IEC 61753-021-2

Edition 2.0 2007-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components performance standard –
Part 021-2: Grade C/3 single-mode fibre optic connectors for category C – Controlled environment

Norme de qualité de fonctionnement des dispositifs d'interconnexion et composants passifs à fibres optiques –
Partie 021-2: Connecteurs à fibres optiques unimodales de classe C/3 pour la catégorie C – Environnement contrôlé

IEC 61753-021-2:2007

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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 corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

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 It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:
Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,…). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:
Email: csc@iec.ch
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

IEC 61753-021-2

Edition 2.0 2007-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components performance standard –
Part 021-2: Grade C/3 single-mode fibre optic connectors for category C – Controlled environment

Norme de qualité de fonctionnement des dispositifs d'interconnexion et composants passifs à fibres optiques –
Partie 021-2: Connecteurs à fibres optiques unimodales de classe C/3 pour la catégorie C – Environnement contrôlé

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX P

ICS 33.180.20

ISBN 2-8318-9465-4

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS PERFORMANCE STANDARD –

Part 021-2: Grade C/3 single-mode fibre optic connectors for category C – Controlled environment

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
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 61753-021-2 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2002 and constitutes a technical revision. The standard has been updated to reflect changes made to IEC 61753-1.

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

FDIS	Report on voting
86B/2602/FDIS	86B/2655/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 2.

A list of all parts of the IEC 61753 series, published under the general title *Fibre optic interconnecting devices and passive components performance standard,* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

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

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS PERFORMANCE STANDARD –

Part 021-2: Grade C/3 single-mode fibre optic connectors for category C – Controlled environment

1 Scope

This part of IEC 61753 defines C/3 minimum initial test and measurement requirements and severities which a single-mode connector/cable assembly must satisfy in order to be categorized as meeting the IEC standard category C (controlled environment), as defined in Clause A.2 of IEC 61753-1.

2 Normative references

The following referenced documents are indispensable for the application 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 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 61300-2-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-1: Tests – Vibration (sinusoidal)*

IEC 61300-2-2, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-2: Tests – Mating durability*

IEC 61300-2-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-4: Tests – Fibre/cable retention*

IEC 61300-2-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-6: Tests – Tensile strength of coupling mechanism*

IEC 61300-2-12, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-12: Tests – Impact*

IEC 61300-2-17, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-17: Tests – Cold*

IEC 61300-2-18, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-18: Tests – Dry heat – High temperature endurance*

IEC 61300-2-19, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-19: Tests – Damp heat (steady state)*

IEC 61300-2-22, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-22: Tests – Change of temperature*

IEC 61300-2-42, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-42: Tests – Static side load for connectors*

IEC 61300-2-44, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-44: Tests – Flexing of the strain relief of fibre optic devices*

IEC 61300-3-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-1: Examinations and measurements – Visual examination*

IEC 61300-3-3, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-3: Examinations and measurements – Active monitoring of changes in attenuation and return loss*

IEC 61300-3-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-4: Examinations and measurements – Attenuation*

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

IEC 61300-3-28, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-28: Examinations and measurements – Transient loss*

IEC 61300-3-34, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-34: Examinations and measurements – Attenuation of random mated connectors*

IEC 61753-1:2007 *Fibre optic interconnecting devices and passive components performance standard – Part 1: General and guidance for performance standards*

IEC 61754 (all parts), *Fibre optic connector interfaces*

IEC 61755 (all parts), *Fibre optic connector optical interfaces*

IEC 61755-3 (all parts) *Fibre optic connector optical interfaces – Part 3: Optical interface*

ISO 11801, *Information technology – Generic cabling for customer premises*

3 Terms and definitions

For the purposes of this document, the following definitions apply.

3.1
change in attenuation
peak-to-peak variation

3.2
sample
complete set of connector components required to provide demountable coupling between one or more pairs of optical fibres

3.3
pigtail assembly
two connector plugs mated with an adapter with unterminated leads, as shown in Figure 1.

NOTE Each of the unterminated leads should be at least 3 m long so that the splices may be located outside of the environmental test chamber.

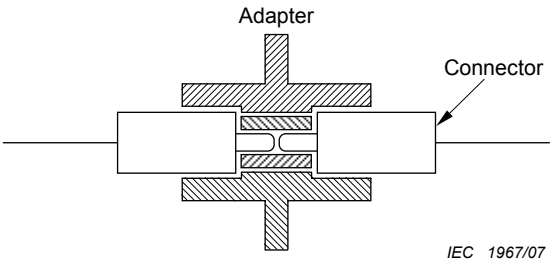

Figure 1 – Pigtail assembly

3.4
jumper cable assembly
jumper cable terminated with plugs on each end connected with adapters to two additional connector plugs with unterminated leads on either end, as shown in Figure 2. The jumper cable should be 5 m ± 0,5 m. Each of the unterminated leads should be long enough so that the splices may be located outside of the environmental test chamber.

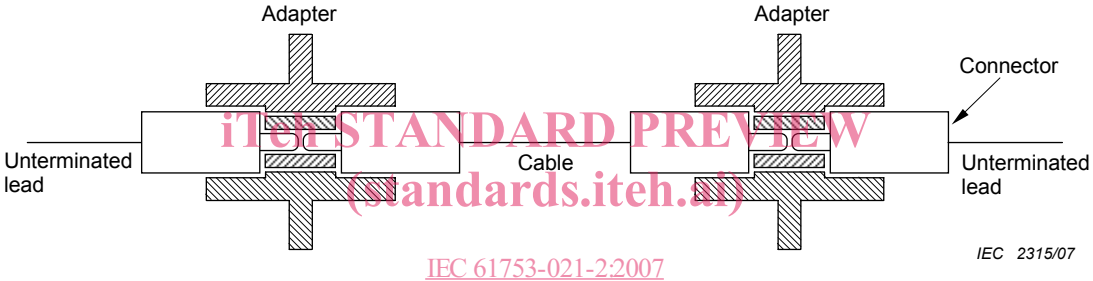

Figure 2 – Jumper cable assembly

4 Tests

All test methods are in accordance with the relevant parts of IEC 61300 as defined in 7.4 and 7.5.

The connectors under test shall be terminated onto single-mode fibre per type B1.1 or B1.3 of IEC 60793-2-50, in either secondary coated or cable format. The connector interface standard shall meet the dimensions of IEC 61754 and the connector optical interface standard shall meet the relevant requirements of IEC 61755.

The optical connector requirements shall be met in order to be in accordance with IS0 11801.

Each test defines the number of samples to be evaluated. The sample set used for the first test is to be composed of randomly selected and previously unstressed new samples.

The optical criteria for each test shall be as defined in 7.4.

5 Test report

Fully documented test reports and supporting evidence shall be prepared and available for inspection as evidence that the tests have been carried out and the results are satisfactory.

6 Reference components

No reference components are required to perform the tests in this standard.

7 Performance requirements

7.1 Dimensions

Dimensions shall comply with the appropriate IEC interface standard as defined in IEC 61754.

7.2 Sample size, test sequencing and grouping

For the purposes of this standard, a sample is composed of pigtail assemblies and jumper cable assemblies (see Clause 3). The sample sizes to be used for the tests shall be as defined in Annex A. There is no defined sequence or grouping in which the tests shall be run. Samples for the first test (attenuation) are to be randomly selected and randomly mated new products. Samples for the second test (return loss) are the same plugs selected and mated for the first test. Samples for subsequent tests may be randomly selected and randomly mated new products or the same plugs.

7.3 Endface geometry

The connector endface shall comply with the endface geometry requirements of the applicable IEC optical interface standard as defined in 61755-3. Compliance with the appropriate optical interface standard shall be confirmed on all samples before the start of testing and after all of the tests have been completed. Non-compliance with the endface geometry requirements of the applicable optical interface standard on any connector tested results in a failure of this performance standard.

7.4 Performance criteria

The optical performance levels shall meet the requirements of Grade C/3 as defined in Table A.12 of IEC 61753-1. See Table.1

Table 1 – Performance levels

Performance level	Test name	Initial	During and after test
C/3	Attenuation IEC 61300-3-34	≤0,25 dB mean ≤0,50 dB max. for ≥97 % of samples	
	Return loss IEC 61300-3-6	≥35 dB	Return loss ≥35 dB during and after test
	Monitoring change in attenuation and in return loss (multiple path IEC 61300-3-3)		Maximum variation ≤0,2 dB during and after test for pigtails Maximum variation ≤0,5 dB during and ≤0,4 dB after test for patchcords

7.5 Performance details

Performance details are specified in Table 2.

Table 2 – Performance details

No	Test	Requirements	Details
1	Attenuation (Method C)	Grade C performance level: Mean ≤ 0,25 Maximum = 0,50 dB Test wavelengths: 1 310 nm ± 30 nm and 1 550 nm ± 30 nm (launch condition S4 and S5)	IEC 61300-3-4 Device under test (DUT) type 5, Insertion method (C) Launch mode conditions: only the fundamental mode shall propagate at the connector interface and at the detector. Source characteristics reference to IEC 61300-3-4 (attenuation) Specimen shall be optically functioning. Preconditioning procedure: clean plug and adapter according to manufacturer's instructions.
2	Return loss	Grade 3 performance level: Minimum > 35 dB Test wavelengths: 1 310 nm ± 20 nm and 1 550 nm ± 20 nm	IEC 61300-3-6 Method branching devices Launch fibre length: L > 2 m Source stability: ±0,20 dB over the measuring period or at least 1 h Detector linearity: within 5 % of the power levels to be measured Directivity: >65 dB Specimen shall be optically functioning. Preconditioning procedure: clean plug and adapter according to manufacturer's instructions. Alternative method: IEC 61300-3-6 Method OTDR Launch fibre length: $L1$ ≥ 500 m, $L2$ ≥ 6 m, $L3$ ≥ 6 m Pulse duration: ≤10 ns Specimen shall be optically functioning. Preconditioning procedure: clean plug and adapter according to manufacturer's instructions.
3	Vibration (sinusoidal)	Attenuation: All attenuation measurements shall meet the criteria specified in 7.4. Return loss: All return loss measurements shall meet the criteria specified in 7.4. Test wavelengths: 1 550 nm ± 20 nm	IEC 61300-2-1 Frequency range: 10 Hz to 55 Hz Change in frequency: 1 oct/min Endurance duration per axis: 0,5 h Number of axes: three orthogonal Number of sweeps per axis: 15 Vibration amplitude: 0,75 mm Sampling rate: before, during and after each axis. The measurement interval during the test shall be < 2 ms and transient monitoring shall be performed according to IEC 61300-3-28. Sampling rate note: Attenuation and return loss decrease is the difference between any measurement and the initial measurement, and applies to all measurements. Maximum attenuation and return loss criteria apply to all measurements. Method of mounting: an adapter shall be mounted rigidly to the mounting fixture. Specimen shall be optically functioning. Preconditioning procedure: clean plug and adapter according to manufacturer's instructions. The connector samples shall not be uncoupled or cleaned anytime during the test.

Table 2 *(continued)*

No	Test	Requirements	Details
4	Cold	Attenuation: All attenuation measurements shall meet the criteria specified in 7.4. Return loss: All return loss measurements shall meet the criteria specified in 7.4. Test wavelengths: 1 550 nm ± 20 nm	IEC 61300-2-17 Temperature: –10 °C ± 2 °C Duration of exposure: 96 h Length of the cable on each side of the connector inside the chamber: 1,5 m minimum Sampling rate: before and after test and at a maximum interval of 1 h during the test. Preconditioning procedure: before test, specimens shall be maintained in room temperature condition for 2 h. Clean plug and adapter according to manufacturer's instructions. Recovery procedure: after test, specimens shall be maintained in room temperature condition for 2 h. The connector samples shall not be uncoupled or cleaned anytime during the test.
5	Dry heat - high temperature endurance	Attenuation: All attenuation measurements shall meet the criteria specified in 7.4. Return loss: All return loss measurements shall meet the criteria specified in 7.4. Test wavelengths: 1 550 nm ± 20 nm	IEC 61300-2-18 Temperature: +60 °C ± 2 °C Duration of exposure: 96 h Length of the cable on each side of the connector inside the chamber:1,5 m minimum Sampling rate: before and after test and at a maximum interval of 1 h during the test Preconditioning procedure: before test, specimens shall be maintained in room temperature condition for 2 h. Clean plug and adapter according to manufacturer's instructions. Recovery procedure: after test, specimens shall be maintained in room temperature condition for 2 h. The connector samples shall not be uncoupled or cleaned anytime during the test.
6	Damp heat (steady state)	Attenuation: All attenuation measurements shall meet the criteria specified in 7.4. Return Loss: All return loss measurements shall meet the criteria specified in 7.4. Test wavelengths: 1 550 nm ± 20 nm	IEC 61300-2-19 Temperature: +40 °C ± 2 °C Relative humidity: 93 % $^{+2}_{-3}$ % Duration of exposure: 96 h Length of the cable on each side of the connector inside the chamber: 1,5 m minimum Sampling rate: before and after test and at a maximum interval of 1 h during the test Preconditioning procedure: before test, specimens shall be maintained in room temperature condition for 2 h. Clean plug and adapter according to manufacturer's instructions. Recovery procedure: after test, specimens shall be maintained in room temperature condition for 2 h. The connector samples shall not be uncoupled or cleaned anytime during the test.