

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –

Part 3-55: Examinations and measurements – Polarisation extinction ratio and keying accuracy of polarisation maintaining, passive, optical components

Dispositifs d'interconnexion et composants passifs fibroniques – Procédures fondamentales d'essais et de mesures –

Partie 3-55: Examens et mesures – Rapport d'extinction de polarisation et précision du détrompage des composants optiques passifs maintenant la polarisation



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 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 Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
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

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

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

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

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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

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

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

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

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 3-55: Examinations and measurements – Polarisation extinction ratio and keying accuracy of polarisation maintaining, passive, optical components**

**Dispositifs d'interconnexion et composants passifs fibroniques – Procédures fondamentales d'essais et de mesures –
Partie 3-55: Examens et mesures – Rapport d'extinction de polarisation et précision du détrompage des composants optiques passifs maintenant la polarisation**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.180.20

ISBN 978-2-8322-8255-7

**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
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviated terms	7
3.1 Terms and definitions.....	7
3.2 Abbreviated terms.....	7
4 General description	8
5 Measurement principles.....	8
6 Apparatuses	9
6.1 General.....	9
6.2 Method A (reference-less approach)	9
6.2.1 General	9
6.2.2 Light source.....	10
6.2.3 Polariser and analyser	11
6.2.4 Depolariser.....	11
6.2.5 Input and output coupling optics	11
6.2.6 Power detection system.....	11
6.2.7 Mechanical holders.....	12
6.2.8 Reference connector receptacle	12
6.2.9 PM-DUT	12
6.3 Method B (comparative approach)	12
6.3.1 General	12
6.3.2 Light source.....	13
6.3.3 Polariser, waveplates and analyser.....	13
6.3.4 Reference cable	13
6.3.5 Coupling optics.....	14
6.3.6 Power detection system.....	14
6.3.7 Mechanical holders.....	14
6.3.8 Reference connector receptacle	14
6.3.9 PM-DUT	14
7 PER measurement procedures	14
7.1 General.....	14
7.2 Method A (reference-less approach)	15
7.2.1 General	15
7.2.2 Measurement preparation	15
7.2.3 Polarisation extinction ratio measurement.....	15
7.3 Method B (comparative approach)	16
7.3.1 General	16
7.3.2 Measurement preparation	16
7.3.3 Polarisation extinction ratio measurement.....	18
8 Mechanical key accuracy measurement procedures	18
8.1 General.....	18
8.2 Method A (reference-less approach)	18
8.2.1 General	18
8.2.2 Measurement preparation	19

8.2.3	Mechanical reference guide key angular offset Δ measurement	19
8.3	Method B (comparative approach)	19
8.3.1	General	19
8.3.2	Measurement preparation	20
8.3.3	Mechanical reference guide key angular offset Δ measurement	20
9	Details to be specified	20
Annex A (informative)	Generation of linear states of polarisation	21
A.1	General.....	21
A.2	Polariser – Quarter-waveplate – Polariser	21
A.3	Polariser – Half-waveplate	21
Annex B (informative)	Keying accuracy for PM fibre.....	23
Annex C (informative)	Calculated extinction ratio versus measured values	25
Bibliography	27

Figure 1	– Test apparatus for both polarisation extinction ratio measurements and for the determination of the mechanical reference guide keying angular misalignment	10
Figure 2	– Test apparatus for both polarisation extinction ratio measurements and for the determination of the mechanical reference guide key angular misalignment using a reference	13
Figure 3	– Typical power transmission curve after analyser	16
Figure 4	– Schematic initial layout for measurement preparation according to method B.....	17
Figure 5	– Examples of relative angular misalignments between fibre's principal axis, mechanical reference guide key, reference receptacle, and analyser's orientation	19
Figure A.1	– Arrangement 1 for the generation of a constant intensity, arbitrarily oriented, linear SOP	21
Figure A.2	– Arrangement 2 for the generation of a constant intensity, arbitrarily oriented, linear SOP	22
Figure B.1	– Relative position of mechanical reference guide key	23
Figure B.2	– Relative position of mechanical reference guide key, geometrical and optical axes in one example of PM PANDA fibre	24
Figure B.3	– Relative position of mechanical reference guide key, geometrical and optical axes in one example of Bowtie fibre.....	24
Figure C.1	– Calculated extinction ratio versus measured values	26
Figure C.2	– Calculated extinction ratio for a connection of two PM fibre sections	26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING
DEVICES AND PASSIVE COMPONENTS –
BASIC TEST AND MEASUREMENT PROCEDURES –**
**Part 3-55: Examinations and measurements –
Polarisation extinction ratio and keying accuracy
of polarisation maintaining, passive, optical components**

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 61300-3-55 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86B/4276/FDIS	86B/4290/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.

A list of all parts in the IEC 61300 series, published under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*, 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 "<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.

INTRODUCTION

This document contains and expands the content of IEC 61300-3-24 and IEC 61300-3-40.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 3-55: Examinations and measurements – Polarisation extinction ratio and keying accuracy of polarisation maintaining, passive, optical components

1 Scope

This part of IEC 61300 provides methods for measuring the polarisation extinction ratio (PER) of single-mode, polarisation maintaining (PM) optical components based upon PM fibres. This document also provides methods for detecting the input and output orientation of the PM components' principal axes as well as methods for estimating the keying accuracy, i.e. the angular misalignment between the principal axes and the mechanical reference guide key of the connectors, if these are present.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in 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>

3.1.1

principal state of polarisation

PSP

state of polarisation (SOP) that propagates unaltered through an optically anisotropic medium

Note 1 to entry: It is also known as "eigen polarisation".

Note 2 to entry: This note applies to the French language only.

3.1.2

polarisation extinction ratio

PER

fraction of the power of one PSP that leaks onto the orthogonal one as it propagates along the polarisation maintaining component

Note 1 to entry: This note applies to the French language only.

3.2 Abbreviated terms

Term	Description
DUT	device under test