

INTERNATIONAL STANDARD

IEC 61753-022-2

First edition
2003-02

**Fibre optic interconnecting devices and
passive components performance standard –**

**Part 022-2:
Fibre optic connectors terminated on multimode fibre
for category C – Controlled environment**

*Norme de qualité de fonctionnement des dispositifs
d'interconnexion et composants passifs à fibres optiques –*

*Partie 022-2:
Connecteurs à fibres optiques raccordés à une fibre multimode
pour la catégorie C – Environnement contrôlé*



Reference number
IEC 61753-022-2:2003(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** (www.iec.ch)

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site (http://www.iec.ch/searchpub/cur_fut.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

This summary of recently issued publications (http://www.iec.ch/online_news/justpub/jp_entry.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: custserv@iec.ch
Tel: +41 22 919 02 11
Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 61753-022-2

First edition
2003-02

Fibre optic interconnecting devices and passive components performance standard –

Part 022-2: Fibre optic connectors terminated on multimode fibre for category C – Controlled environment

Norme de qualité de fonctionnement des dispositifs d'interconnexion et composants passifs à fibres optiques –

Partie 022-2: Connecteurs à fibres optiques raccordés à une fibre multimode pour la catégorie C – Environnement contrôlé

© IEC 2003 — Copyright - all rights reserved

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 the publisher.

International Electrotechnical Commission, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

L

For price, see current catalogue

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS PERFORMANCE STANDARD –

Part 022-2: Fibre optic connectors terminated on multimode fibre for category C – Controlled environment

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.
- 2) The formal decisions or agreements of the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61753-022-2 has been prepared by sub-committee 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 of voting
86B/1776/FDIS	86B/1830/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.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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

A bilingual version of this publication may be issued at a later date.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS PERFORMANCE STANDARD –

Part 022-2: Fibre optic connectors terminated on multimode fibre for category C – Controlled environment

1 Scope

This part of IEC 61753 contains the minimum requirements and severities which a fibre optic connector terminated on multimode fibre must satisfy in order to be categorised as meeting the IEC standard category C – Controlled Environment, as defined in annex A of IEC 61753-1-1.

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.

60793-2:1998, *Optical fibres – Part 2: Product specifications*

61300 (all parts), *Fibre optic interconnecting devices and passive components*

61300-2-1:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-1: Tests – Vibration (sinusoidal)*

61300-2-2:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-2: Tests – Mating durability*

61300-2-4:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-4: Tests – Fibre/cable retention*

61300-2-6:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-6: Tests – Tensile strength of coupling mechanism*

61300-2-12:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-12: Tests – Impact*

61300-2-17:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-17: Tests – Cold*

61300-2-18:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-18: Tests – Dry heat – High temperature endurance*

61300-2-19:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-19: Tests – Damp heat (steady state)*

61300-2-22:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-22: Tests – Change of temperature*

61300-2-42:1998, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-42: Tests – Static side load for connectors*

61300-3-3:1997, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-3: Examinations and measurements – Monitoring change in attenuation and in return loss (multiple paths)*

61300-3-4:2001, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-4: Examinations and measurements – Attenuation*

61300-3-6:1997, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examinations and measurements – Return loss*

61300-3-28:2002, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-28: Examinations and measurements – Transient loss*

61300-3-34:2001, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-34: Examinations and measurements – Attenuation of random mated connectors*

61753-1-1:2000, *Fibre optic interconnecting devices and passive components performance standard – Part 1-1: General and guidance – Interconnecting devices (connectors)*

3 Test

All test methods are in accordance with the IEC 61300 series of standards.

The connector shall be terminated onto multimode fibre as per IEC 60793-2, fibre type A1a or A1b, in either secondary coated or reinforced cable format.

Each test defines the number of samples to be evaluated.

The samples used for each test are intended to be previously unstressed new samples, but may be selected from previously used samples if so desired.

All optical testing shall be carried out at a central wavelength of $1\,300\text{ nm} \pm 30\text{ nm}$. Attenuation (reference) is the only test that calls up additional testing at the central wavelength of $850\text{ nm} \pm 30\text{ nm}$.

Source characteristics S2, S3 and detector D1 refer to IEC 61300-3-4.

Launch conditions shall be in accordance with IEC 61300-1, annex B, case 2: equilibrium mode distribution. Useful information to obtain that condition is given in 4.2 of IEC 61300-3-34.

The full set of tests shall be carried out for all fibre types for which compliance to this standard is claimed.

For different cable structures only requalification to tests 4, 5, 8, 10, 11, 12 and 13 is requested.

Change in attenuation, for the purpose of the test, is defined as the peak to peak variation and shall be measured using IEC 61300-3-3. For monitoring intermittent discontinuities during a test, IEC 61300-3-28 shall be used.

4 Test report

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

5 Reference components

Where the test methods used within this document require the use of reference components they shall have characteristics as defined in Annex B.

6 Performance requirements

6.1 Dimensions

Dimensions, shall comply with either the appropriate IEC interface standard or with those given in appropriate manufacturers' drawings, where the IEC interface standard does not exist or cannot be used.

6.2 Sample size, sequencing and groupings

For the purposes of this standard a sample is a connector set, defined as the complete set of connector components required to provide demountable coupling between one or more pairs of optical fibres, i.e. "cable-plug-adapter-plug-cable" or "cable-socket-plug-cable". The length of cable (or fibre) inside the chamber on each side of the connector set should be 1,5 minimum.

The sample sizes, sequencing and grouping to be used for the tests shall be as defined in Annex A. Samples may either be new product or sourced from a previous test.

6.3 Performance details

NO.	TEST	REQUIREMENTS	DETAILS
1	Attenuation (reference)	$\leq 0,30$ dB Each part of the sample shall be tested against reference components at 1 300 nm and at 850 nm.	IEC 61300-3-4 INSERTION METHOD B At equilibrium mode distribution conditions Source stability $\pm 0,05$ dB over the measuring period or at least 1 h Source characteristics: for 850 nm: S2 type, LED for 1 300 nm: S3 type, LED Power meter: D1 Reference component: as per Annex B Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.

2	Return loss	<p>Class M: RL > 20dB</p> <p>Class N: No requirements</p>	<p>IEC 61300-3-6</p> <p>METHOD A (Branching device method)</p> <p>Source: Stability: $\pm 0,20$ dB over the measuring period or at least 1 h Spectral width: 20 nm Launch condition: EMD</p> <p>Detector: Sensitivity: <30 dB under source injected power Linearity: <0,5 dB</p> <p>Branching device: Directivity: >36 dB, without modal dispersion</p> <p>Reference components: as per Annex B</p> <p>Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>
3	Attenuation (random mate)	<p>Class M: Mean $\leq 0,35$ dB Max. 0,50 dB for ± 95 % of mating combinations Max. 0,75 dB for 100 % of mating combinations</p> <p>Class N: Mean $\leq 0,70$ dB Max. 1,25 dB</p>	<p>IEC 61300-3-34</p> <p>METHOD 1</p> <p>At equilibrium mode distribution conditions</p> <p>Source stability $\pm 0,05$ dB over the measuring period or at least 1 h</p> <p>Source characteristics: (IEC 61300-3-4) for 1300 nm: S2 type, LED</p> <p>Power meter: D1</p> <p>Attenuation measurements shall be made on randomly selected specimens.</p> <p>Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>
4	Vibration (sinusoidal)	<p>Attenuation shall be measured before, at a maximum interval of 2 s during and after the test.</p> <p>Class M: Allowable change in attenuation: $\leq 0,20$ dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: $\leq 0,50$ dB</p>	<p>IEC 61300-2-1</p> <p>Frequency range: 10-55 Hz</p> <p>Endurance duration per axis: 0,5 h</p> <p>Number of axes: Three orthogonal</p> <p>Number of sweeps: 15</p> <p>Vibration amplitude: 0,75 mm</p> <p>Sampling interval: Optical measurement shall be at a maximum period of 2 s</p> <p>Method of mounting: An adapter shall be mounted rigidly to the mounting fixture</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions</p>

5	Fibre cable retention	<p>Attenuation shall be measured before, during and after the test.</p> <p>Class M: Allowable change in attenuation: $\leq 0,20$ dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: $\leq 0,50$ dB</p>	<p>IEC 61300-2-4</p> <p>Magnitude & rate of application of the tensile load: 50 ± 2 N at a speed of 5 N/s for reinforced cables $5 \pm 0,5$ N at a speed of 0,5 N/s for coated fibres.</p> <p>Point of application of tensile load: 0,3 from the end face of the connector.</p> <p>Duration of the test (maintaining the load): 60 s</p> <p>Sampling rate: Attenuation shall be measured at least once after the load has reached its maximum level and been maintained for a minimum period of 30 s.</p> <p>Method of mounting: The connector shall be rigidly mounted such that the load is applied to the fibre/cable retention mechanism not the connector coupling mechanism.</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions</p>
6	Tensile strength of coupling mechanism	<p>Attenuation shall be measured before, during and after the test.</p> <p>Class M: Allowable change in attenuation: $\leq 0,20$ dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: $\leq 0,50$ dB</p>	<p>IEC 61300-2-6</p> <p>Magnitude of the tensile load: $40 \text{ N} \pm 1 \text{ N}$</p> <p>Rate of application of the load: 2 N/s</p> <p>Duration of the test: 60 s</p> <p>Sampling rate: Attenuation shall be measured at least once after the load has reached its maximum level and been maintained for a minimum period of 30 s.</p> <p>Method of mounting: An adapter shall be mounted rigidly to the mounting fixture.</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer instructions</p>
7	Impact	<p>Attenuation shall be measured before, and after each drop.</p> <p>Class M: Allowable change in attenuation: $\leq 0,20$ dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: $\leq 0,50$ dB</p>	<p>IEC 61300-2-12 (Method A)</p> <p>Number of drops: 5</p> <p>Drop height: 1,5 m</p> <p>Sampling rate: After each drop</p> <p>Specimen shall be unmated during drops, and remated for measurements after each drop.</p> <p>Specimen shall be non-functioning.</p> <p>Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p> <p>Recovery procedure after each drop: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>

8	Static side load	<p>Attenuation shall be measured before, at a maximum interval of 3 min during and after the test.</p> <p>Class M: Allowable change in attenuation: ≤0,20 dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: ≤0,50 dB</p>	<p>IEC 61300-2-42</p> <p>Magnitude of the tensile load: 1 N (reinforced cable) 0,2 N (buffered fibre)</p> <p>Point of application of the tensile load: 0,5 from the end face of the connector</p> <p>Duration of the test (maintaining load): 1 h for each tensile load (reinforced cable) 5 min for each tensile load (buffered fibre)</p> <p>Sampling rate: 3 min maximum interval</p> <p>Method of mounting: An adapter shall be mounted rigidly to the mounting fixture.</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>
9	Mating durability	<p>Attenuation shall be measured before, after each mating during the test.</p> <p>In the event that the transient attenuation increases above the allowable limit, the connector may be cleaned as necessary but not more than 25 times during the course of the test. (The measurement at which the cleaning takes place shall be discounted from the test results.)</p> <p>Class M: Allowable change in attenuation: ≤0,20 dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: ≤0,50 dB</p>	<p>IEC 61300-2-2</p> <p>Coupling mechanism to be cycled: plug-adapter</p> <p>Cycling rate: Not less than 3 s between each engagement and separation</p> <p>Number of cycles: 500</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning & recovery procedure: Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>
10	Cold	<p>Attenuation shall be measured before, at a maximum interval of 1 h during and after the test</p> <p>Class M: Allowable change in attenuation: ≤0,20 dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: ≤0,50 dB</p>	<p>IEC 61300-2-17</p> <p>Temperature: -10 °C</p> <p>Duration of exposure: 96 h</p> <p>Length of the cable on each side of the connector: 1,5 minimum (inside the chamber)</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning & recovery procedure: Before test, specimens shall be maintained in room temperature condition for 2 h. Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>
11	High temperature endurance	<p>Strength of coupling mechanism (as in Test 6) shall be measured on completion of test after recovery procedure.</p> <p>Attenuation shall be measured before, after and at a maximum interval of 1 h during the test.</p> <p>Class M: Allowable change in attenuation: ≤0,20 dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: ≤0,50 dB</p>	<p>IEC 61300-2-18</p> <p>Temperature: +60 °C.</p> <p>Duration of exposure: 96 h</p> <p>Length of the cable on each side of the connector: 1,5 minimum</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning & recovery procedure: Before test, specimens shall be maintained in room temperature condition for 2 h. Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>

12	Damp Heat (Steady state)	<p>Attenuation shall be measured before, at a maximum interval of 1 h during, and after the test.</p> <p>Class M: Allowable change in attenuation: $\leq 0,20$ dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: $\leq 0,50$ dB</p>	<p>IEC 61300-2-19</p> <p>Temperature: $+40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$</p> <p>Relative humidity: $93\% \pm 2\%$</p> <p>Duration of exposure: 96 h</p> <p>Length of the cable on each side of the connector: 1,5 minimum (inside the chamber)</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning & recovery procedure: Before test, specimens shall be maintained in room temperature condition for 2 h. Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>
13	Change of Temperature	<p>Attenuation shall be measured before, at a maximum interval of 10 min during, and after the test.</p> <p>Class M: Allowable change in attenuation: $\leq 0,20$ dB RL > 20 dB after test</p> <p>Class N: Allowable change in attenuation: $\leq 0,50$ dB</p>	<p>IEC 61300-2-22</p> <p>High temperature: $+60\text{ }^{\circ}\text{C}$</p> <p>Low temperature: $-10\text{ }^{\circ}\text{C}$</p> <p>Duration at extreme temperatures: 1 h</p> <p>Temperature rate of change: $1\text{ }^{\circ}\text{C}/\text{min}$</p> <p>Number of cycles: 5</p> <p>Length of the cable on each side of the connector: 1,5 minimum (inside the chamber)</p> <p>Specimen shall be optically functioning.</p> <p>Preconditioning & recovery procedure: Before test, specimens shall be maintained in room temperature condition for 2 h. Clean the mechanical and optical alignment parts of the specimen according to the manufacturer's instructions.</p>