SLOVENSKI STANDARD
SIST EN 61753-2-3:2002

01-september-2002

Fibre optic interconnecting devices and passive components - Part 2-3: Non-connectorised single-mode 1 * N and 2 * N non-wavelenght-selective branching devices for category U - Uncontrolled environment (IEC 61735-2-3:2001)

Fibre optic interconnecting devices and passive components performance standard -- Part 2-3: Non-connectorised single mode 1xN and 2xN non-wavelength-selective branching devices for Category U - Uncontrolled environment

Lichtwellenleiter - Verbindungselemente und passive Bauteile - Betriebsverhalten -- Teil 2-3: Nicht steckbare wellenlängenunabhängige Einmoden-1xN- und -2xN-Verzweiger für die Kategorie U - Unkontrollierte Umgebung

Norme de qualité de fonctionnement des dispositifs d'interconnexion et composants passifs à fibres optiques -- Partie 2-3: Dispositifs de couplage non-connectorisés monomodes 1xN et 2xN ne dépendant pas de la longueur d'onde pour catégorie U - Environnement non contrôlé

Ta slovenski standard je istoveten z: **EN 61753-2-3:2001**

ICS:

33.180.20	Povezovalne naprave za optiļ na vlakna	Fibre optic interconnecting devices

SIST EN 61753-2-3:2002 **en**

EUROPEAN STANDARD **EN 61753-2-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM November 2001

ICS 33.180.20

English version

Fibre optic interconnecting devices and passive components performance standard Part 2-3: Non-connectorised single mode 1xN and 2xN non-wavelength-selective branching devices for Category U - Uncontrolled environment

(IEC 61753-2-3:2001)

Norme de qualité de fonctionnement des dispositifs d'interconnexion et composants passifs à fibres optiques
Partie 2-3: Dispositifs de couplage non-connectorisés monomodes 1xN et 2xN ne dépendant pas de la longueur d'onde pour catégorie U - Environnement non contrôlé
(CEI 61753-2-3:2001)

Lichtwellenleiter - Verbindungselemente und passive Bauteile - Betriebsverhalten
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(IEC 61753-2-3:2001)

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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

Ref. No. EN 61753-2-3:2001 E

Foreword

The text of document 86B/1509/FDIS, future edition 1 of IEC 61753-2-3, 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 61753-2-3 on 2001-10-01.

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)	2002-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2004-10-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes B and ZA are normative and annex A is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61753-2-3:2001 was approved by CENELEC as a European Standard without any modification.

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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.

No.	Tests	Requirements	Details
1	Attenuation Three classes of requirements have been identified for attenuation requirements: 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) 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) 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)	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. Eq. 1 (pass-band 1 260 nm to 1 360 nm and 1 480 nm to 1 580 nm) 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) $2,7 \times \log_2 N$ $2,7 \times \log_2 N - 0,1$ (See also table A.1 of annex A) 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) Eq. 2 (pass-band 1 450 nm to 1 480 nm and 1 580 nm to 1 600 nm) 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) $2,5 \times \log_2 N + 0,1$ $2,5 \times \log_2 N$ (See also table A.3 of annex A) Eq. 3 (pass-band 1 600 nm to 1 650 nm) 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) $2,4 \times \log_2 N - 0,1$ $2,4 \times \log_2 N - 0,2$ (See also table A.4 of annex A)	IEC 61300-3-5 Fibre lengths of the branching device pigtail: ≥2 m Launch fibre lengths: ≥2 m Source: the stability at the operating wavelength shall be better than ±0,05 dB over the measuring period Unpolarised source Launch conditions: the wavelength of the source shall be longer than the cut-off wavelength of the fibre 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) Detector system: linearity within ±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 The minimum and maximum attenuation values apply to any combination of input/output ports
2	Directivity	≥35 dB Class T ≥45 dB Class U ≥55 dB Class V over the operating wavelength range	IEC 61300-3-20 Details: same as in test No. 1 All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement Other conditions: the directivity shall be measured between any pair of input or output ports

3a	Return loss (branching device method)	≥35 dB Class T ≥45 dB Class U	IEC 61300-3-6, Method 1 Branching device: nominal splitting ratio: 50/50 directivity: >60 dB Source: central wavelength: 1 310 nm ± 20 nm, 1 550 nm ± 20 nm, 1 625 nm ± 20 nm spectral width: ≤20 nm stability at the operating wavelength in a period of at least 1 h: within ±0,05 dB Detector: sensitivity:<–80 dBm linearity: within ±0,05 dB All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement
3b	Return loss (OTDR method)	≥55 dB Class V	IEC 61300-3-6, Method 2 OTDR source specifications: central wavelength: 1 310 nm ± 20 nm, 1 550 nm ± 20 nm, 1 625 nm ± 20 nm spectral width: ≤20 nm pulse duration: <500 ns Fibre lengths L1 + L2, L3 ≥ 500 m All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement
4	Polarisation dependent loss	For balanced branching devices: ≤0,3 dB $N \leq 4$ ≤0,5 dB $4 < N \leq 8$ ≤0,6 dB $N > 8$ For unbalanced 1×2 and 2×2 branching devices (only for Class 1) and for both output ports: $\leq 0{,}7 - 0{,}25 \times \log_{10} (P\ \%)$ where *P* % is the nominal percentage of the power associated with one port	IEC 61300-3-2, Option 1, Method A Source: LD 1 310 nm ± 10 nm, 1 550 nm ± 10 nm, 1 625 nm ± 10 nm Other details: same as in test No 1 The allowable loss combination applies to all combinations of input and output ports
5	Maximum input power	During the test the attenuation limits of test No. 1 shall be met. Moreover, during and on completion of the test, the attenuation of balanced branching devices shall be within ±0,3 dB for $N \leq 4$ and within ±0,5 dB for $N > 4$ of the original value under ambient conditions For unbalanced branching devices, the attenuation limits shall be within ±0,3 dB for *P* % > 2 % and ±0,5 dB for *P* % ≤ 2 % during the test Return loss shall satisfy the requirements for the specified class	IEC 61300-2-14 Maximum power to apply: 20 dBm Power increments: 5 dBm Duration of the optical power exposure at the different levels: 30 min Other details: same as in tests Nos. 1 and 3 Attenuation and return loss shall be measured before the test, during the test at a maximum interval of 10 min and after the test by means of the monitoring set-ups defined in test No. 6a or 6b

6a	Monitoring of attenuation and return loss (branching device method)	See requirements of attenuation and return loss (Classes T and U) of the environmental tests stated below	IEC 61300-3-3 Method 1 or Method 2 Source characteristics: same as tests Nos. 1 and 3 (branching device method) Branching devices directivity: >60 dB 1×N switch: repeatability <0,02 dB over the monitoring period Method to verify reference return loss and how to insert it in the reference line: to be decided
6b	Monitoring of attenuation and return loss (OTDR method)	See requirements of attenuation and return loss (Class V) of the environmental tests stated below	IEC 61300-3-3 Method 3 or Method 4 OTDR source specifications: same as tests No. 3 (return loss for Class V) 1×N switch: repeatability: <0,02 dB over the monitoring period Fibres: length as in test No. 3 (OTDR method) or longer than the distance required between the marker locations to make attenuation measurements
7	Cold	During the test the attenuation limits of test No. 1 shall be met. Moreover, during and on completion of the test, the attenuation of balanced branching devices shall be within ±0,3 dB for $N \leq 4$ and within ±0,5 dB for $N > 4$ of the original value under ambient conditions For unbalanced branching devices, the attenuation limits shall be within ±0,3 dB for P % > 2 % and ±0,5 dB for P % ≤ 2 % during the test Return loss shall satisfy the requirements for the specified class	IEC 61300-2-17 Temperature: –25 °C Duration of exposure: 96 h Length of the cable on each side of the device: >1,5 m Specimens shall be optically functioning: attenuation and return loss shall be measured before the test, during the test at a maximum interval of 1 h and after the test by means of the monitoring set-ups defined in test No. 6a or 6b Preconditioning procedure: before test, specimens shall be maintained at room temperature for 2 h Recovery procedure: after test, specimens shall be maintained at room temperature for 2 h
8	Dry heat – high temperature endurance	During the test the attenuation limits of test No. 1 shall be met. Moreover, during and on completion of the test, the attenuation of balanced branching devices shall be within ±0,3 dB for $N \leq 4$ and within ±0,5 dB for $N > 4$ of the original value under ambient conditions For unbalanced branching devices, the attenuation limits shall be within ±0,3 dB for P % > 2 % and ±0,5 dB for P % ≤ 2 % during the test Return loss shall satisfy the requirements for the specified class	IEC 61300-2-18 Temperature: +70 °C Duration of exposure: 96 h Length of the cable on each side of the device: >1,5 m Specimens shall be optically functioning: attenuation and return loss shall be measured before the test, during the test at a maximum interval of 1 h and after the test by means of the monitoring set-ups defined in test No. 6a or 6b Preconditioning procedure: before test, specimens shall be maintained at room temperature for 2 h Recovery procedure: after test, specimens shall be maintained at room temperature for 2 h