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Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-24: Examinations and measurements - Keying accuracy of optical connectors for polarization maintaining fibre (IEC 61300-3-24:1999)

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English version

**Fibre optic interconnecting devices and passive components  
Basic test and measurement procedures  
Part 3-24: Examinations and measurements - Keying accuracy of optical  
connectors for polarization maintaining fibre  
(IEC 61300-3-24:1999)**

Dispositifs d'interconnexion et  
composants passifs à fibres optiques  
Méthodes fondamentales d'essais et de  
mesures  
Partie 3-24: Examens et mesures  
Précision du détrompage des  
connecteurs optiques pour la fibre de  
maintien de la polarisation  
(CEI 61300-3-24:1999)

LWL-Verbindungselemente und passive  
Bauteile - Grundlegende Prüf- und  
Meßverfahren  
Teil 3-24: Untersuchungen und  
Messungen - Genauigkeit der  
Außenzentrierung von optischen  
Steckverbindern für  
polarisationserhaltende Fasern  
(IEC 61300-3-24:1999)

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# CENELEC

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

### Foreword

The text of document 86B/1254/FDIS, future edition 1 of IEC 61300-3-24, prepared by SC 86B, Fibre optic interconnecting devices and passive components, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61300-3-24 on 2000-01-01.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2000-10-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2003-01-01

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### Endorsement notice

The text of the International Standard IEC 61300-3-24:1999 was approved by CENELEC as a European Standard without any modification.

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INTERNATIONAL  
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61300-3-24

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First edition  
1999-12

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passifs à fibres optiques –  
Méthodes fondamentales d'essais et de mesures –**

**Partie 3-24:  
Examens et mesures –  
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pour la fibre de maintien de la polarisation**

**Fibre optic interconnecting devices and  
passive components –  
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for STANDARD maintaining fibre**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING DEVICES AND  
PASSIVE COMPONENTS –  
BASIC TEST AND MEASUREMENT PROCEDURES –  
Part 3-24: Examinations and measurements –  
Keying accuracy of optical connectors for  
polarization maintaining fibre**

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61300-3-24 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

The text of this standard is based on the following documents:

FDIS	Report on voting
86B/1254/FDIS	86B/1286/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The IEC 61300 series consists of the following parts, under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*:

- Part 1: General and guidance
- Part 2: Tests
- Part 3: Examinations and measurements

Annexes A and B form an integral part of this standard.

The committee has decided that this publication remains valid until 2004.

At this date, in accordance with the committee's decision, the publication will be

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

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Keying accuracy of optical connectors for  
polarization maintaining fibre**

## 1 Scope and object

The purpose of IEC 61300-3-24 is to measure the keying accuracy of a polarization maintaining fibre connector.

## 2 General description

Optical fibre connectors for polarization maintaining fibre (PMF) shall align the birefringence axes of the two mating fibres. The keying accuracy of PM connector plugs should be specified to realize PMF connection with high extinction ratio propagation (see annex A). The extinction ratio of PMF itself is generally over 40 dB for fibres several metres in length.

The extinction ratio achieved with the PMF connectors is lower than that due to the PM fibre alone because of the following reasons:

- a) in the termination: after the PM fibre has been terminated into the ferrule, some residual stress causes the extinction ratio to decrease;
- b) angular misalignment of the axes of birefringence: the angular misalignment of the polarization axes at the connection point affects the extinction ratio.

To evaluate the influence of the second factor of the misalignment angle of the polarization axes at the connection point, measurement of the keying accuracy and the extinction ratio is very important (see annex B).

## 3 Apparatus

The apparatus and arrangement necessary to make this measurement is shown in figure 1. The material needed consists of the following:

- a) an optical source S with known characteristics (wavelength, spectral width, etc.) and a compatible detector D. A Fabry-Perot laser or low-coherence source (for example SLD) is suitable for this measurement;
- b) an in-line polarization assembly of polarizer P1, quarter-wave retardation plate and polarizer P2 in an expanded beam system formed by two lenses L1 and L2. The quarter-wave plate converts the state of polarization SOP from linear to circular and the polarizer converts the SOP from circular to linear. With this combination of elements, linearly polarized light with the same optical power will be produced regardless of the plane of polarization.

NOTE In the case of an unpolarized light source such as an LED, P1 and quarter wave retardation plate are not necessary.

- c) two optical receptacles Re;
- d) an analyzer A to determine the extinction ratio of light.



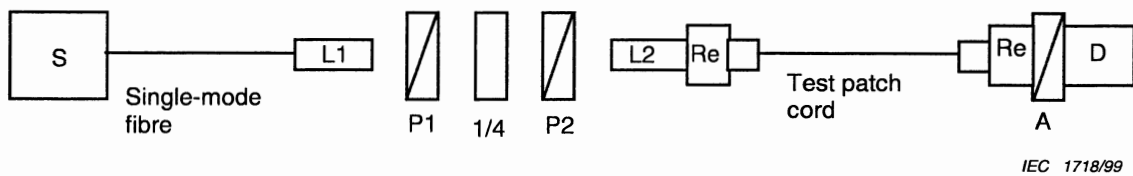


Figure 1 – Apparatus of keying accuracy and extinction ratio measurement

#### 4 Procedure

4.1 The first part of this procedure sets a uniform linearly polarized light for any direction at the output of the lens L2. With the measurement arrangement set up as in figure 2:

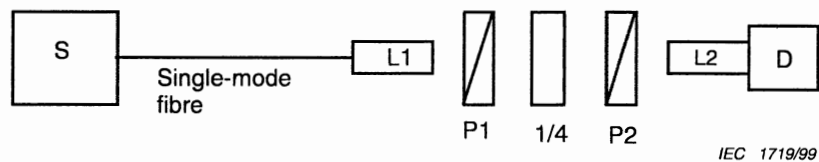


Figure 2 – First part of the measurement procedure

- Remove the polarizer P2 and adjust the polarizer P1 to get a maximum measurement at the detector.
- Insert the polarizer P2 and adjust the quarter-wave retardation plates to get a uniform measurement at the detector for every direction of polarizer P2.

4.2 The next part of this procedure measures the angle of polarization axis and the extinction ratio of the test patch cord.

- Place the patch cord to be tested between two receptacles (Re) as shown in figure 1.
- Adjust analyzer A to get a minimum measurement at the detector.
- Adjust polarizer P2 to get a minimum measurement at the detector.
- Repeat steps b) and c) until the lowest measurement attainable is achieved. Record this measurement as  $D_{\min}$  (dBm).
- Rotate the analyzer to  $90^\circ$  from a minimum reading point at the detector. Record this reading as  $D_{\max}$  (dBm).

The extinction ratio of the test patch cord is given by  $D_{\max} - D_{\min}$  (dB). The angle of polarization axis of each plug of the test patch cord is the angle of the polarizer P2 and the analyzer A, respectively.

- Keying accuracy is obtained as a mismatch angle  $\Delta$  between the obtained polarization axis and the key groove direction of the receptacle for each plug end as shown in figure 3.