

REDLINE VERSION



Fibre optic interconnecting devices and passive components – Fibre optic passive power control devices – Part 1: Generic specification

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.20

ISBN 978-2-8322-6298-6

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
3.1 Component terms.....	8
3.2 Performance terms	9
4 Description of devices	11
4.1 Optical attenuator	11
Variable optical attenuator (VOA).....	11
4.2 Optical fuse	12
4.3 Optical power limiter	13
5 Requirements	13
5.1 Classification	13
5.1.1 General	13
5.1.2 Type	14
5.1.3 Wavelength band.....	14
5.1.4 Style	14
5.1.5 Variant.....	15
5.1.6 Assessment level.....	15
5.1.7 Normative reference extensions.....	16
5.2 Documentation.....	17
5.2.1 Symbols	17
5.2.2 Specification system	17
5.2.3 Drawings	18
5.2.4 Tests and measurements.....	18
5.2.5 Test data sheets	19
5.2.6 Instructions for use	19
5.3 Standardization system.....	19
5.3.1 Interface standards.....	19
5.3.2 Performance standards.....	20
5.3.3 Reliability standards	20
5.3.4 Interlinking.....	21
5.4 Design and construction.....	22
5.4.1 Materials	22
5.4.2 Workmanship.....	22
5.5 Quality	22
5.6 Performance	23
5.7 Identification and marking	23
5.7.1 General	23
5.7.2 Variant identification number	23
5.7.3 Component marking.....	23
5.7.4 Package marking	23
5.8 Packaging.....	24
5.9 Storage conditions	24
5.10 Safety	24
Annex A (informative) Optical fuse configuration and performance examples	25

Annex B (informative) Optical fuse application notes.....	27
Annex C (informative) Optical power limiter configuration and performance examples	29
Annex D (informative) Optical power limiter application notes	32
Annex E (informative) Fixed optical attenuator application note	34
Annex F (informative) Variable (manually or electrically) optical attenuator application note	36
Annex G (informative) Example of technology of variable optical attenuators	38
G.1 Example technology of micro-electromechanical system (MEMS) based VOA	38
G.2 Example technology of planar lightwave circuit (PLC) based and thermo-optic (TO) based VOA	38
G.3 Example technology of magnet-optic (MO) based VOA	39
Bibliography.....	41
Figure 1 – Fixed optical attenuator operation curve.....	11
Figure 2 – VOA operation curve	12
Figure 3 – Optical fuse operation curve.....	12
Figure 4 – Optical power limiter operation curve	13
Figure 5 – Configuration A	15
Figure 6 – Configuration B	15
Figure 7 – Configuration C	15
Figure 8 – Standardization structure	22
Figure A.1 – Optical fuse, pigtail non-connectorized style	25
Figure A.2 – Optical fuse, plug-receptacle style (LC- plug).....	25
Figure A.3 – Response time curve of an optical fuse.....	26
Figure A.4 – Optical fuse, power threshold approx. 30 dBm (1 W), output power drop at threshold approx. 25 dB.....	26
Figure B.1 – Placement of an optical fuse	28
Figure C.1 – Optical power limiter, pigtail non-connectorized style	29
Figure C.2 – Optical power limiter, plug-receptacle style (LC- plug)	29
Figure C.3 – Optical power limiter – Experimental.....	29
Figure C.4 – Schematic optical power limiter response time; 1 ms input pulse time.....	30
Figure C.5 – Schematic power definitions	31
Figure C.6 – Optical power limiter, input power definitions	31
Figure D.1 – Optical power limiter and optical fuse, combined, operation curve	33
Figure E.1 – Placement of a fixed optical attenuator	35
Figure F.1 – Placement of a variable, manual or electrical, optical attenuator	37
Figure G.1 – Example technology of MEMS based VOA.....	38
Figure G.2 – Example technology of PLC-TO based VOA	39
Figure G.3 – The relation of phase changes and attenuation.....	39
Figure G.4 – Example technology of MO based VOA	40
Table 1 – Three-level IEC specification structure	17
Table 2 – Standards' interlink matrix	22

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC PASSIVE POWER CONTROL DEVICES –

Part 1: Generic specification

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

DISCLAIMER

This Redline version is not an official Standard and is intended to provide the user with an indication of what changes have been made to the previous version. Only the IEC International Standard provided in this package is to be considered the official Standard.

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60869-1 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC TC 86: Fibre optics.

This fifth edition cancels and replaces the fourth edition published in 2012 and constitutes a technical revision.

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

- a) the terms and definitions have been reviewed;
- b) the requirement concerning the IEC Quality Assessment System has been reviewed;
- c) the clause concerning quality assessment procedures has been deleted;
- d) Annex G, relating to technical information on variable optical attenuators, has been added.

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

FDIS	Report on voting
86B/4139/FDIS	86B/4144/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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC PASSIVE POWER CONTROL DEVICES –

Part 1: Generic specification

1 Scope

This part of IEC 60869 applies to fibre optic passive power control devices. These have all of the following general features:

- they are passive in that they contain no optoelectronic or other transducing elements;
- they have two ports for the transmission of optical power and control of the transmitted power in a fixed or variable fashion;
- ~~– the ports are unconnectorized optical fibre tails or optical fibre pigtails with connectors.~~
- the ports are non-connectorized optical fibre pigtails, connectorized optical fibres or receptacles.

This document establishes generic requirements for the following passive optical devices:

- optical attenuator;
- optical fuse;
- optical power limiter.

~~Test and measurement procedures for the above products are described in IEC 61300-1, the IEC 61300-2 series and the 61300-3 series [1,2,3]¹.~~

This document also provides generic information including terminology for the IEC 61753-05x series. Published IEC 61753-05x series documents are listed in Bibliography.

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* (available at www.electropedia.org)

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 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*

¹~~References in square brackets refer to the Bibliography.~~

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

~~ISO 129, Technical drawings – Indication of dimensions and tolerances~~

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

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

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Fibre optic interconnecting devices and passive components – Fibre optic passive power control devices –
Part 1: Generic specification**

**Dispositifs d'interconnexion et composants passifs fibroniques – Dispositifs fibroniques passifs de contrôle de la puissance –
Partie 1: Spécification générique**



CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
3.1 Component terms.....	7
3.2 Performance terms	8
4 Description of devices	9
4.1 Optical attenuator	9
4.2 Optical fuse	10
4.3 Optical power limiter	11
5 Requirements	12
5.1 Classification	12
5.1.1 General	12
5.1.2 Type	13
5.1.3 Wavelength band.....	13
5.1.4 Style	13
5.1.5 Variant.....	14
5.1.6 Assessment level.....	14
5.1.7 Normative reference extensions.....	15
5.2 Documentation.....	15
5.2.1 Symbols	15
5.2.2 Specification system.....	16
5.2.3 Drawings	17
5.2.4 Tests and measurements.....	17
5.2.5 Test data sheets	17
5.2.6 Instructions for use	18
5.3 Standardization system.....	18
5.3.1 Interface standards.....	18
5.3.2 Performance standards.....	18
5.3.3 Reliability standards	19
5.3.4 Interlinking.....	19
5.4 Design and construction.....	21
5.4.1 Materials	21
5.4.2 Workmanship.....	21
5.5 Quality	21
5.6 Performance	21
5.7 Identification and marking	21
5.7.1 General	21
5.7.2 Variant identification number	21
5.7.3 Component marking.....	21
5.7.4 Package marking.....	22
5.8 Packaging.....	22
5.9 Storage conditions	22
5.10 Safety	22
Annex A (informative) Optical fuse configuration and performance examples	23
Annex B (informative) Optical fuse application notes.....	25

Annex C (informative) Optical power limiter configuration and performance examples	26
Annex D (informative) Optical power limiter application notes	29
Annex E (informative) Fixed optical attenuator application note	30
Annex F (informative) Variable, manual or electrical, optical attenuator application note	31
Annex G (informative) Example of technology of variable optical attenuators	33
G.1 Example technology of micro electromechanical system (MEMS) based VOA	33
G.2 Example technology of planar lightwave circuit (PLC) based and thermo-optic (TO) based VOA	33
G.3 Example technology of magnet-optic (MO) based VOA	34
Bibliography.....	36
Figure 1 – Fixed optical attenuator operation curve.....	10
Figure 2 – VOA operation curve	10
Figure 3 – Optical fuse operation curve.....	11
Figure 4 – Optical power limiter operation curve	12
Figure 5 – Configuration A	13
Figure 6 – Configuration B	13
Figure 7 – Configuration C	14
Figure 8 – Standardization structure	20
Figure A.1 – Optical fuse, non-connectorised style)	23
Figure A.2 – Optical fuse, plug-receptacle style (LC)	23
Figure A.3 – Response time curve of an optical fuse.....	24
Figure A.4 – Optical fuse, power threshold approx. 30 dBm (1 W), output power drop at threshold approx. 25 dB.....	24
Figure B.1 – Placement of an optical fuse	25
Figure C.1 – Optical power limiter, non-connectorised style	26
Figure C.2 – Optical power limiter, plug-receptacle style (LC)	26
Figure C.3 – Optical power limiter – Experimental.....	26
Figure C.4 – Schematic optical power limiter response time. Input pulse is 1 ms long.....	27
Figure C.5 – Schematic power definitions	28
Figure C.6 – Optical power limiter, input power definitions	28
Figure D.1 – Optical power limiter and optical fuse, combined, operation curve	29
Figure E.1 – Placement of a fixed optical attenuator	30
Figure F.1 – Placement of a variable, manual or electrical, optical attenuator	32
Figure G.1 – Example technology of MEMS based VOA.....	33
Figure G.2 – Example technology of PLC-TO based VOA	34
Figure G.3 – The relation of phase changes and attenuation.....	34
Figure G.4 – Example technology of MO based VOA	35
Table 1 – Three-level IEC specification structure	16
Table 2 – Standards interlink matrix.....	20

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC PASSIVE POWER CONTROL DEVICES –

Part 1: Generic specification

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60869-1 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC TC 86: Fibre optics.

This fifth edition cancels and replaces the fourth edition published in 2012 and constitutes a technical revision.

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

- a) the terms and definitions have been reviewed;
- b) the requirement concerning the IEC Quality Assessment System has been reviewed;
- c) the clause concerning quality assessment procedures has been deleted;
- d) Annex G, relating to technical information on variable optical attenuators, has been added.

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

FDIS	Report on voting
86B/4139/FDIS	86B/4144/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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – FIBRE OPTIC PASSIVE POWER CONTROL DEVICES –

Part 1: Generic specification

1 Scope

This part of IEC 60869 applies to fibre optic passive power control devices. These have all of the following general features:

- they are passive in that they contain no optoelectronic or other transducing elements;
- they have two ports for the transmission of optical power and control of the transmitted power in a fixed or variable fashion;
- the ports are non-connectorized optical fibre pigtails, connectorized optical fibres or receptacles.

This document establishes generic requirements for the following passive optical devices:

- optical attenuator;
- optical fuse;
- optical power limiter.

This document also provides generic information including terminology for the IEC 61753-05x series. Published IEC 61753-05x series documents are listed in Bibliography.

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* (available at www.electropedia.org)

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 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 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*

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*

SOMMAIRE

AVANT-PROPOS.....	41
1 Domaine d'application	43
2 Références normatives	43
3 Termes et définitions	44
3.1 Termes concernant les composants	44
3.2 Termes concernant les performances	45
4 Description des dispositifs	47
4.1 Affaiblisseur optique	47
4.2 Fusible optique	48
4.3 Limiteur de puissance optique.....	48
5 Exigences.....	49
5.1 Classification	49
5.1.1 Généralités	49
5.1.2 Type	50
5.1.3 Bande de longueur d'onde	50
5.1.4 Modèle	50
5.1.5 Variante.....	51
5.1.6 Niveau d'assurance de la qualité	51
5.1.7 Extensions des références normatives.....	52
5.2 Documentation.....	53
5.2.1 Symboles.....	53
5.2.2 Système de spécifications	53
5.2.3 Schémas	54
5.2.4 Essais et mesures	55
5.2.5 Fiches techniques d'essai.....	55
5.2.6 Instructions d'emploi.....	55
5.3 Système de normalisation	55
5.3.1 Normes d'interface.....	55
5.3.2 Normes de performance	56
5.3.3 Normes de fiabilité.....	56
5.3.4 Interconnexions	57
5.4 Conception et construction.....	58
5.4.1 Matériaux	58
5.4.2 Fabrication	59
5.5 Qualité	59
5.6 Performance	59
5.7 Identification et marquage.....	59
5.7.1 Généralités.....	59
5.7.2 Numéro d'identification des variantes	59
5.7.3 Marquage des composants	59
5.7.4 Marquage de l'emballage.....	59
5.8 Emballage.....	60
5.9 Conditions de stockage.....	60
5.10 Sécurité	60
Annexe A (informative) Exemples de configurations et de performances pour les fusibles optiques.....	61

Annexe B (informative) Notes d'application des fusibles optiques	63
Annexe C (informative) Exemples de configurations et de performances pour les limiteurs de puissance optique	64
Annexe D (informative) Notes d'application pour les limiteurs de puissance optique	67
Annexe E (informative) Note d'application pour les affaiblisseurs optiques fixes	69
Annexe F (informative) Note d'application pour les affaiblisseurs optiques variables, manuellement ou électriquement	70
Annexe G (informative) Exemple de technologie des affaiblisseurs optiques variables.....	72
G.1 Exemple de technologie d'un VOA de type système micro-électromécanique (MEMS)	72
G.2 Exemple de technologie d'un VOA de type à circuits optiques planaires (PLC) et de type thermo-optique (TO)	72
G.3 Exemple de technologie d'un VOA de type magnéto-optique (MO)	73
Bibliographie.....	75
Figure 1 – Courbe de fonctionnement de l'affaiblisseur optique fixe	47
Figure 2 – Courbe de fonctionnement du VOA	48
Figure 3 – Courbe de fonctionnement du fusible optique.....	48
Figure 4 – Courbe de fonctionnement du limiteur de puissance optique	49
Figure 5 – Configuration A	51
Figure 6 – Configuration B	51
Figure 7 – Configuration C.....	51
Figure 8 – Structure de la normalisation.....	58
Figure A.1 – Fusible optique, modèle dépourvu de connecteur	61
Figure A.2 – Fusible optique, modèle fiche-embase (LC)	61
Figure A.3 – Courbe de temps de réponse d'un fusible optique	62
Figure A.4 – Fusible optique, seuil de puissance d'environ 30 dBm (1 W), chute de puissance de sortie au niveau du seuil d'environ 25 dB	62
Figure B.1 – Mise en place d'un fusible optique	63
Figure C.1 – Limiteur de puissance optique, modèle dépourvu de connecteur.....	64
Figure C.2 – Limiteur de puissance optique, modèle fiche-embase (LC)	64
Figure C.3 – Limiteurs de puissance optique – Expérience	65
Figure C.4 – Temps de réponse schématique du limiteur de puissance optique L'impulsion d'entrée a une durée de 1 ms.	65
Figure C.5 – Schéma des définitions de puissance	66
Figure C.6 – Limiteur de puissance optique, définitions de puissance d'entrée	66
Figure D.1 – Limiteur de puissance optique et fusible optique, combinés, courbe de fonctionnement	68
Figure E.1 – Mise en place d'un affaiblisseur optique fixe	69
Figure F.1 – Mise en place d'un affaiblisseur optique variable, manuellement ou électriquement	71
Figure G.1 – Exemple de technologie d'un VOA de type MEMS	72
Figure G.2 – Exemple de technologie d'un VOA de type PLC-TO.....	73
Figure G.3 – Relation entre les variations de phase et l'affaiblissement	73
Figure G.4 – Exemple de technologie d'un VOA de type MO.....	74

Tableau 1 – Structure de spécification de l'IEC à trois niveaux	53
Tableau 2 – Matrice de croisement des normes	58

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

DISPOSITIFS D'INTERCONNEXION ET COMPOSANTS PASSIFS FIBRONIQUES – DISPOSITIFS FIBRONIQUES PASSIFS DE CONTRÔLE DE LA PUISSANCE –

Partie 1: Spécification générique

AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 60869-1 a été établie par le sous-comité 86B: Dispositifs d'interconnexion et composants passifs à fibres optiques, du comité d'études 86 de l'IEC: Fibres optiques.

Cette cinquième édition annule et remplace la quatrième édition parue en 2012 et constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) les termes et définitions ont été revus;
- b) l'exigence concernant le système IEC 'd'évaluation de la qualité a été revue;
- c) l'article concernant les procédures d'assurance de la qualité a été supprimé;

d) l'Annexe G, concernant les informations techniques des affaiblisseurs optiques variables, a été ajoutée.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
86B/4139/FDIS	86B/4144/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives à la publication recherchée. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.

DISPOSITIFS D'INTERCONNEXION ET COMPOSANTS PASSIFS FIBRONIQUES – DISPOSITIFS FIBRONIQUES PASSIFS DE CONTRÔLE DE LA PUISSANCE –

Partie 1: Spécification générique

1 Domaine d'application

La présente partie de l'IEC 60869 s'applique aux dispositifs fibroniques passifs de contrôle de la puissance. Ceux-ci présentent toutes les caractéristiques générales suivantes:

- ils sont passifs dans le sens où ils ne contiennent aucun élément optoélectronique ou autre élément transducteur;
- ils disposent de deux ports pour la transmission de la puissance optique et ils contrôlent l'énergie transmise de manière fixe ou variable;
- les ports sont des fibres amorces optiques dépourvues de connecteurs, des fibres optiques munies de connecteurs ou des embases.

Le présent document établit les exigences génériques pour les dispositifs optiques passifs suivants:

- affaiblisseur optique,
- fusible optique,
- limiteur de puissance optique.

Le présent document prévoit également l'information générique y compris la terminologie pour la série IEC 61753-05x. Les publications de la série IEC 61753-05x sont indiquées dans la Bibliographie.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60027 (toutes les parties), *Symboles littéraux à utiliser en électrotechnique*

IEC 60050-731, *Vocabulaire Electrotechnique International – Chapitre 731: Télécommunications par fibres optiques* (disponible sur le site web www.electropedia.org)

IEC 60617, *Symboles graphiques pour schémas* (disponible sur le site web <http://std.iec.ch/iec60617>)

IEC 60695-11-5, *Essais relatifs aux risques du feu – Partie 11-5: Flammes d'essai – Méthode d'essai au brûleur-aiguille – Appareillage, dispositif d'essai de vérification et lignes directrices*

IEC 60825 (toutes les parties), *Sécurité des appareils à laser*

IEC 61300 (toutes les parties), *Dispositifs d'interconnexion et composants passifs fibroniques – Procédures fondamentales d'essais et de mesures*

IEC TS 62627-09, *Fibre optic interconnecting devices and passive components – Vocabulary for passive optical devices* (disponible en anglais seulement)

ISO 129-1, *Documentation technique de produits – Représentation des dimensions et tolérances*

ISO 286-1, *Spécification géométrique des produits (GPS) – Système de codification ISO pour les tolérances sur les tailles linéaires – Partie 1: Base des tolérances, écarts et ajustements*

ISO 1101, *Spécification géométrique des produits (GPS) – Tolérancement géométrique – Tolérancement de forme, orientation, position et battement*

ISO 8601, *Éléments de données et formats d'échange – Échange d'information – Représentation de la date et de l'heure*