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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-43: Tests – Screen testing of return loss of single-mode PC optical fibre connectors

Dispositifs d'interconnexion et composants passifs à fibres optiques – Procédures fondamentales d'essais et de mesures – Partie 2-43: Essais – Sélection des connecteurs PC pour fibres optiques unimodales en fonction de leur affaiblissement de réflexion

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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

Part 2-43: Tests – Screen testing of return loss of single-mode PC optical fibre connectors

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International Standard IEC 61300-3-43 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This second edition of IEC 61300-3-43 cancels and replaces the first edition published in 1999 and constitutes a technical revision.

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

a) revision of the scope;
b) revision of the procedure;
c) addition of measurement uncertainty into the 'Details to be specified';
d) addition of a bibliography.

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

CDV	Report on voting
86B/3669/CDV	86B/3755/RVC

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 2.

A list of all parts in the IEC 61300 series, published under the general title, *Fibre optic interconnecting and passive components – Basic test and measurement procedures*, can be found on the IEC website.

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

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

Part 2-43: Tests – Screen testing of return loss of single-mode PC optical fibre connectors

1 Scope

This part of IEC 61300 aims at screening single-mode physical contact (PC) optical fibre connectors of an optical fibre cord or an optical fibre pigtail in terms of return loss, thus ensuring minimum return loss when the connectors, which have been screen tested by this method, are randomly mated with each other in the field.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examinations and measurements – Return loss*

3 General description

The domed ferrule end faces of PC connectors (not angled) are produced by a polishing process. This polishing process results in a thin damaged layer at the fibre end face of the connector. In silica fibres, the refractive index of the damaged layer is slightly higher than that of original fibre. This high refractive index layer generates optical reflection. When PC connectors are mated, return loss occurs as a result of multiple reflections at the two damaged layers of the butted connectors.

This test procedure ensures that a designed minimum return loss is achieved when PC connectors are randomly mated. It screens cords or pigtails by using a pair of reflection standard plug (RP) cords. The pair of reflection standard plugs is selected on the condition that the return loss when the plugs are mated is several decibels better than the designed minimum return loss. Cords which pass this test will achieve the designed minimum return loss in over 99 % of cases when randomly mated (see Annex A).

4 Apparatus

The equipment listed below shall be chosen according to the method used to measure the connector return loss, in accordance with IEC 61300-3-6. The reflection standard plug shall be prepared according to the procedure given in 5.1.

- Sources S
- Excitation unit E
- Detector D
- Temporary joint TJ
- Terminator T
- Branching device BD
- Reflection standard cord

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The reflection standard cord has a reflection standard plug (RP) at one end. The other end of the reflection standard cord is an end or a plug whose return loss is better than the designed minimum return loss L_{rs} (in decibels).

5 Procedure

5.1 Selection of the reflection standard cord

The reflection standard plug (RP) shall be selected by the following procedure.

a) Set up an objective reflection standard cord as shown in Figure 1.

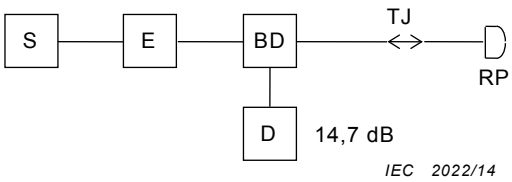

Figure 1 – Measurement set-up for open plug reflection standard

b) Set the detector to 14,7 dB as the Fresnel reflection between the air and the silica fibre core as shown in Figure 1. The refractive index of air is 1,0, and the one of silica fibre is 1,452 for single-mode fibre on condition Δ = 0,3 %, λ = 1,31 μm.

NOTE Measurement accuracy can be improved by using the actual parameters of fibres which have been employed.

c) Connect another objective reflection standard cord as shown in Figure 2, then measure the return loss.

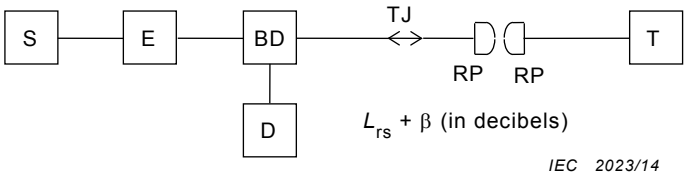

Figure 2 – Measurement set-up for mated reflection standard cords

d) Take the pair of objective reflection standard cords as reflection standard cords on condition that their return loss from the mating point is $L_{rs} + \beta$ (in decibels), where L_{rs} is a designed minimum return loss. The value of β shall be set at above 2 dB.

5.2 Cord screen testing

a) Connect the device under test (DUT) (cord) between the reflection standard plugs as shown in Figure 3.

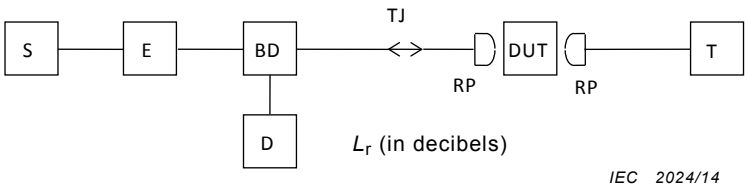

Figure 3 – Measurement set-up for cord screen testing

b) Measure the return loss L_r (in decibels) from the two PC mating points.

c) Consider the objective cord as a screen tested cord when L_r is greater than L_{rs}.

5.3 Pigtail cord screen testing

a) Connect the objective PC connector of DUT (pigtail cord) to one reflection standard plug as shown in Figure 4, and terminate pigtail fibre end.

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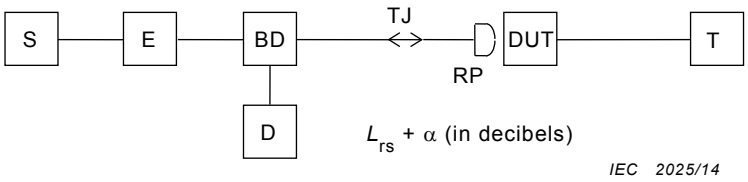

Figure 4 – Measurement set-up for pigtail cord screen testing

b) Measure the return loss L_r (in decibels) from the mating point.

c) Pass the objective pigtail cord as a screen tested cord when L_r is greater than L_{rs} + α (in decibels). The value of α shall be set at above 0,6 dB and at less than 5 dB.

6 Details to be specified

The following details, as applicable, shall be specified in the relevant specification:

– minimum return loss L_{rs} (in decibels);

– condition of standard reflection plugs (the value of β in decibels);

– screening condition for pigtail cords (the value of α in decibels);

– attenuation of mating points between the reflection standard connectors and the objective connectors;

– measurement uncertainty.

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