

INTERNATIONAL STANDARD

IEC
61753-2-3

First edition
2001-07

Fibre optic interconnecting devices and passive components performance standard –

Part 2-3:

Non-connectorised single-mode 1×N and 2×N non-wavelength-selective branching devices for Category U – Uncontrolled environment

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

Partie 2-3:

*Dispositifs de couplage non-connectorisés monomodes
1×N et 2×N ne dépendant pas de la longueur d'onde
pour catégorie U –
Environnement non contrôlé*



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International Electrotechnical Commission
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS PERFORMANCE STANDARD –**Part 2-3: Non-connectorised single-mode 1×N and 2×N non-wavelength-selective branching devices for Category U – Uncontrolled 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.
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- 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.
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International Standard IEC 61753-2-3 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/1509/FDIS	86B/1548/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.

Annex B forms an integral part of this standard.

Annex A is for information only.

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

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- withdrawn;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

Withdrawn

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS PERFORMANCE STANDARD –

Part 2-3: Non-connectorised single-mode 1×N and 2×N non-wavelength-selective branching devices for Category U – Uncontrolled environment

1 Scope

This part of IEC 61753 contains the minimum initialisation test and measurement requirements and severities which a branching device shall satisfy in order to be categorised as meeting the IEC standard. The requirements cover balanced non-connectorised single-mode 1×N and 2×N non-wavelength-selective branching devices for use in an IEC Category U environment (N is the number of output ports). The specifications of unbalanced branching devices are limited to 1×2 and 2×2 devices because they are the most commonly used.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61753. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61753 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

IEC 60793-1-1:1995, *Optical fibres – Part 1: Generic specification – Section 1: General*

IEC 61300 (all parts), *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*

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

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

IEC 61300-2-5:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-5: Tests – Torsion/twist*

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

IEC 61300-2-14:1997, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-14: Tests – Maximum input power*

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

IEC 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*

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

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

IEC 61300-2-26:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-26: Tests – Salt mist*

IEC 61300-2-27:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-27: Tests – Dust – Laminar flow*

IEC 61300-2-28:1995, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-28: Tests – Industrial atmosphere (sulphur dioxide)*

IEC 61300-2-45:1999, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-45: Tests – Durability test by water immersion*

IEC 61300-3-2:1999, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-2: Examinations and measurements – Polarization dependence of attenuation in a single-mode fibre optic device*

IEC 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)*

IEC 61300-3-5:2001, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-5: Examinations and measurements – Wavelength dependence of attenuation*

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

IEC 61300-3-20:2001, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-20: Examinations and measurements – Directivity of fibre optic branching devices*

IEC 61753-2-1:2000, *Fibre optic interconnecting devices and passive components performance standard – Part 2-1: Fibre optic connectors terminated on single-mode fibre for category U – Uncontrolled environment*

3 Test

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

The samples shall be terminated onto single-mode fibres according to Type B1.1 of IEC 60793-1-1 in either coated fibres (primary and secondary) or reinforced cable format.

Each test defines the number of samples to be evaluated.

All tests shall be carried out to validate performance over the optical pass-bands of 1 260 nm to 1 360 nm and 1 480 nm to 1 580 nm. This is the minimum requirement for devices corresponding to Class 1 as described in 5.2. Extensions to these windows are covered by classes 2 and 3. Class 2 specifies additional attenuation limits for 1 450 nm to 1 480 nm and 1 580 nm to 1 600 nm. Class 3 devices shall meet Class 2 requirements and additionally have defined attenuation limits for 1 600 nm to 1 650 nm.

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 Performance requirements

5.1 Sample size, sequencing and grouping

Sample sizes for the tests are defined in annex B of this document.

Test groups and test sequences shall be performed individually or in sequential order as shown in annex B.

When testing in sequential order, the test sequence shown in annex B shall be followed.

5.2 Test details and requirements

Attenuation and return loss performances are given only for non-connectorised branching devices. For connectorised components the connector performances shall be in compliance with IEC 61753-2-1.

During the environmental tests where monitoring of the branching device is needed, all ports of the device shall be controlled.

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No.	Tests	Requirements	Details																											
1	<p>Attenuation</p> <p>Three classes of requirements have been identified for attenuation requirements:</p> <p>1) Class 1 for standard and obligatory requirements for telecom operation in 1 260 nm – 1 360 nm and 1 480 nm – 1 580 nm bands (attenuation requirements in Eq. 1 for balanced devices and in Eq. 1' for unbalanced devices)</p> <p>2) Class 2 for extended wavelength operation over a pass-band of 150 nm around the 1 550 nm optical window (attenuation requirements in Eq. 1 and Eq. 2 simultaneously)</p> <p>3) Class 3 for further extended band-pass between 1 600 nm and 1 650 nm for maintenance operation (attenuation requirements in Eq. 1, Eq. 2 and Eq. 3 simultaneously)</p>	<p>The attenuation requirements of 1×N and 2×N balanced branching devices are given for each Class in Eq. 1, 2 and 3, while the attenuation requirements of 1×2 and 2×2 unbalanced branching devices are expressed in Eq 1', only for Class 1.</p> <p>Eq. 1 (pass-band 1 260 nm to 1 360 nm and 1 480 nm to 1 580 nm)</p> <table><tr><td></td><td>1×N</td><td>2×N</td></tr><tr><td>A max. (dB)</td><td>$0,6 + 3,6 \times \log_2 N$</td><td>$0,9 + 3,6 \times \log_2 N$</td></tr><tr><td>A min. (dB)</td><td>$2,7 \times \log_2 N$</td><td>$2,7 \times \log_2 N - 0,1$</td></tr></table> <p>(See also table A.1 of annex A)</p> <p>Eq. 1' A max. (dB) = $25,5 - 12,5 \log_{10} (P \%)$ where $P \%$ is the nominal percentage of the power associated with one port (See also table A.2 of annex A)</p> <p>Eq. 2 (pass-band 1 450 nm to 1 480 nm and 1 580 nm to 1 600 nm)</p> <table><tr><td></td><td>1×N</td><td>2×N</td></tr><tr><td>A max. (dB)</td><td>$0,6 + 3,7 \times \log_2 N$</td><td>$0,9 + 3,7 \times \log_2 N$</td></tr><tr><td>A min. (dB)</td><td>$2,5 \times \log_2 N + 0,1$</td><td>$2,5 \times \log_2 N$</td></tr></table> <p>(See also table A.3 of annex A)</p> <p>Eq. 3 (pass-band 1 600 nm to 1 650 nm)</p> <table><tr><td></td><td>1×N</td><td>2×N</td></tr><tr><td>A max. (dB)</td><td>$0,6 + 3,9 \times \log_2 N$</td><td>$0,9 + 3,9 \times \log_2 N$</td></tr><tr><td>A min. (dB)</td><td>$2,4 \times \log_2 N - 0,1$</td><td>$2,4 \times \log_2 N - 0,2$</td></tr></table> <p>(See also table A.4 of annex A)</p>		1×N	2×N	A max. (dB)	$0,6 + 3,6 \times \log_2 N$	$0,9 + 3,6 \times \log_2 N$	A min. (dB)	$2,7 \times \log_2 N$	$2,7 \times \log_2 N - 0,1$		1×N	2×N	A max. (dB)	$0,6 + 3,7 \times \log_2 N$	$0,9 + 3,7 \times \log_2 N$	A min. (dB)	$2,5 \times \log_2 N + 0,1$	$2,5 \times \log_2 N$		1×N	2×N	A max. (dB)	$0,6 + 3,9 \times \log_2 N$	$0,9 + 3,9 \times \log_2 N$	A min. (dB)	$2,4 \times \log_2 N - 0,1$	$2,4 \times \log_2 N - 0,2$	<p>IEC 61300-3-5</p> <p>Fibre lengths of the branching device pigtail: ≥ 2 m</p> <p>Launch fibre lengths: ≥ 2 m</p> <p>Source: the stability at the operating wavelength shall be better than $\pm 0,05$ dB over the measuring period</p> <p>Unpolarised source</p> <p>Launch conditions: the wavelength of the source shall be longer than the cut-off wavelength of the fibre</p> <p>Wavelength bands: 1 260 nm – 1 360 nm and 1 480 nm – 1 580 nm (Class 1), 1 260 nm – 1 360 nm and 1 450 nm – 1 600 nm (Class 2) and 1 260 nm – 1 360 nm and 1 450 nm – 1 650 nm (Class 3)</p> <p>Detector system: linearity within $\pm 0,05$ dB spectral response matched to source dynamic range within the attenuation values to be measured wavelength resolution: ≤ 10 nm wavelength accuracy: ± 1 nm</p> <p>The minimum and maximum attenuation values apply to any combination of input/output ports</p>
	1×N	2×N																												
A max. (dB)	$0,6 + 3,6 \times \log_2 N$	$0,9 + 3,6 \times \log_2 N$																												
A min. (dB)	$2,7 \times \log_2 N$	$2,7 \times \log_2 N - 0,1$																												
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	1×N	2×N																												
A max. (dB)	$0,6 + 3,9 \times \log_2 N$	$0,9 + 3,9 \times \log_2 N$																												
A min. (dB)	$2,4 \times \log_2 N - 0,1$	$2,4 \times \log_2 N - 0,2$																												
2	Directivity	<p>≥ 35 dB Class T</p> <p>≥ 45 dB Class U</p> <p>≥ 55 dB Class V</p> <p>over the operating wavelength range</p>	<p>IEC 61300-3-20</p> <p>Details: same as in test No. 1</p> <p>All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement</p> <p>Other conditions: the directivity shall be measured between any pair of input or output ports</p>																											