BS EN 62149-1:2012

BSI Standards Publication

Fibre optic active components and devices – Performance standards

Part 1: General and guidance

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National foreword

This British Standard is the UK implementation of EN 62149-1:2012. It is identical to IEC 62149-1:2011. It supersedes BS EN 62149-1:2004 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/3, Fibre optic systems and active devices.

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

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Fibre optic active components and devices - Performance standards - Part 1: General and guidance

(IEC 62149-1:2011)

Composants et dispositifs actifs à fibres optiques -
Normes de performances -
Partie 1: Généralités et lignes directrices
(CEI 62149-1:2011)

Aktive Lichtwellenleiterbauelemente und -geräte -
Betriebsverhaltensnormen -
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(IEC 62149-1:2011)

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Foreword

The text of document 86C/1016/CDV, future edition 2 of IEC 62149-1, prepared by SC 86C "Fibre optic systems and active devices", of IEC/TC 86, "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62149-1:2012.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2012-10-11
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2015-01-11

This document supersedes EN 62149-1:2004.

EN 62149-1:2012 includes the following significant technical changes with respect to EN 62149-1:2004: The technical change consists of an update in Table A.1.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62149-1:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61300 series	NOTE	Harmonized in EN 61300 series (not modified).
IEC 61751	NOTE	Harmonized as EN 61751.
IEC 62005 series	NOTE	Harmonized in EN 62005 series (not modified).

Annex ZA
(normative)
Normative references to international publications with their corresponding European publications

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60068-2-27	-	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	-
IEC 61300-2-1	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-1: Tests - Vibration (sinusoidal)	EN 61300-2-1	-
IEC 61300-2-4	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-4: Tests - Fibre/cable retention	EN 61300-2-4	-
IEC 61300-2-5	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-5: Tests - Torsion	EN 61300-2-5	-
IEC 61300-2-9	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-9: Tests - Shock	EN 61300-2-9	-
IEC 61300-2-17	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-17: Tests - Cold	EN 61300-2-17	-
IEC 61300-2-18	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-18: Tests - Dry heat - High temperature endurance	EN 61300-2-18	-
IEC 61300-2-19	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-19: Tests - Damp heat (steady state)	EN 61300-2-19	-
IEC 61300-2-21	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-21: Tests - Composite temperature/humidity cyclic test	EN 61300-2-21	-
IEC 61300-2-22	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-22: Tests - Change of temperature	EN 61300-2-22	-

Publication	Year	Title	EN/HD	Year
IEC 61300-2-26	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-26: Tests - Salt mist	EN 61300-2-26	-
IEC 61300-2-27	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-27: Tests - Dust - Laminar flow	EN 61300-2-27	-
IEC 61300-2-28	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-28: Tests - Industrial atmosphere (sulphur dioxide)	EN 61300-2-28	-
IEC 61300-2-42	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-42: Tests - Static side load for connectors	EN 61300-2-42	-
IEC 61300-2-44	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-44: Tests - Flexing of the strain relief of fibre optic devices	EN 61300-2-44	-
IEC 61300-2-45	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-45: Tests - Durability test by water immersion	EN 61300-2-45	-
IEC 61300-2-46	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-46: Tests - Damp heat cyclic	EN 61300-2-46	-
IEC 61300-2-48	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-48: Tests - Temperature-humidity cycling	EN 61300-2-48	-

CONTENTS

INTRODUCTION

Performance standards define standard electro-optical performance under a set of prescribed conditions and contain a series or a set of tests and measurements (which may or may not be grouped into a specific schedule) with clearly defined conditions, severities and pass/fail criteria. The tests are intended to be run on as an initial design verification to prove the product's ability to satisfy the requirements of a specific application, market sector or user group.

The subsequent parts of this document contain those sets of performance criteria that have been standardised for international use. A product that has been shown to meet all the requirements of a performance standard may be declared as complying with that performance standard.

Products from one manufacturer that are tested to a performance standard will operate together within the bounds of the criteria set by the performance standard. There is however no guarantee that products from different suppliers having the same standard interface, which have been independently tested to a performance standard, will meet the same levels of optical performance when mated together as those supplied by one manufacturer.

Compliance with a performance standard demonstrates that a product has in essence passed a design verification test, it is not a guarantee of lifetime assured performance nor reliability. Both service life tests and reliability testing must be the subject of a separate test schedule where the tests and severities selected are such that they are truly representative of the requirements of these test programmes. Consistency of manufacture should be maintained using a recognised quality assurance programme while the reliability of the product should be evaluated using the procedures recommended in IEC 62005 and IEC 61751.

Where possible, tests and measurements should be selected from IEC 61300. Where this is not possible, the required test method shall be attached as an annex to the performance standard.

FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PERFORMANCE STANDARDS –

Part 1: General and guidance

1 Scope

This part of IEC 62149 provides references, definitions and rules for creating active fibre optic device performance standards, as well as related information pertinent to the subject.

Subsequent parts of IEC 62149 are sequentially numbered and contain performance criteria for specific applications. Each part will be added as the performance criteria become standardised for international use.

2 Normative references

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

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

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

IEC 61300-2-4, *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 61300-2-9, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-9: Tests – Shock*

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

IEC 61300-2-18, *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, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-19: Tests – Damp heat (steady state)*

IEC 61300-2-21, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-21: Tests – Composite temperature/humidity cyclic test*

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

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

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

IEC 61300-2-44, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-44: Tests – Flexing of the strain relief of fibre optic devices*

IEC 61300-2-45, *Fibre optic interconnecting devices and passive components – Basic test and 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 61300-2-48, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-48: Tests – Temperature-humidity cycling*

3 Terms and definitions

For the purposes of this document, the following definition applies.

3.1
performance standard test report
report to be produced on completion of testing to a performance standard

4 Preparation of a performance standard

4.1 General

In the preparation of a performance standard, the following items shall be considered and instructions pertaining to them included.

- Product definition
- Tests
- Details
- Requirements
- Sample size
- Groupings/sequences
- Pass/fail criteria
- Reference product definition

4.2 Product definition

The product to which the performance standard relates shall be clearly defined.

4.3 Tests

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

The tests selected combined with the severities/durations, groupings/sequencing, method used and pass/fail criteria should be indicative of a defined product location within a service environment.

The test method to be used shall be clearly defined for each test. Wherever possible the test method shall be selected from IEC referenced tests; where this is not possible other test methods may be defined. If a previously undefined test method is used, the test method and details to be specified shall be included in an annex of the performance standard.

4.4 Details

Severities, durations and the details to be considered, shall be given for all tests and measurements presented in a performance standard. These should be directly related to the requirements specified for a product location within a service environment to which the performance standard is intended to correspond. No ambiguity or options shall be allowed.

4.5 Requirements

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

4.6 Sample size

The sample size for each test shall be defined in an annex of the performance standard. No deviations shall be allowed.

4.7 Groupings/sequences

Test groups and test sequences shall be defined in an annex as required by the user, user group or manufacturer. The number of samples for each test group shall also be defined in the annex. Where prohibitive cost is associated with the active devices, numbers of samples may be reduced.

4.8 Pass/fail criteria

The pass/fail criteria shall be unambiguously stated for each test within the performance standard. No deviation or exceptions shall be allowed.

4.9 Reference product definition

Where a reference product is called for in any of the test and measurement methods used within a performance standard, the reference product shall be clearly defined in an annex of the performance standard.

4.10 Performance standard test report

Conformance to a performance standard shall be supported by a test report. The test report may be prepared by an independent test laboratory. The test report shall clearly demonstrate that the tests were carried out as per the requirements of the performance standard and provide full details of the tests, together with a pass/fail declaration.

Any product failing a particular test or sequence of tests shall be reported in the performance standard test report. The cause of the failure shall be given and any corrective action 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 the tests reported.

Any design changes shall be identified in the performance standard test report. The full set of performance tests must be rerun and the results reported in this case.

4.11 Environmental aspects

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

Annex A
(normative)

Tests and severities for performance standards

This annex contains the preferred tests and recommended severities associated with these tests for typical system locations in which active fibre optic components may be installed (see Tables A.2 to A.5).

Where tests have been grouped it is intended that the tests be run as a group, in the order indicated, to simulate a particular aspect of the conditions to which the product may be submitted.

The general system location for which performance standard schedules are provided is given in Table A.1.

Table A.1 – General operating service environments and definitions

Category	Environment	Temperature range °C	Water/Humidity	Typical location
C	Controlled	– 10 to + 60	5 % to 93 %	Typically within an office, equipment room, telecommunication centre or building. Not subjected to condensed water
U	Semi-controlled	– 25 to + 70	0 % to 95 %	Typically outdoors but enclosed or covered. Locations: shacks, lofts, telephone booths, street cabinets. Subject to condensed water and limited wind driven precipitation. In close proximity to sand or dust.
O	Outside plant	– 40 to + 75	0 % to 95 %	Typically outdoors but enclosed or covered. Locations: garages, cellars, entrances of buildings and unattended equipment stations. Subject to condensed water.
E	Extreme	– 40 to + 85	0 % to 95 %	Typically outdoors, not enclosed. Locations: direct exposed to open air climate. Subject to industrial sources of chemical emission.

Table A.1 indicates the ambient temperature ranges for optical network equipment under various environmental categories and does not indicate the operating temperature ranges for active optical components. The operating temperature range for each active component shall be specified by its case temperature, unless otherwise stated, and defined in each performance standard document in order that the component operates under the specific environmental category described in Table A.1. The system designer should design the heat flow of the equipment to maintain the case temperature of the installed active components within their specifications. The performance tests for each active component should be carried out within the specified case temperature range.

Table A.2 – Category C – Controlled environment

Test	Severity
Cold IEC 61300-2-17	–10 °C ± 2 °C 96 h duration
High temperature endurance IEC 61300-2-18	+60 °C ± 2 °C 96 h duration
Damp heat Steady state IEC 61300-2-19	+40 °C ± 2 °C (93 ± 2) % RH 96 h duration
Vibration (sinusoidal) IEC 61300-2-1	10 Hz to 55 Hz 15 sweeps (10 Hz – 55 Hz – 10 Hz) 1 octave/minute 3 axes 0,75 mm amplitude
Change of temperature IEC 61300-2-22	–10 °C ± 2 °C to +60 °C ± 2 °C 60 min duration at extremes 1 °C/min rate of change 5 cycles

Table A.3 – Category U – Uncontrolled environment

Test	Severity
Vibration (sinusoidal) IEC 61300-2-1	10 Hz to 55 Hz 15 sweeps (10 Hz – 55 Hz – 10 Hz) 1 octave/minute 3 axes 0,75 mm amplitude
Cold IEC 61300-2-17	– 25 °C ± 2 °C 96 h duration
High temperature endurance IEC 61300-2-18	+ 70 °C ± 2 °C 96 h duration
Damp heat Steady state IEC 61300-2-19	+ 40 °C ± 2 °C (93 ± 2) % RH 96 h duration
Change of temperature IEC 61300-2-22 Test Nb	– 25 °C ± 2 °C to + 70 °C ± 2 °C 60 min duration at extreme 1 °C/min rate of change 12 cycles
Dust IEC 61300-2-27	Particle size $d < 150$ μm Dust type talc + 35 °C RH, 60 % RH, 10 min duration
Damp heat (cyclic) (See IEC 61300-2-46)	+ 25 °C ± 2 °C to + 55 °C ± 2 °C, RH > 95 % [Variant 1] 96 h duration

Table A.4 – Category O – Outside plant environment

Test	Severity
Damp heat (steady state) IEC 61300-2-19	+ 75 °C ± 2 °C 90 ± 5 % RH 168 hours
Vibration (sinusoidal) IEC 61300-2-1	10 – 55 Hz 2 hours per axis 1 octave/minute 3 axes 1,52 mm amplitude
Change of temperature IEC 61300-2-22 Test Nb	– 40 °C ± 2 °C to + 75 °C ± 2 °C 1 hour duration at extremes ≥ 1 °C /min rate of change 10 cycles Dwell at + 23 °C allowed between temperature extremes
Temperature-humidity cycling IEC 61300-2-48, method A (Need to add method B to accommodate GR-326 method) Optical fibre cable flexing IEC 61300-2-44	– 40 °C ± 2 °C to + 85 °C ± 2 °C 85 ± 5 % RH at the maximum temperature 1 hour minimum duration at extremes ≥ 1 °C/min rate of change 42 cycles 5 N for reinforced cable 30 cycles ± 90 °
Torsion/twist IEC 61300-2-5 Static side load IEC 61300-2-42	5 N at 0,1 N/s for reinforced cables 10 cycles ± 180 ° 5 N for 5 s for reinforced cable 2,3 N for 5 s for buffered fibres Two mutually perpendicular directions
Fibre/cable retention IEC 61300-2-4	10 ± 1 N at 0,5 N/s for reinforced cables 5 ± 0,5 N at 0,5 N/s for buffered fibres 120 s duration at 10 N 60 s duration at 5 N
Shock For passive components IEC 61300-2-9	500 g_n, 3 axes in 2 directions, 2 shocks per axis, 12 shocks total. Nominal 1 ms duration, half sine pulse
Shock For modules	Mass (kg) Drop height (mm) 0 to < 10 100 0 to < 25 75
(Free drop, IEC 60068-2-27)	

Table A.5 – Category E – Extreme environment

Test	Severity
Vibration (sinusoidal) IEC 61300-2-1	10 Hz to 55 Hz 15 sweeps (10 Hz – 55 Hz – 10 Hz) 1 octave/minute 3 axes 0,75 mm amplitude
Cold IEC 61300-2-17	– 40 °C ± 2 °C 96 h duration
High temperature endurance IEC 61300-2-18	+ 85 °C ± 2 °C 96 h duration
Damp heat Steady state IEC 61300-2-19	+ 40 °C ± 2 °C (93 ± 3) % RH 96 h duration
Change of temperature IEC 61300-2-22 Test Nb	– 40 °C ± 2 °C to + 85 °C ± 2 °C 1 h duration at extremes 1 °C/min rate of change 12 cycles
Dust IEC 61300-2-27	Particle size $d < 150$ μm Dust type talc + 35 °C, RH 60 %, 10 min duration
Composite temperature humidity cyclic test IEC 61300-2-21	Z/AD profile with exposure to cold – 10 °C ± 2 °C to + 65 °C ± 2 °C 93 ± 3 % RH at the maximum temperature 3 h dwells at the temperature extremes 4 cycles
Industrial atmosphere IEC 61300-2-28	Sulphur dioxide SO_2 25×10^{-6} + 25 °C ± 2 °C, and 75 % RH 96 h duration
Corrosive atmosphere IEC 61300-2-26	Salt solution 5 % NaCl PH 6,5 to 7,2 96 h duration
Water immersion (optional) IEC 61300-2-45	Depth of water: (to be defined in relevant performance standard) Temperature: (to be defined in relevant performance standard) Duration: (to be defined in relevant performance standard)

Bibliography

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

IEC 61751, *Laser modules used for telecommunication – Reliability assessment*

IEC 62005 (all parts), *Reliability of fibre optic interconnecting devices and passive components*

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