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Project No. 2023/01537

Responsible committee: GEL/86/2 Fibre optic interconnecting devices and passive components

Interested committees:

Title: BS EN IEC 61753-1 Fibre optic interconnecting devices and passive components - Performance standard

Part 1: General and guidance

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



86B/4782/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 61753-1 ED3

DATE OF CIRCULATION:

2023-07-07

CLOSING DATE FOR COMMENTS:

2023-09-29

SUPERSEDES DOCUMENTS:

86B/4779/RR

IEC SC 86B : FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS

SECRETARIAT:

Japan

SECRETARY:

Mr Shigeru Tomita

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:

☐

Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Fibre optic interconnecting devices and passive components - Performance standard - Part 1: General and guidance

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING DEVICES AND
PASSIVE COMPONENTS – PERFORMANCE STANDARD –****Part 1: General and guidance****FOREWORD**

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International Standard IEC 61753-1 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2018. It constitutes a technical revision.

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

- a) Definitions and tables updated with new products: free-breathing hardened connectors, free-breathing and sealed terminals;
- b) replaced all test temperatures $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ by $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ to harmonize with the standard atmospheric conditions in IEC 61300-1;

- c) addition of ageing cycle temperatures for the assembly/disassembly requirements in categories C, C^{HD}, OP, OP^{HD}, OP+, OP+^{HD}, A, G and S;
- d) correction duration of shock pulses according to IEC 60068-2-27. Changed duration of 200 g pulse to 6 ms and to 11 ms for the 50 g pulse;
- e) removal of the static side load test requirement in categories C, C^{HD}, OP, OP^{HD}, OP+, OP+^{HD};
- f) addition of installation test for FMS in category C and OP;
- g) moved category E to an informative annex D;
- h) added separate tables for free breathing and sealed housings in categories C and A;
- i) added information on test overpressure for sealing tests in tables for sealed protective housings in categories C, A, G and S;
- j) addition of material tests for protective housings (UV-light resistance, mould growth, hydrolysis resistance and resistance to cleaning solvents) in a new Annex B;
- k) added alternative for nonyl-phenol ethoxylate (Igepal®) as stress-cracking solvent;
- l) updated the cable retention test severities for categories A, G and S;
- m) updated the cable axial compression test severities for categories A, G and S;
- n) added new grade 1m (≥ 45 dB mated, ≥ 35 dB unmated) for return loss of multimode APC connectors;
- o) added torque limit of 25 Nm for cable torsion test of protective housings in categories C, A, G and S;
- p) added limit of 100 N for force to bend cables in the cable bending test of protective housings in categories C, A, G and S;
- q) added new pass/fail criteria for ingress of dust and water in IP5x, IPx4, IPx5 and IPx6 free breathing housings according to IEC TS 63334;
- r) specified the 300 N proof test requirement for hardened connectors for pulling on cap/plug/cable interface;
- s) removal of hardened connectors from category S;
- t) re-stated Annex E with exemption of lower test temperatures of -45 °C for Finland for categories OP+, E, A and G.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
86B/xxxx/FDIS	86B/xxxx/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- 179 • reconfirmed,
- 180 • withdrawn,
- 181 • replaced by a revised edition, or
- 182 • amended.

183 The contents of the corrigendum of May 2019 have been included in this copy.

184

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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187

INTRODUCTION

188 The IEC 61753 series is dealing with performance standards for all passive fibre optic products,
189 including connectors, passive optical components, fibre management systems and various
190 protective housings. The standard is published in multiple parts. This part, Part 1, covers
191 general information on performance standards. Subsequent parts are known as performance
192 standards and are numbered according to the classification defined in Annex B. These
193 standards contain the minimum test and measurement severities which are common to all
194 passive fibre optic products, for a particular service environment or performance category, and
195 the test and measurement severities which are considered specific to that particular product in
196 that environment.

197 Performance Standards define the requirements for standard optical performance under a set
198 of specified conditions. Each standard contains a series or a set of tests and measurements
199 with clearly stated conditions, severities and pass/fail criteria. The series of tests, commonly
200 referred to as an operating service environment or performance category, is intended to be run
201 on a 'one-off' basis to prove the product's ability to satisfy the requirements of a specific
202 application, market sector or user group.

203 This document define those sets of tests which form each operating service environment or
204 performance category and which have been standardised for international use. A product that
205 has been shown to meet all the requirements of a performance standard can be declared as
206 complying with that performance standard.

207 Products having the same classification from one manufacturer that satisfy a performance
208 standard, will operate within the boundaries set by the performance standard. Intermateability
209 or interchangeability of products from different suppliers (having the same classification and
210 conforming to the same performance standard) can only be guaranteed when these products
211 also meet the interface standards. Only in this condition will an equivalent level of performance
212 be provided when they are used together (for example, in the case of optical connectors).

213 Conformance to a performance standard is not a guarantee of lifetime assured performance or
214 reliability. Reliability testing is the subject of a separate test schedule, where the tests and
215 severities selected are truly representative of the requirements of this reliability test programme.
216 Consistency of manufacture will be maintained using a recognised quality assurance
217 programme whilst the reliability of product will be evaluated using the procedures recommended
218 in IEC 62005 (all parts).

219 Tests and measurements are selected from IEC 61300 (all parts). Where this is not possible,
220 the required test method is attached as an annex to the performance standard.

221

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 1: General and guidance

1 Scope

This part of IEC 61753 provides guidance for the drafting of performance standards for all passive fibre optic products.

This document defines the tests and severities which form the performance categories or general operating service environments and identifies those tests which are considered to be product specific. Test and severity details are given in Annex A.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60529, *Degrees of protection provided by enclosures (IP Code)*

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

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

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 61300-2-7, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-7: Tests – Bending moment*

IEC 61300-2-9, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-9: Tests – Shock*

IEC 61300-2-10, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-10: Tests – Crush resistance*

IEC 61300-2-11, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-11: Tests – Axial compression*

- 261 IEC 61300-2-12, *Fibre optic interconnecting devices and passive components – Basic test and*
262 *measurement procedures – Part 2-12: Tests – Impact*
- 263 IEC 61300-2-17, *Fibre optic interconnecting devices and passive components – Basic test and*
264 *measurement procedures – Part 2-17: Tests – Cold*
- 265 IEC 61300-2-18, *Fibre optic interconnecting devices and passive components – Basic test and*
266 *measurement procedures – Part 2-18: Tests – Dry heat – High temperature endurance*
- 267 IEC 61300-2-19, *Fibre optic interconnecting devices and passive components – Basic test and*
268 *measurement procedures – Part 2-19: Tests – Damp heat (steady state)*
- 269 IEC 61300-2-21, *Fibre optic interconnecting devices and passive components – Basic test and*
270 *measurement procedures – Part 2-21: Tests – Composite temperature/humidity cyclic test*
- 271 IEC 61300-2-22, *Fibre optic interconnecting devices and passive components – Basic test and*
272 *measurement procedures – Part 2-22: Tests – Change of temperature*
- 273 IEC 61300-2-23, *Fibre optic interconnecting devices and passive components – Basic test and*
274 *measurement procedures – Part 2-23: Tests – Sealing for non-pressurized closures of fibre*
275 *optic devices*
- 276 IEC 61300-2-26, *Fibre optic interconnecting devices and passive components – Basic test and*
277 *measurement procedures – Part 2-26: Tests – Salt mist*
- 278 IEC 61300-2-27, *Fibre optic interconnecting devices and passive components – Basic test and*
279 *measurement procedures – Part 2-27: Tests – Dust – Laminar flow*
- 280 IEC 61300-2-28, *Fibre optic interconnecting devices and passive components – Basic test and*
281 *measurement procedures – Part 2-28: Tests – Corrosive atmosphere (sulphur dioxide)*
- 282 IEC 61300-2-33, *Fibre optic interconnecting devices and passive components – Basic test and*
283 *measurement procedures – Part 2-33: Tests – Assembly and disassembly of fibre optic*
284 *mechanical splices, fibre management systems and closures*
- 285 IEC 61300-2-34, *Fibre optic interconnecting devices and passive components – Basic test and*
286 *measurement procedures – Part 2-34: Tests – Resistance to solvents and contaminating fluids of*
287 *interconnecting components and closures*
- 288 IEC 61300-2-35, *Fibre optic interconnecting devices and passive components – Basic test and*
289 *measurement procedures – Part 2-35: Tests – Cable nutation*
- 290 IEC 61300-2-37, *Fibre optic interconnecting devices and passive components – Basic test and*
291 *measurement procedures – Part 2-37: Tests – Cable bending for fibre optic closures*
- 292 IEC 61300-2-38, *Fibre optic interconnecting devices and passive components – Basic test and*
293 *measurement procedures – Part 2-38: Tests – Sealing for pressurized fibre optic closures*
- 294 IEC 61300-2-42, *Fibre optic interconnecting devices and passive components – Basic test and*
295 *measurement procedures – Part 2-42: Tests – Static side load for strain relief*
- 296 IEC 61300-2-44, *Fibre optic interconnecting devices and passive components – Basic test and*
297 *measurement procedures – Part 2-44: Tests – Flexing of the strain relief of fibre optic devices*
- 298 IEC 61300-2-45, *Fibre optic interconnecting devices and passive components – Basic test and*
299 *measurement procedures – Part 2-45: Tests – Durability test by water immersion*

IEC 61300-2-46, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-46: Tests – Damp heat, cyclic*

IEC 61300-2-50, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-50: Tests – Fibre optic connector proof test with static load – Singlemode and multimode*

IEC 61300-2-54, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-54: Tests – Corrosive atmosphere (mixed gas)*

IEC 61300-2-56, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-56: Tests – Wind resistance of mounted housing*

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 61300-3-7, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-7: Examinations and measurements – Wavelength dependence of attenuation and return loss of single mode components*

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 61300-3-29, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-29: Examinations and measurements – Spectral transfer characteristics of DWDM devices*

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 61300-3-45, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-45: Examinations and measurements – Attenuation of random mated multi-fibre connectors*

IEC TS 63334, *Fibre optic interconnecting devices and passive components – Conditions for testing the protection against dust and water ingress of passive optical protective housings and hardened fibre optic connectors (IP5X, IPX4, IPX5, IPX6)*

IEC Guide 109, *Environmental aspects – Inclusion in electrotechnical product standards*

ISO 1998-1:1998, *Petroleum industry – Terminology – Part 1: Raw materials and products*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

NOTE Terms and definitions for various components can be found in IEC TS 62538 and in the relevant IEC 61753 series performance standards.

3.1

adaptor

component that permits mating between a connector and another optical component

NOTE 1 to entry: Another optical component is a connector plug, an active device, a passive optical component.

3.2

box

free breathing housing that is permanently fixed to a wall or pole

NOTE 1 to entry: A box is not specifically designed to allow cable movement (e.g. torsion, bending) at the cable ports during operation.

NOTE 2 to entry: A box is typically designed for reconfiguration or maintenance work without removing it from the wall or pole.

3.3

closure

protective housing utilised for the storage, distribution or protection of one or more cable joints or any passive or active telecom equipment

NOTE 1 to entry: A closure can be either a "sealed closure" or a "free breathing closure".

NOTE 2 to entry: Closures can be moved into handholes, direct buried or mounted onto poles after installation. During maintenance or due to network churn, the closure can be moved back to a more controlled environment location that provides better conditions for cable addition, splicing and fibre routing. As cable movement will occur, the closures have additional sets of requirements on cable handling (torsion, bending, cable retention, cable compression). Because of this additional handling, closures are considered to be more robust than boxes.

3.4

connector

component normally attached to a cable or piece of apparatus for the purpose of providing interconnection and disconnection of fibre optic cables

3.5

fibre management system

FMS

system to control, protect and store splices, connectors, passive optical components and fibres from incoming to outgoing cables

NOTE 1 to entry: Splice trays or organiser trays are parts of a fibre management system.

3.6

fibre splice

permanent or separable joint between optical fibres achieved by either fusion splicing or mechanical splicing

3.7

field mountable connector

FMC

connector which is mounted directly onto fibre or fibre cable in the field

3.8

free breathing closure

protective housing that allows a free exchange of air with the environment

NOTE 1 to entry: A free breathing closure may look like a sealed closure, but it is not designed to hold a varying overpressure or underpressure caused by temperature changes or atmospheric pressure changes. Free breathing closures are used in aerial environments for the interconnection of cables.

NOTE 2 to entry: Limited water ingress and/or limited dust ingress is possible. Free breathing closures are not intended for use in areas that are subject to flooding or water immersion.

NOTE 3 to entry: A free breathing closure is typically removed from the fixing position in operation for reconfiguration or maintenance work. During relocation for this work, movement of the cables may occur and should have no negative effect on the operation of the network.

3.9

free breathing hardened fibre optic connector

connector with a free breathing protective housing that allows a free exchange of air with the environment

NOTE 1 to entry: A free breathing hardened fibre optic connector is typically used as connection in aerial environments mounded on a free breathing protective housing.

3.10

Hardened connector

connector with a protective housing

NOTE 1 to entry: A hardened connector can be either a "sealed hardened connector" or a "free breathing hardened connector".

3.11

MICE

classification system that describes the environment conditions that are local to a channel based upon the following factors:

- mechanical (M),
- ingress (I),
- climatic and chemical (C),
- electromagnetic (E)

NOTE 1 to entry: The term MICE is referenced in the generic cabling standards produced by ISO/IEC JTC1 SC25 and relates to the classification of the environment local to the cabling channel.

There are four primary environmental criteria used to classify an environment:

- the M element, defining the mechanical characteristics of the environment;
- the I element, defining the ingress protection characteristics of the environment;
- the C element, defining the climatic and chemical characteristics of the environment;
- the E element, defining the electromagnetic characteristics of the environment.

Each of the four primary environmental criteria is further divided into specific parameters and levels for those parameters. The MICE classification for a given location is therefore defined as MaIbCcEd where a, b, c and d are the individual sub-classifications (levels) for the M, I, C and E criteria respectively.

The suffices for the four primary environmental criteria are either 1, 2 or 3. For example, the most benign environment is described as M1I1C1E1 whereas the most harsh environment would be defined as M3I3C3E3.

Note 2 to entry: The E element is considered not relevant to passive optical components.

[SOURCE: ISO/IEC 24702:2006, 3.1.11, modified – The notes have been added.]

3.12

optical distribution frame module

ODF module

ODFM

housing which is mountable in a supporting structure

NOTE 1 to entry: An ODFM contains a fibre management system and can provide rearrangeable interconnections between the incoming to the outgoing cables.

433 Note 2 to entry: The supporting structure that houses the ODFM is often called an equipment rack.

434 **3.13**

435 **operating service environment**

436 typical service environment or operating location simulated by a performance category

437 **3.14**

438 **performance category**

439 series of tests and measurements with clearly stated conditions and severities, which are
440 chosen to simulate a particular operating service environment

441 **3.15**

442 **performance standard**

443 standard which is designed to verify that a product is capable of meeting the requirements of a
444 particular service environment

445 NOTE 1 to entry: A performance standard contains a combination of those tests, together with their severities and
446 pass-fail criteria, which are applied to all passive fibre optic products for a particular performance category, together
447 with those which are considered specific to that particular product in that environment.

448 **3.16**

449 **performance standard test report**

450 report to be produced on completion of testing to a performance standard

451 **3.17**

452 **product specific tests**

453 tests which are considered to be specific to a particular product category or type

454 Note 1 to entry: Where there is a specific requirement for a product, this is the subject of a separate test and is
455 included in the relevant product performance standard.

456 **3.18**

457 **protective housing**

458 indoor and outdoor housing utilised for the storage, distribution or protection of one or more
459 cable joints or any passive or active telecom equipment

460 **Note 1 to entry: Examples of protective housings: boxes, cabinets, optical distribution frames sub racks, closures,**
461 **terminals or pedestals as shown in Figure 1 – Relationship between various protective**
462 **housing types**

463 . A closure can be either a "sealed closure" or a "free breathing closure". Boxes are free breathing protective housings
464 and permanently fixed to a wall or a pole. The incoming cables are attached to the wall or the pole. As a result no
465 cable bending and torsion requirements are given as cables are not moved anymore after installation. Closures can
466 be moved into handholes or onto poles after installation. During maintenance or due to network churn the closure
467 can be moved back to a location that provides better conditions for cable addition, splicing and fiber routing (more
468 controlled environment). As cable movement will occur, the closures have additional sets of requirements on cable
469 handling (torsion, bending, cable retention, cable compression).

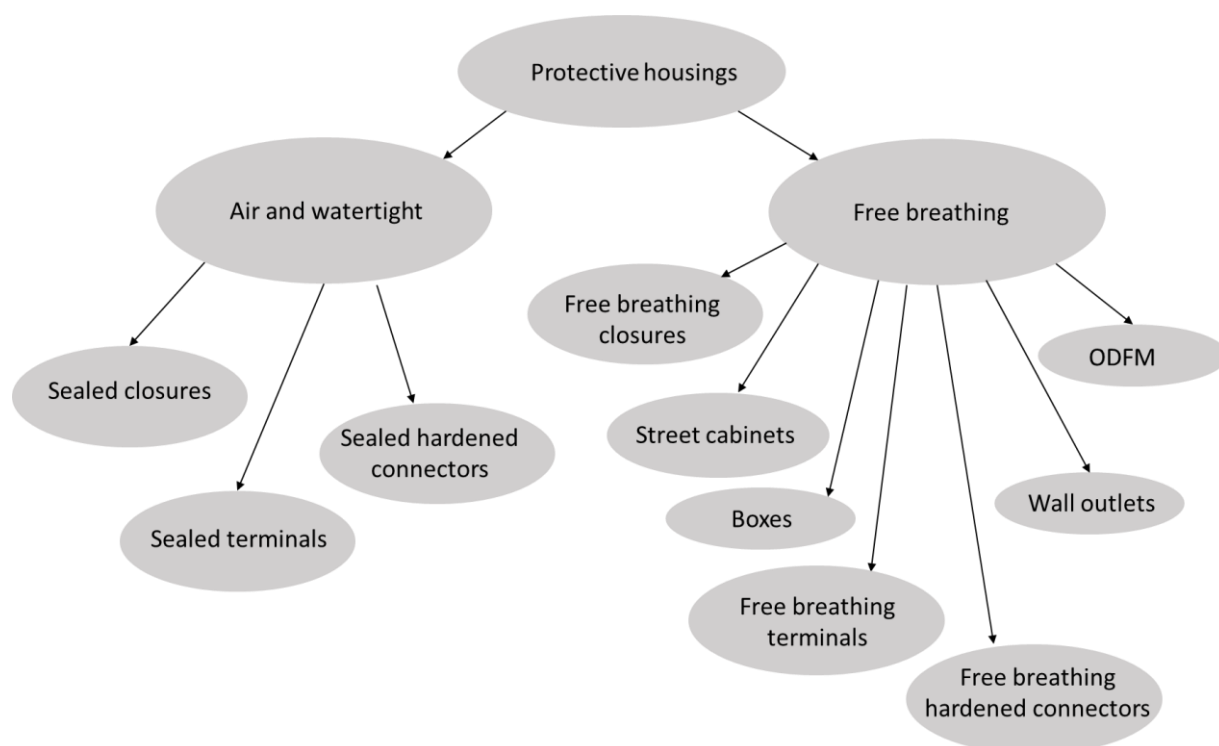


Figure 1 – Relationship between various protective housing types

3.19

sealed closure

airtight, watertight and dust-tight housing that can hold a varying overpressure or underpressure caused by temperature changes or atmospheric pressure changes

Note 1 to entry: After installation, a sealed closure can be pressurized in the field to check the integrity of the environmental seal.

Note 2 to entry: There is no exchange of air with the outside environment when exposed to temperatures over the specified operating temperature range. Although often referred to as hermetic sealed closures, humidity can enter the inner closure by diffusion.

Note 3 to entry: Sealed closures represent the most robust environmental protection available for fibre optic protective housings. This category of closures is generally required for deployment in the buried or underground plant and in any other deployment scenario where exposure to chemicals or corrosive agents is expected.

Note 4 to entry: Complete inner filled housings are also considered to be sealed closures.

3.20

sealed hardened connector

connector in an airtight, watertight and dust-tight housing that can hold a varying overpressure or underpressure caused by temperature changes or atmospheric pressure changes

Note 1 to entry: There is no exchange of air with the outside environment when exposed to temperatures over the specified operating temperature range.

Note 2 to entry: Sealed hardened connectors represent the most robust environmental protection available for fibre optic connectors. This category of connectors is generally required for deployment in aerial or underground plant and in any other deployment scenario where exposure to chemicals or corrosive agents is expected.

3.21**street cabinet**

free outdoor breathing above ground-installed housing that is permanently attached to the ground

Note 1 to entry: A street cabinet is permanently fixed to the ground and is not specifically designed to allow cable movement (e.g. torsion, bending) during operation.

3.22**terminal**

outdoor pre-terminated (with a cable stub) protective housing intended to provide only drop cables or (hardened) connectors

Note 1 to entry: A terminal serves a limited number of customers. Therefore the test severities for this type of protective housing may be less severe compared to the closures or boxes.

Note 2 to entry: Terminals can be free-breathing or sealed.

Note 3 to entry: Terminals are typically not re-entrable.

3.23**wall outlet**

free breathing housing with fixed connecting devices where the horizontal cable terminates

Note 1 to entry: The wall outlet provides the interface to work area cabling.

4 Abbreviations

FMC field mountable connector

FMS fibre management system

ODFM optical distribution frame module

5 Preparation of a performance standard

IEC 61753-1 provides guidance for the drafting of performance standards for all passive fibre optic products.

When a conflict exists between a published document from the IEC 61753 series and the published IEC 61753-1 then the tests, test parameters and acceptance criteria of most recent document shall apply.

If no performance standard for a particular product and performance category exists in the IEC 61753 series, the tests, test parameters and acceptance criteria should be taken from the current edition of IEC 61753-1.

5.1 Performance standard title

The performance standard title shall be clear. This information shall include

- the product description,
- the appropriate performance category, and
- any other variant or differentiation information to distinguish it from other performance standards.

5.2 Tests

The tests to be carried out on the product in order for it to meet the performance standard shall be clearly defined, including those which are product specific. No ambiguity or options shall be allowed.

The selected tests combined with the severities/durations, method used and pass/fail criteria shall be indicative of a defined operating service environment.

The test method to be used shall be clearly defined for each test. Wherever possible, the test method shall be selected from the IEC 61300 (all parts), but where this is not possible other test methods may be defined. If an undefined test method is used, the test method and details to be specified shall be included in the appropriate annex of the performance standard.

Performance standards may call up additional tests that may be needed to fully characterise a particular connector or component.

5.3 Details

The details to be considered (severities and durations) shall be given for all tests and measurements defined in a performance standard. They shall be directly related to the performance requirements defined by the operating service environment. No ambiguity or options are allowed.

5.4 Requirements

The performance requirements that shall be satisfied in order for the product to comply with the performance standard shall be specified for each test and/or measurement. No ambiguities are allowed.

5.5 Sample size

The sample size for each test shall be defined in the appropriate performance standard. No deviations are allowed.

5.6 Sample definition

The sample to be tested shall be defined in the relevant IEC 61753-xxx-yy performance standard. The test sample configuration and the minimum length of fibre(s) or cable(s) placed in the environmental test chamber is given in IEC 61300-1. In case of a specific deviation, the information shall be given in the relevant IEC 61753-xxx-yy document

5.7 Groupings/sequences

In general, no sequencing is required and each test is intended to be performed individually. When applicable, test groups and test sequences can be required by the user, user group or manufacturer.

5.8 Pass/fail criteria

Where required by the performance category, the pass/fail criteria shall be unambiguously stated for each test within the performance standard. No deviation or exceptions are allowed.

A product meets the requirements of this document provided no failures occur in any test.

Consecutive testing on the same sample is allowed. In the event of a failure during consecutive testing, the failing test shall be re-done using a sample size double that of the original. When the samples fail again, the test shall be reported as a failure.

5.9 Reference product definition

Where a performance standard requires the use of a reference product or component, the reference product shall be clearly defined in the appropriate annex of the performance standard.

5.10 Performance standard test report

Conformance to a performance standard shall be supported by a test report. The test report shall clearly demonstrate that the tests were carried out in accordance with the requirements of the performance standard and provide full details of the tests together with a pass/fail declaration. All test and measurement requirements shall be satisfied before a component may be declared to be in compliance with the performance standard.

The failure of any product to comply with a particular test or sequence of tests shall be reported in the performance standard test report. An analysis of the cause of the failure shall be undertaken and any corrective actions taken shall be described.

If no design changes are made to the product, the test or test sequence where the failure occurred shall be rerun with the results of both tests reported.

If design changes are made, another complete performance standard test programme shall be undertaken. Any tests previously completed successfully shall be repeated with new samples.

5.11 Environmental aspects

The requirements concerning the reduction of adverse environmental impacts over the whole life cycle of products are not covered in this document. The appropriate environmental aspects shall be implemented according to the guidelines in IEC Guide 109.

Annex A (normative)

Tests and test severities for performance standards

A.1 General

Annex A defines the tests, the recommended severities and the recommended performance criteria for the various performance categories, which reflect the operating service environments applicable to passive fibre optic products. The list of the operating service environments is given in Table A.1 and Table A.2.

The performance standards of the following components are covered by this document:

- fibre optic connectors and adaptors;
- field mountable connectors (FMC);
- splices (referring to both fusion splice protectors and mechanical splices);
- passive optical components;
- fibre management systems (FMS);

The performance standards of the following protective housings are covered by this document:

- wall outlets (indoor applications only);
- boxes (wall mounted and pole mounted);
- street cabinets;
- optical distribution frame modules (ODFM);
- closures (sealed and free breathing);
- terminals (sealed and free breathing)
- hardened connectors (sealed and free breathing)

The choice of tests and associated severities in each performance category is based upon a harmonized set of requirements determined to be appropriate for that category. The set of tests that form a particular performance category, given in Tables A.3 to A.16, are a combination of common tests, which are applicable to all fibre optic product types, and product specific tests.

Those tests which constitute a performance category form a minimum set of testing requirements. It is recognised that additional tests may often be necessary to fully characterize a particular component or connector.

The outdoor environmental conditions are derived from IEC 60721-2-1. The following climate types are covered for categories E, OP+, A, G and S:

- cold;
- cold temperate;
- warm temperate;
- warm dry;
- mild warm dry;
- extremely warm dry;
- warm damp;
- warm damp, equable.

For category OP, the following climate types are covered (the "cold" environments are excluded).

- 634 – cold temperate;
- 635 – warm temperate;
- 636 – warm dry;
- 637 – mild warm dry;
- 638 – extremely warm dry;
- 639 – warm damp;
- 640 – warm damp, equable.

641 All of the performance categories contained in this Annex A are applicable to single mode and
 642 multi-mode fibre optic transmission. The minimum performance acceptance criteria and
 643 requirements for connectors, mechanical splices, passive optical components, fibre
 644 management systems and various types of protective housings are given in Tables C.1 to C.14
 645 in Annex C. The choice of which values to include in the performance standard test schedules
 646 will depend on the system type and the required performance level.

647 The indicated minimum and maximum temperature limits include the thermal effects caused by
 648 solar radiation during the day and surface radiation during cloudless nights. There is a
 649 possibility that in environmental categories C, I, OP and OP+ the products are situated in a site
 650 or location together with active electronics which generate heat. In this document, such
 651 situations are called "sites with heat dissipation". In these circumstances, the maximum upper
 652 temperature limit is extended as listed in Table A.2. For category C^{HD}, the temperature is
 653 increased from +60 °C to +70 °C. For the outdoor categories, it is increased to +85 °C. This
 654 means that a product in category OP shall withstand an upper temperature of +70 °C and in
 655 category OP^{HD} +85 °C (HD indicates an extended upper temperature necessary due to
 656 additional heat dissipation by active electronics).

657 For all categories, there is no defined sequence in which the tests shall be run. All tests are
 658 intended to be performed individually. If a certain test sequence is required, it shall be defined
 659 in the relevant performance standard.

660 **Table A.1 – Operating service environments and performance categories**

Fibre optic connectors, FMC, mechanical splices, fusion splice protectors, passive optical components and fibre management systems		
Performance category	Description	Operating service environment
C	Indoor controlled environment	Operating temperature: –10 °C to +60 °C Relative humidity: 5 % RH to 93 % RH Weather protected, partly temperature-controlled locations. Typically within an office, home, building, indoor garage, cellar, equipment room, telecommunication centre or enclosed in an indoor protective housing of category C. Not subjected to condensed water.
OP	Outdoor protected environment	Operating temperature: –25 °C to +70 °C Relative humidity: 0 % RH to 95 % RH Weather protected, locations with uncontrolled temperature. Typically outdoors but enclosed or covered. Locations: shacks, lofts, telephone booths, entrances of buildings, open garage, unattended equipment stations, street cabinets or enclosed in protective housings of categories A, G or S. Subject to salt mist, condensed water and limited wind driven precipitation. In close proximity to sand or dust.

OP+	Outdoor protected environment Same as OP with wider operational temperature range for cold, dry heat and change of temperature to cover both cold and extremely warm climates. Additional condensation test	Operating temperature: –40 °C to +75 °C Relative humidity: 0 % RH to 95 % RH Weather protected, locations with uncontrolled temperature. Typically outdoors but enclosed or covered. Locations: shacks, lofts, telephone booths, entrances of buildings, open garages, unattended equipment stations, street cabinets or enclosed in protective housings of categories A, G or S. Subject to salt mist, condensed water and limited wind driven precipitation. In close proximity to sand or dust.
I	Industrial environment derived from MICE	Operating temperature: –40 °C to +70 °C Relative humidity: 0 % RH to 95 % RH Locations: typically automation islands. Subject to severe vibrations, industrial sources of corrosive gasses, splashes of liquid solvents, not subjected to immersion.
E ^a	Extreme environment	Operating temperature –40 °C to +85 °C Relative humidity 0 % RH to 100 % RH Locations: non-weather protected locations with uncontrolled temperature and humidity. Locations: typically outdoors, not enclosed, direct exposed to open air climate.
a Category E was originally used for temporary connections in direct exposed outdoor environments. For permanent connections the hardened connectors of categories A and G are recommended.		

661

Hardened connectors and protective housings (wall outlets, boxes, ODFM, street cabinets, terminals and closures)		
Performance category	Description	Operating service environment
C	Indoor controlled environment	Operating temperature –10 °C to +60 °C Relative humidity 5 % RH to 93 % RH Weather protected, partly temperature-controlled locations. Typically within an office, home, building, indoor garage, cellar, equipment room or telecommunication centre. Not subjected to condensed water.
A	Outdoor aerial environment	Operating temperature –40 °C to +65 °C Relative humidity 0 % RH to 100 % RH Outdoor, fully exposed environment, above ground level aerial mounted. No flooding requirements.
G	Outdoor ground level environment	Operating temperature –40 °C to +65 °C Relative humidity 0 % RH to 100 % RH Outdoor, fully exposed environment, mounted just above or at ground level with possibility of flooding, or below ground level inside footway boxes or hand holes continuously immersed in water. –1 m ≤ height ≤ +3 m (–: below ground level, +: above ground level)
S	Outdoor subterranean or sub-surface environment	Operating temperature –30 °C to +60 °C Relative humidity 5 % RH to 100 % RH Outdoor, either direct buried or stored below ground level in hand holes or manholes continuously immersed in water. 0 m ≤ depth ≤ 5 m

662

Table A.2 – Operating service environments and performance categories for components in locations with additional heat dissipation by active electronics

Fibre optic connectors, splices, passive optical components and fibre management systems		
Performance category	Description	Operating service environment
C ^{HD}	Indoor controlled environment with additional heat dissipation. Same as category C with higher operational upper temperature limit for dry heat and change of temperature.	Operating temperature: –10 °C to +70 °C Relative humidity: 5 % RH to 93 % RH Weather protected, partly temperature-controlled locations. Typically within an office, home, building, indoor garage, cellar, equipment room, telecommunication centre or enclosed in a protective housing of category C. Not subjected to condensed water.
OP ^{HD}	Outdoor protected environment with additional heat dissipation. Same as category OP with higher operational upper temperature limit for dry heat and change of temperature.	Operating temperature: –25 °C to +85 °C Relative humidity: 0 % RH to 95 % RH Weather protected, locations with uncontrolled temperature. Typically outdoors but enclosed or covered. Locations: shacks, lofts, telephone booths, entrances of buildings, open garage, unattended equipment stations, street cabinets or enclosed in a protective housing of categories A, G and S. Subject to salt mist, condensed water and limited wind driven precipitation. In close proximity to sand or dust.
OP+ ^{HD}	Outdoor protected environment with additional heat dissipation. Same as category OP+ with higher operational upper temperature limit for dry heat and change of temperature.	Operating temperature: –40 °C to +85 °C Relative humidity: 0 % RH to 95 % RH Weather protected, locations with uncontrolled temperature. Typically outdoors but enclosed or covered. Locations: shacks, lofts, telephone booths, entrances of buildings, open garages, unattended equipment stations, street cabinets or enclosed in a protective housing of categories A, G and S. Subject to salt mist, condensed water and limited wind driven precipitation. In close proximity to sand or dust.
I ^{HD}	Industrial environment with additional heat dissipation. Same as category I with higher operational upper temperature limit for dry heat and change of temperature.	Operating temperature: –40 °C to +85 °C Relative humidity: 0 % RH to 95 % RH Locations: typically automation islands. Subject to severe vibrations, industrial sources of corrosive gasses, splashes of liquid solvents, not subjected to immersion.

Fire performance is outside the scope of this document and covered by other standards and regulations.

Resistance of polymer materials to ozone and UV radiation should be considered for categories E, A or G, or in other environments with long-term UV light exposure. These material related requirements shall be given in Annex B and in the relevant IEC 61753-series standard.

A.2 How to find the performance tests for the desired category?

The relevant category for the operating service environment of a product can be found by following the flow chart as given in Figure A.1.

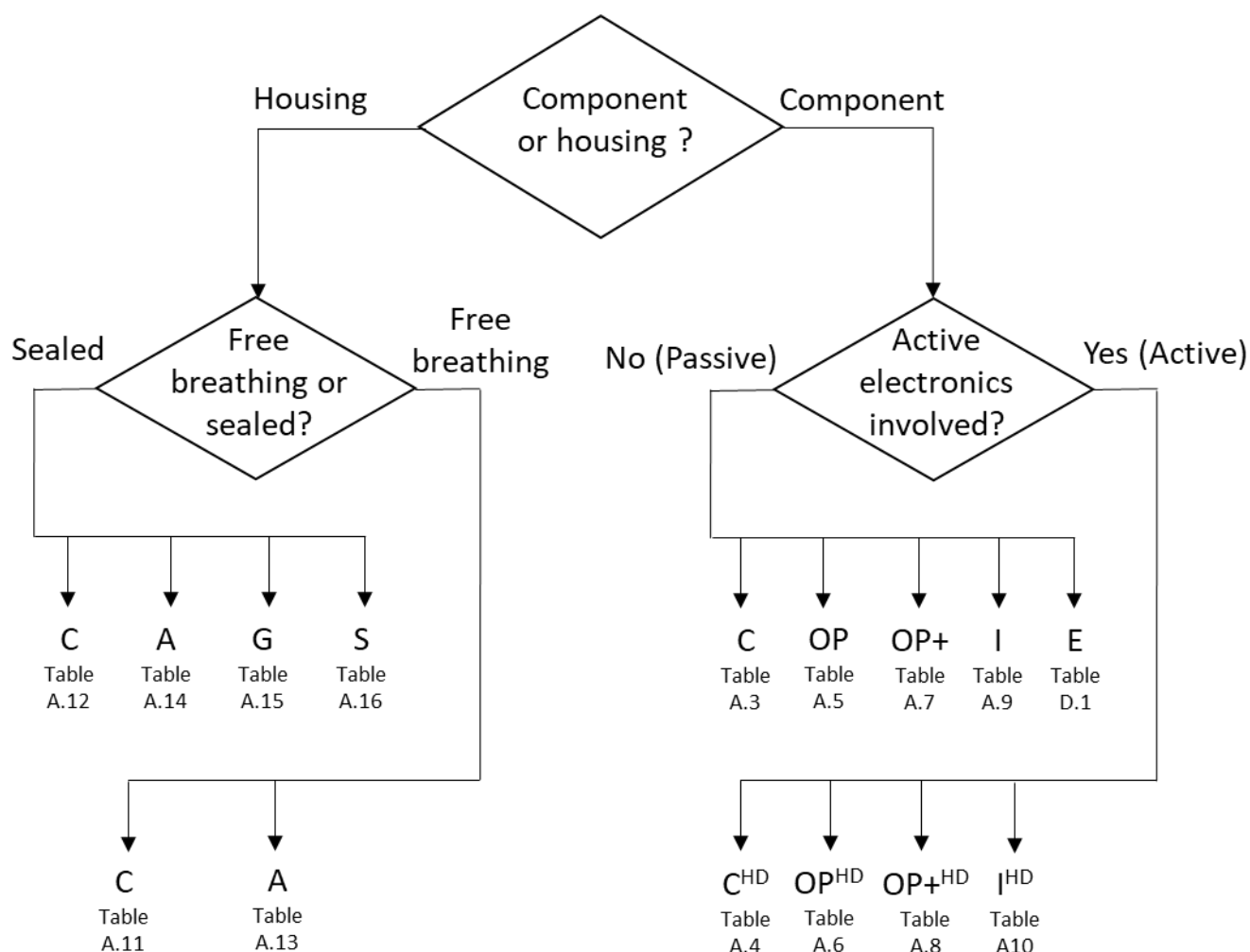


Figure A.1 – Flow chart to identify the relevant category for the operating service environment

Once the category is identified, the following Tables A.3 to A.16 will give the minimum required tests, the test severities and the recommended acceptance criteria for the specific product:

- connectors, passive components, splices and fibre management systems – Category C – Indoor controlled environment (Table A.3);
- connectors, field mountable connectors, passive components, splices and fibre management systems – Category C^{HD} – Indoor controlled environment with additional heat dissipation (Table A.4);
- connectors, field mountable connectors, passive components, splices and fibre management systems – Category OP – Outdoor protected environment (Table A.5);
- connectors, field mountable connectors, passive components, splices and fibre management systems – Category OP^{HD} – Outdoor protected environment with additional heat dissipation (Table A.6);
- Connectors, field mountable connectors, passive components, splices and fibre management systems – Category OP+ – Extended outdoor protected environment (Table A.7);
- connectors, field mountable connectors, passive components, splices and fibre management systems – Category OP+^{HD} – Extended outdoor protected environment with additional heat dissipation (Table A.8);
- connectors, passive optical components – Category I – Industrial environment (Table A.9);

– connectors, passive optical components – Category I^{HD} – Industrial environment with additional heat dissipation (Table A.10);

– connectors and passive optical components – Category E – Extreme environment (Annex D, Table D.1).

Note: Category E was originally used for temporary connections in direct exposed outdoor environments. For permanent connections the hardened connectors of categories A and G are recommended.

– wall outlets, boxes, optical distribution frame modules and free breathing closures – Category C – Indoor controlled environment (Table A.11)

– sealed closures – Category C – Indoor controlled environment (Table A.12);

– free breathing hardened optical connectors, street cabinets, boxes, terminals and closures - Category A – Outdoor aerial environment (Table A.13);

– sealed hardened optical connectors, sealed terminals and sealed closures - Category A – Outdoor aerial environment (Table A.14);

– sealed hardened optical connectors, sealed closures and sealed terminals Category G – Outdoor ground environment (Table A.15);

– sealed closures – Category S – Outdoor subterranean environment (Table A.16).

The acceptance or pass/fail criteria of the tests that need to be performed for each product listed at the top of the columns in the above-mentioned tables are:

– S: Sealing acceptance criteria

– O: Optical acceptance criteria

– V: Visual inspection acceptance criteria

– M: Material acceptance criteria

The tests with a blank cell are not required for the selected product.

The detailed acceptance criteria S, O and/or V are listed in Tables C.1 to C.14 in Annex C. The detailed acceptance criteria M are given in Table B.1 in Annex B

723
724**Table A.3 – Connectors, passive components, splices and fibre management systems – Category C – Indoor controlled environment**

Test	Severity	Connectors	FMC	Passive components	Splices	FMS
Installation test IEC 61753-101-03 Annex B	A live optical circuit is built with 5 splices and/or connections. The fibres and splices are kept outside the splice trays. Active monitoring is started and the fibres and splices are installed in the splice trays. After installation of all fibres and splices, the change in attenuation is checked.					O,V
Fibre/cable retention IEC 61300-2-4	Load and duration: 50 N for 60 s for cables with aramid yarn strength members 10 N for 60 s for tubes or cables without aramid yarn strength members 5,0 N for 60 s for buffered fibres 2,0 N for 60 s for primary coated fibres	O,V	O,V		O,V	
Fibre/cable retention IEC 61300-2-4	Load and duration: 10 N for 60 s for cables 5,0 N for 60 s for buffered fibres 2,0 N for 60 s for primary coated fibres			O,V		
Fibre/cable retention ^b IEC 61300-2-4	Load and duration: 10 N for 60 s for cables 5,0 N for 60 s for cable elements and tubes					O, V ^b
Tensile strength of coupling mechanism IEC 61300-2-6	Load and duration: 40 N for 60 s	O,V	O,V	O, V ^c		
Flexing of the strain relief of fibre optic devices IEC 61300-2-44	Load: 2 N for cables Cycle: $\pm 90^\circ$ Number of cycles: 50	O,V		O, V ^a		
Torsion IEC 61300-2-5	Load: 10 N for cables 2,0 N for primary coated and buffered fibres 25 cycles $\pm 180^\circ$ Fibre/cable clamping distance: 25 cm $\pm$ 5 cm	O,V	O,V			
Torsion IEC 61300-2-5	Load: 5 N for cables 2,0 N for primary coated and buffered fibres Cycle: $\pm 180^\circ$ Number of cycles: 10 Fibre/cable clamping distance: 25 cm $\pm$ 5 cm			O,V	O,V	
Mating durability IEC 61300-2-2	200 cycles for cylindrical ferrules 50 cycles for rectangular ferrules Not less than 3 s between engagements	O,V	O,V	O, V ^c		
Assembly and disassembly of fibre optic mechanical splices, fibre management systems and closures ^e IEC 61300-2-33	Open and re-install the mechanical splice ^e Number of disassembly/assembly cycles: 5 Aging between each disassembly/assembly cycle by at least one "Change of temperature" cycle: - Temperature cycle: -10°C to $+60^\circ\text{C}$ - Dwell time: 2 h - Transition: $1^\circ\text{C}/\text{minute}$				O,V	
Assembly and disassembly of fibre optic mechanical splices, fibre management systems and closures IEC 61300-2-33	If applicable, move the fibre management system to gain access to the splice trays. Move the splice trays to gain access to splices and fibres. Rearrange splices and/or connectors. Add splice trays/splice modules when applicable. Add fibre/cable.					O,V