 7
4 Requirements 11
4.1 Classification 11
4.1.1 General 11
4.1.2 Type 11
4.1.3 Style 11
4.2 Documentation 12
4.2.1 Symbols 12
4.2.2 Drawings 12
4.2.3 Test and measurements 13
4.2.4 Test report 13
4.2.5 Instructions for use 13
4.3 Standardisation system 13
4.3.1 Performance standard 13
4.3.2 Reliability standard 14
4.3.3 Interlinking 14
4.4 Design and construction 15
4.4.1 Materials 15
4.4.2 Workmanship 15
4.5 Performance requirements 16
4.6 Identification and marking 16
4.6.1 General 16
4.6.2 Component marking 16
4.6.3 Package marking 16
4.7 Packaging 16
4.8 Storage conditions 16
4.9 Safety 17
Annex A (informative) General information of tuneable bandpass filters 18
Annex B (informative) Examples of tuneable bandpass filter technologies 19
B.1 Tuneable filter using thermo-optic effects 19
B.2 Tuneable filter using acousto-optic effects 20
B.3 Tuneable filter using mechanical effects 20
B.4 Tuneable filter using piezoelectric effects 21
Bibliography 23

Figure 1 – Illustration of wavelength tuneable bandpass filter 7
Figure 2 – Illustration of bandwidth tuneable bandpass filter 8
Figure 3 – Illustration of wavelength and bandwidth tuneable bandpass filter 8
Figure 4 – Illustration of insertion loss deviation of tuning 9
Figure 5 – Illustration of X dB bandwidth deviation of wavelength tuning 10
Figure 6 – Tuneable bandpass filter style configurations 12
Figure B.1 – Thermally tuneable thin film filter 19

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Figure B.2 – Thermally tuneable waveguide Bragg grating 19
Figure B.3 – Thermally tuneable fibre Bragg grating 19
Figure B.4 – Acousto-optic tuneable bandpass filter 20
Figure B.5 – Tuneable filter by changing the incident angle 20
Figure B.6 – Tuneable filter by sliding the incident position 21
Figure B.7 – MEMS tuneable filter 21
Figure B.8 – Tuneable bandpass filter by gap control using piezoelectric effect 22

Table 1 – IEC specification structure 11
Table 2 – Standards interlink matrix 15
Table 3 – Quality assurance options 15

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC TUNEABLE BANDPASS FILTERS – GENERIC SPECIFICATION

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

FDIS	Report on voting
86B/4125/FDIS	86B/4129/RVD

Full information on the voting for the approval of this International Standard 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.

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC TUNEABLE BANDPASS FILTERS – GENERIC SPECIFICATION

1 Scope

This document applies to the family of tuneable bandpass filters. These components can modify the spectral intensity distribution in order to select some wavelengths and inhibit others.

They can be categorized into the following:

– wavelength tuneable;
– bandwidth tuneable;
– wavelength and bandwidth tuneable filter.

This document establishes uniform requirements for 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 60617, *Graphical symbols for diagrams* (available at http://std.iec.ch/iec60617)

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

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

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

IEC TR 61930, *Fibre optic graphical symbology*

IEC 61977, *Fibre optic interconnecting devices and passive components – Fibre optic filters – Generic specification*

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

ISO 129, *Technical drawings – Dimensioning – General principles, definitions, methods of execution and special indications*

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

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ISO 1101, *Geometrical product specifications (GPS) – Geometrical tolerancing – Tolerancing 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

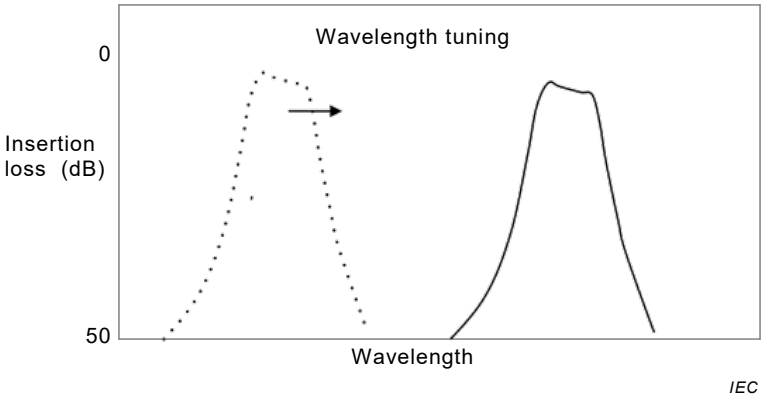
For the purposes of this document, the terms and definitions in IEC 61977, IEC TS 62627-09 and the following apply.

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

3.1
wavelength tuneable bandpass filter
fibre optic filter in which the passband can be shifted without changing the spectral shape

Note 1 to entry: See Figure 1.



NOTE Insertion loss is equivalent to attenuation.

Figure 1 – Illustration of wavelength tuneable bandpass filter

3.2
bandwidth tuneable bandpass filter
fibre optic filter in which the passband width can be changed without shifting the centre of the passband

Note 1 to entry: See Figure 2.

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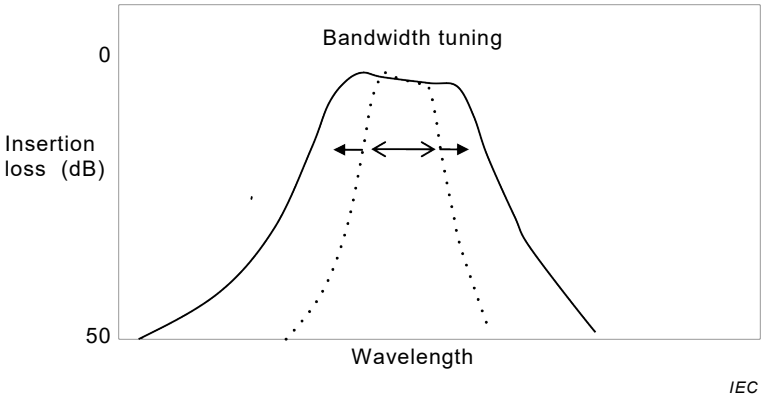
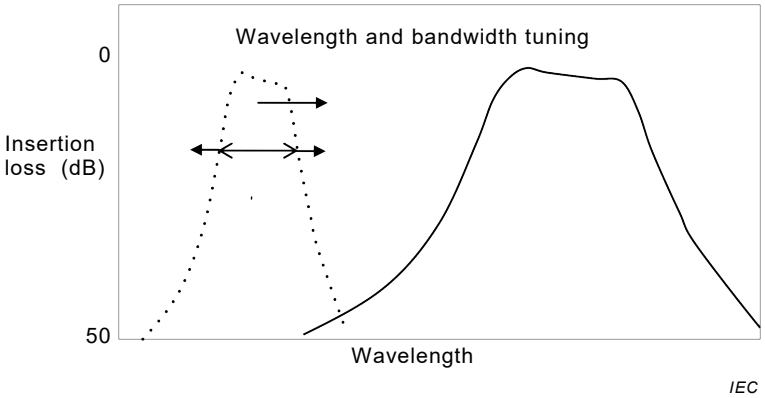


NOTE Insertion loss is equivalent to attenuation.

Figure 2 – Illustration of bandwidth tuneable bandpass filter

3.3
wavelength and bandwidth tuneable bandpass filter
fibre optic filter in which both the centre of the passband and the passband width can be changed

Note 1 to entry: See Figure 3.



NOTE Insertion loss is equivalent to attenuation.

Figure 3 – Illustration of wavelength and bandwidth tuneable bandpass filter

3.4
bandwidth tuneable range
spectral interval either in frequency or wavelength over which the passband bandwidth of a tuneable optic filter can be adjusted by means of tuning control

Note 1 to entry: This term is applied for (a) bandwidth tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

3.5
wavelength tuneable range
spectral interval either in frequency or wavelength over which the operating wavelength or frequency of a tuneable optic filter can be adjusted by means of tuning control

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

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3.6
bandwidth tuning resolution
minimum adjustable step size of the passband bandwidth

Note 1 to entry: This term is applied for (a) bandwidth tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

3.7
wavelength tuning resolution
minimum adjustable step size of the centre wavelength

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

3.8
repeatability of bandwidth tuning
maximum deviation of the passband bandwidth after multiple times of repeated tuning

Note 1 to entry: This term is applied for (a) bandwidth tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

Note 2 to entry: The number of repeated times of tuning will be defined in the performance standard.

3.9
repeatability of wavelength tuning
maximum deviation of the wavelength after multiple times of repeated tuning

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

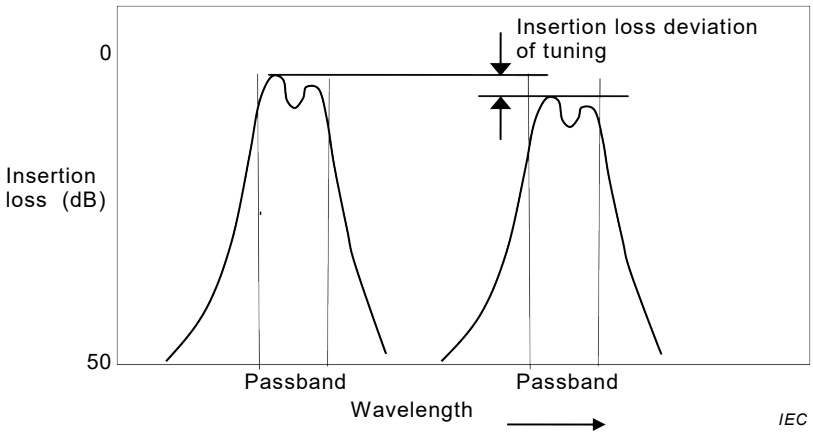
Note 2 to entry: The number of repeated times of tuning will be defined in the performance standard.

3.10
insertion loss deviation of wavelength tuning
maximum attenuation (insertion loss) variation of a tuneable optic filter between wavelength channels after multiple times of repeated tuning

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

Note 2 to entry: The number of repeated times of tuning will be defined in the performance standard.

Note 3 to entry: See Figure 4.



NOTE Insertion loss is equivalent to attenuation.

Figure 4 – Illustration of insertion loss deviation of tuning

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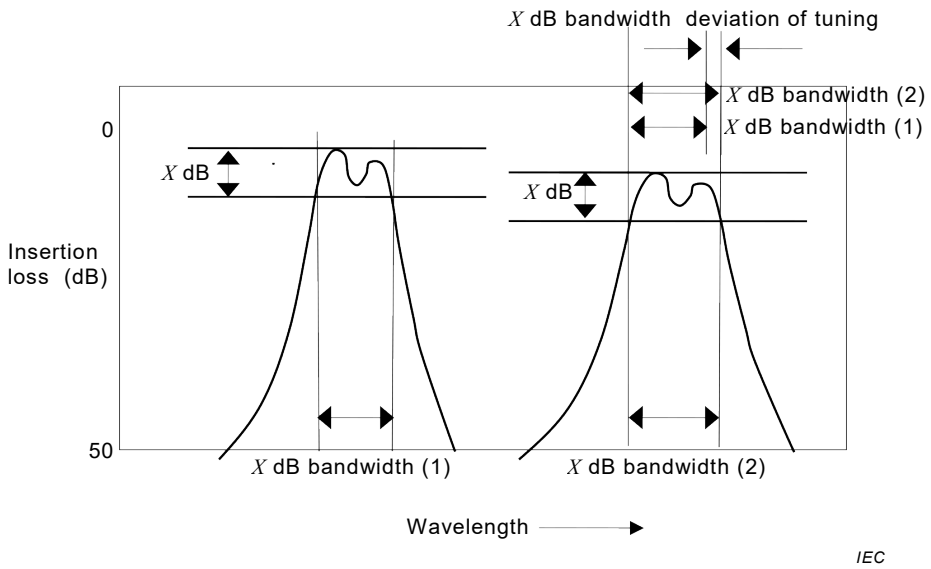
3.11
***X* dB bandwidth deviation of wavelength tuning**
maximum variation of a bandwidth of the tuneable optic filter after multiple times of repeated tuning

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

Note 2 to entry: The number of repeated times of tuning will be defined in the performance standard.

Note 3 to entry: See Figure 5.



NOTE Insertion loss is equivalent to attenuation.

Figure 5 – Illustration of *X* dB bandwidth deviation of wavelength tuning

3.12
polarization dependent loss deviation of wavelength tuning
PDL deviation of wavelength tuning
maximum variation of polarization dependent loss for several wavelength channels after multiple times of repeated tuning

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

Note 2 to entry: The number of repeated times of tuning will be defined in the performance standard.

Note 3 to entry: This note applies to the French language only.

3.13
channel isolation deviation of wavelength tuning
maximum variation in channel isolation for several wavelength channels after multiple times of repeated tuning

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

Note 2 to entry: The number of repeated times of tuning will be defined in the performance standard.

3.14
wavelength channel tuning time
time taken for the tuneable optic filter to move from the initial wavelength channel to the target wavelength channel

Note 1 to entry: This term is applied for (a) wavelength tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

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3.15
bandwidth tuning time
time taken to adjust the bandwidth of the tuneable optic filter

Note 1 to entry: This term is applied for (a) bandwidth tuneable bandpass filters and (b) wavelength and bandwidth tuneable bandpass filters.

4 Requirements

4.1 Classification

4.1.1 General

Fibre optic tuneable bandpass filters are classified either totally or in part by the following categories:

– type;
– style.

An example of a typical tuneable bandpass filter classification is shown in Table 1.

Table 1 – IEC specification structure

Type	Style
Wavelength tuneable	– Configuration C – LC connector

4.1.2 Type

The tuneable bandpass filter type shall be defined by its intended function and optical performance. There are several types of filters, for instance:

– wavelength tuneable;
– bandwidth tuneable.

4.1.3 Style

The tuneable bandpass filter style shall be defined on the basis of the following elements:

– the input and output port configuration;
– the connector set type(s), if any.

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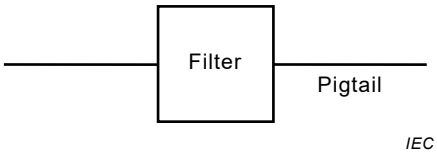
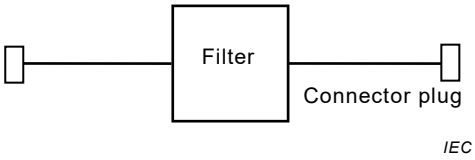
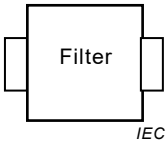
The five different input and output configurations can be scheduled as shown in Figures 6 a) to 6 e).



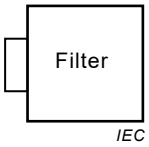
a) Configuration A – Device containing fibre optic pigtails without connector plug



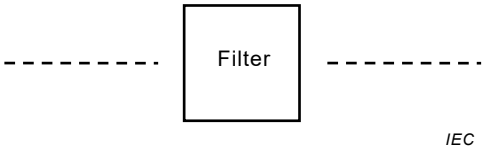
b) Configuration B – Device containing integral fibres, with a connector plug on each fibre



c) Configuration C – Device containing fibre optic connectors as a part of the device housing



d) Configuration D – Device containing one fibre optic connector as a part of the device housing



e) Configuration E – Device with the interfacing features of the ray of light

Figure 6 – Tuneable bandpass filter style configurations

4.2 Documentation

4.2.1 Symbols

Graphical and letter symbols shall, whenever possible, be taken from IEC 60027 (all parts), IEC 60617 (all parts) and IEC TR 61930 unless superseded by this document.

4.2.2 Drawings

4.2.2.1 General

The drawings and dimensions given in the relevant specifications shall not restrict detail construction nor be used as manufacturing drawings.

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4.2.2.2 Dimensional system

All dimensions shall be given in accordance with ISO 129, 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.

4.2.3 Test and measurements

4.2.3.1 Test and measurement procedures

The test and measurement procedures for optical, mechanical, climatic and environmental characteristics of filters to be used shall be defined and selected preferentially from IEC 61300 (all parts). The size measurement method to be used shall be specified in the relevant specification for dimensions which are specified within a total tolerance zone of 0,01 mm or less.

4.2.3.2 Reference components

Reference components for measurement purposes, if required, shall be specified in the relevant specification.

4.2.4 Test report

The test report shall be prepared for each test conducted as required by a relevant 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 and date of test;
– specimen description including the variant identification number (see 4.6.2);
– test equipment used;
– all applicable test details;
– all measurement values and observations.

4.2.5 Instructions for use

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

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

4.3 Standardisation system

4.3.1 Performance standard

Performance standards contain a series of tests and measurements (which may or may not be grouped into a specified schedule depending on the requirements of those standards) with clearly defined conditions, severities and pass/fail criteria. The tests are intended to be run on a "one-off" basis to prove the ability of any products to satisfy the performance standards requirement. Each performance standard has a different set of tests, and/or severities (and/or groupings) representing the requirements of a market sector, user group or system location.

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