

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Fibre optic interconnecting devices and passive components – Fibre optic passive chromatic dispersion compensators – Part 1: Generic specification**

**Dispositifs d'interconnexion et composants passifs fibroniques – Compensateurs de dispersion chromatique passifs fibroniques – Partie 1 : Spécification générique**



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2024 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

#### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

#### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Discover our powerful search engine and read freely all the publications provided, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

#### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Recherche de publications IEC -

[webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Fibre optic interconnecting devices and passive components – Fibre optic passive chromatic dispersion compensators – Part 1: Generic specification**

**Dispositifs d'interconnexion et composants passifs fibroniques – Compensateurs de dispersion chromatique passifs fibroniques – Partie 1 : Spécification générique**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 33.180.01

ISBN 978-2-8322-8702-6

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

# 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 Requirements ..... 10

    4.1 Classification ..... 10

        4.1.1 General ..... 10

        4.1.2 Technology..... 11

        4.1.3 Types ..... 11

        4.1.4 Wavelength band..... 11

        4.1.5 Application of PDCSs and their suitable technologies ..... 11

        4.1.6 Interface style..... 12

    4.2 Documentation..... 12

        4.2.1 Symbols ..... 12

        4.2.2 Drawings ..... 12

        4.2.3 Tests and measurements..... 12

        4.2.4 Test report..... 13

        4.2.5 Instructions for use ..... 13

    4.3 Standardisation system..... 13

        4.3.1 Interface standards..... 13

        4.3.2 Performance standards..... 13

        4.3.3 Reliability standards ..... 13

    4.4 Design and construction..... 14

        4.4.1 Materials ..... 14

        4.4.2 Workmanship..... 14

    4.5 Quality ..... 14

    4.6 Performance requirements..... 14

    4.7 Identification and marking ..... 14

        4.7.1 General ..... 14

        4.7.2 Component marking..... 14

        4.7.3 Package marking ..... 15

    4.8 Packaging ..... 15

    4.9 Storage conditions ..... 15

    4.10 Safety ..... 15

Annex A (informative) Example of dispersion compensating fibre (DCF) technologies ..... 16

Annex B (informative) Example of fibre Bragg grating (FBG) technologies ..... 18

Annex C (informative) Example of virtually imaged phased array (VIPA) technologies ..... 20

Annex D (informative) Example of GT etalon technologies ..... 22

Annex E (informative) Technology dependent characteristics of PCDCs ..... 23

Annex F (informative) Example of interface style ..... 24

Bibliography..... 25

Figure A.1 – Chromatic dispersion in a standard single-mode optical fibre (SMF) ..... 16

Figure A.2 – Calculated contour for different dispersion at the wavelength of 1,55 $\mu\text{m}$ [CD( $\lambda$ :1,55 $\mu\text{m}$ )] for a step index core fibre .....	17
Figure A.3 – Examples of refractive index profile used in DCF .....	17
Figure B.1 – Illustration of the use of a chirped fibre Bragg grating for chromatic dispersion compensation .....	18
Figure B.2 – Expanded view over 10 nm of the insertion loss (attenuation) spectrum of a multi-channel FBG .....	19
Figure C.1 – Structure of virtually imaged phased array (VIPA).....	20
Figure C.2 – Detailed light path and mechanism of generating chromatic dispersion.....	21
Figure D.1 – Gires-Tournois etalon .....	22
Figure F.1 – Examples of interface style for fibre optic PCDCs .....	23
Table 1 – Example of a typical fibre optic PDCS classification .....	11
Table 2 – Application, channel numbers, passband and technologies of PDCS .....	12
Table E.1 – Summary of technology dependent characteristics of PCDCs .....	23

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING DEVICES  
AND PASSIVE COMPONENTS – FIBRE OPTIC PASSIVE  
CHROMATIC DISPERSION COMPENSATORS –****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, accept 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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61978-1 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2014. This edition constitutes a technical revision.

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

- a) harmonization of terms and definitions with IEC TS 62627-09;
- b) change of Clause 4 regarding requirements.

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

Draft	Report on voting
86B/4866/FDIS	86B/4901/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

A list of all parts in the IEC 61978 series, published under the general title *Fibre optic interconnecting devices and passive components – Fibre optic passive chromatic dispersion compensators*, 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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document 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 CHROMATIC DISPERSION COMPENSATORS –

## Part 1: Generic specification

### 1 Scope

This part of IEC 61978 applies to fibre optic passive chromatic dispersion compensators, all exhibiting the following features:

- they are optically passive;
- they have an optical input and an optical output for transmitting optical power;
- the ports are optical fibres or optical fibre connectors;
- they are wavelength sensitive;
- they can be polarization sensitive.

This document establishes uniform requirements for the passive chromatic dispersion compensator.

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

IEC 61753 (all parts), *Fibre optic interconnecting devices and passive components performance standards*

IEC 61930, *Fibre optic graphical symbology*

IEC 62005 (all parts), *Reliability of fibre optic interconnecting devices and passive components*

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*