

DD IEC/PAS 61753-1-3:2009



BSI Standards Publication

# Fibre optic interconnecting devices and passive components performance standard —

Part 1-3: General and guidance for performance standards – Single-mode fibre optic connector performance for harsh industrial operating conditions

**bsi.**

...making excellence a habit.  
**AVA** Documents™  
Document Sharing Hub

## National foreword

This Draft for Development is the UK implementation of IEC/PAS 61753-1-3:2009.

### **This publication is not to be regarded as a British Standard.**

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

A PAS is a Technical Specification not fulfilling the requirements for a standard, but made available to the public and established in an organization operating under a given procedure.

A review of this Draft for Development will be carried out not later than three years after its publication.

Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development, will be made in an announcement in the appropriate issue of Update Standards. According to the replies received, the responsible BSI Committee will judge whether the validity of the PAS should be extended for a further three years or what other action should be taken and pass their comments on to the relevant international committee.

Observations which it is felt should receive attention before the official call for comments will be welcomed. These should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/2, Fibre optic interconnecting devices and passive components.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© BSI 2010

ISBN 978 0 580 68598 9

ICS 33.180.20

### **Compliance with a British Standard cannot confer immunity from legal obligations.**

This Draft for Development was published under the authority of the Standards Policy and Strategy Committee on 31 January 2010

## Amendments issued since publication

| Amd. No. | Date | Text affected |
|----------|------|---------------|
|----------|------|---------------|



# PUBLICLY AVAILABLE SPECIFICATION

## PRE-STANDARD

---

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

**Part 1-3: General and guidance for performance standards – Single-mode fibre optic connector performance for harsh industrial operating conditions**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE

**S**

ICS 33.180.20

ISBN 2-8318-1068-5

## CONTENTS

|     |                                                                                |    |
|-----|--------------------------------------------------------------------------------|----|
| 1   | Scope .....                                                                    | 5  |
| 2   | Normative references .....                                                     | 5  |
| 3   | Terms and definitions .....                                                    | 7  |
| 4   | Industrial environment .....                                                   | 7  |
| 4.1 | General .....                                                                  | 7  |
| 4.2 | Cross reference with MICE .....                                                | 7  |
| 5   | Tests .....                                                                    | 8  |
| 5.1 | General .....                                                                  | 8  |
| 5.2 | Sample size .....                                                              | 8  |
| 6   | Test report .....                                                              | 8  |
| 7   | Reference component .....                                                      | 8  |
| 8   | Performance requirements .....                                                 | 9  |
| 8.1 | General .....                                                                  | 9  |
| 8.2 | Dimensions .....                                                               | 9  |
| 8.3 | Sample definition and size .....                                               | 9  |
| 8.4 | Test preparation and accomplishment .....                                      | 9  |
| 8.5 | Performance criteria .....                                                     | 9  |
| 9   | Performance tests .....                                                        | 10 |
|     | Annex A (informative) Scheme of a test matrix for a duplex connector .....     | 21 |
|     | Figure 1 – Example of a duplex sample (mated), DUT .....                       | 9  |
|     | Table 1 – Single mode attenuation grades at 1310 nm and 1550 nm (dB) .....     | 10 |
|     | Table 2 – Test description .....                                               | 11 |
|     | Table 3 – Sample size and product sourcing requirements .....                  | 20 |
|     | Table A.1 – Scheme of measurements for random-random test for duplex DUT ..... | 21 |

## **FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS PERFORMANCE STANDARD –**

### **Part 1-3: General and guidance for performance standards – Single-mode fibre optic connector performance for harsh industrial operating conditions**

#### **1 Scope**

This Publicly Available Specification (PAS) defines the minimum initial performance, test and measurement requirements and severities which a single-mode connector or cable assembly must satisfy in order to be categorized as meeting IEC Category I (industrial environment). Category I is an addition to environmental categories C, U, O, E described in IEC 61753-1 and the MICE methodology described in ISO/IEC 24702.

#### **2 Normative references**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-60, *Environmental testing – Part 2: Tests – Test Ke: Flowing mixed gas corrosion test*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

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

IEC 61300-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 1: General and guidance*

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*<sup>1</sup>

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*<sup>2</sup>

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

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

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

IEC 61300-2-34, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-34: Tests – Resistance to solvents and contaminating fluids of interconnecting components and closures*

61300-2-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-35: Tests – Cable nutation*<sup>3</sup>

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

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

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

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

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

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

IEC 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Fibre optic connector endface visual and automated inspection*<sup>4</sup>

---

<sup>1</sup> Publication withdrawn and not replaced.

<sup>2</sup> Publication withdrawn and not replaced.

<sup>3</sup> Publication withdrawn and not replaced.

<sup>4</sup> To be published.

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

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

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

IEC 61755-1, *Fibre optic connector optical interfaces – Part 1: Optical interfaces for single mode non-dispersion shifted fibres – General and guidance*

IEC 61755-3 (all parts 3), *Fibre optic connector optical interfaces*

ISO/IEC 24702, *Information technology – Generic cabling – Industrial premises*

ISO/IEC TR 29106, *Information technology – Generic cabling – Introduction to the MICE environmental classification*

### 3 Terms and definitions

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

#### 3.1

##### **change in attenuation**

peak-to-peak variation (see Table A-12, IEC 61753-1)

#### 3.2

##### **sample**

a complete set of passive connector components consisting of a free plug and a socket. The socket may be mounted in an enclosure. This allow demountable coupling between pairs of optical fibres

#### 3.3

##### **patch cord assembly**

two connector plugs mated consisting of a free plug and a socket with each socket mechanically mounted in an enclosure. Each of the non terminated leads from the socket should be at least 3 m long so that the splices may be located outside of the environmental test chamber (see also Figure 1)

### 4 Industrial environment

#### 4.1 General

Fibre optic components are frequently used in industrial environments, like control stations, power rooms or inside switch cabinets. The special environmental conditions such as temperature, dust, moisture, vibration, chemicals, etc. in industrial deployment require more rugged components than found in standard environments.

#### 4.2 Cross-reference with MICE

The MICE methodology from ISO/IEC/TR 29106 classifies the environment local to a cabling system in terms of mechanical, ingress, climatic and chemical and electromagnetic characteristics. The tests and severities in Clause 9 of this PAS are intended to reflect the M<sub>3</sub> and I<sub>3</sub> environment. The climatic conditions and chemical substances used are selected from the C<sub>3</sub> environment. The defined tests and severities are according to IEC 60068-2-60

NOTE Not all chemical substances are used.

## 5 Tests

### 5.1 General

The defined performance test procedures should:

- evaluate the product for two basic acceptance criteria: mechanical integrity and optical transmission requirements;
- simulate the effects of exposure to the environment in which it will be installed;
- simulate installation and intervention conditions;
- evaluate all specified features of the product.

The defined performance test procedures should simulate the situation in a mated condition under use in a harsh industrial environment. It is not the intention to simulate the situation:

- when being mated or demated;
- during the assembling of the connector;
- during transportation and storage of the connector.

All test methods are in accordance with IEC 61300 series as defined in Table 3.

Each test defines the number of samples to be evaluated as described in Annex A. The samples used for each test should be composed of randomly selected and previously unstressed new samples but may also be selected from previously used samples if desired.

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

Unless otherwise specified, tests should be carried out under standard atmospheric conditions according to IEC 61300-1. The optical criteria for each test shall be as defined in Clause 9, (see also notes to Table 1).

### 5.2 Sample size

As a minimum requirement and if not otherwise mentioned, the tests can be run individually on five samples per test only. It is intended that new samples should be used for each test however samples may be reused at the manufacturer's own risk. In the event that this reuse causes a failure, the test may be rerun with new samples.

Samples for the attenuation test are to be randomly selected and randomly mated as new product, starting with 10 DUT, see Figure 1 (e.g. as duplex version, see also Annex A).

## 6 Test report

Fully documented test reports and supporting evidence shall be prepared and available for inspection to show that the tests have been carried out and the results are satisfactory; the requested performances (see Table 1 for the grades) should be defined before starting the tests.

## 7 Reference component

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