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INTERNATIONAL STANDARD

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 2-1: Tests – Vibration (sinusoidal)

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IEC 61300-2-1 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical change with respect to the previous edition: harmonizing with the test conditions in IEC 61753-1:2018 and revising severities.

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

Draft	Report on voting
86B/4692/FDIS	86B/4724/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of IEC 61300 series, published under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- withdrawn,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

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 2-1: Tests – Vibration (sinusoidal)

1 Scope

This part of IEC 61300 evaluates the effects of vibration on fibre optic devices at the predominant frequency ranges and magnitudes that ~~may be~~ are encountered during field service on attenuation.

NOTE Most vibrations encountered in service are not of a simple harmonic nature. However, it has been shown that tests based on vibrations of this type are satisfactory to simulating actual service.

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 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

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

IEC 61300-3-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-1: Examinations and measurements – Visual examination*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61300-1 apply.

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

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

4 General description

This procedure is derived from IEC 60068-2-6, test Fc. The device under test (DUT) is mounted on a vibration generator and vibrated with a sinusoidal motion. The DUT is exposed to vibration in three mutually perpendicular directions, one of which is parallel to the optical axis. The

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vibration amplitude is specified either in terms of constant displacement or constant acceleration.

5 Apparatus

5.1 General

The apparatus shall be in accordance with IEC 60068-2-6, test Fc, and consists of the following elements.

5.2 Vibration generator

A vibration generator capable of generating a sinusoidal excitation and its auxiliary test equipment.

5.3 Mounting fixture

A suitable DUT mounting fixture capable of transmitting the vibration conditions specified shall be used. The mounting fixture shall be designed so that the resonant vibration inherent in the fixture shall not have an effect on the specified frequency range.

5.4 Acceleration monitoring device

The amplitude and the acceleration of the applied vibration shall be monitored by an acceleration monitoring device, i.e. accelerometer on the ~~test~~ mounting fixture near the DUT ~~mounting points~~.

5.5 Measuring equipment

~~Unless otherwise specified, measuring equipment specified in IEC 61300-3-3 shall be connected to the DUT for monitoring the optical performances during the test; moreover~~ The transient loss ~~measuring~~ measurement equipment specified in IEC 61300-3-28 shall be connected to the DUT and used to detect fast variation of attenuation during and after the test, unless otherwise specified in the relevant specification.

6 Procedure

6.1 Preparation of DUT

Prepare the DUT according to the manufacturer's instructions ~~or~~ and as specified in the relevant specification.

6.2 Preconditioning

Precondition the DUT for more than or equal to 2 h at the standard ~~test~~ atmospheric conditions specified in IEC 61300-1, unless otherwise specified in the relevant specification.

6.3 Initial examination and measurement

Complete initial examinations and measurements of the DUT as required by the relevant specification.

Unless otherwise specified, visually examine the DUT in accordance with IEC 61300-3-1. Check for evidence of any degradation in the DUT. The following are possible examples of degradation:

– broken, loose or damaged parts or accessories;
– breaking or damage to the cable jacket, seals, strain relief, or fibres;
– displaced, bent, broken or chipped parts.

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6.4 ~~Conditioning~~ Mounting and test procedure

The DUT shall be mounted rigidly to the fixture in a manner that simulates normal mounting as closely as possible. ~~A minimum of 200 mm~~ Greater than 20 cm of optical fibre/cable shall be unsupported on both ends of the DUT and be attached free of tension to the vibrating surface. Conduct the procedure in accordance with IEC 60068-2-6, test Fc. The DUT shall be vibrated in three mutually perpendicular axes coincident with the principal axes of the device. If the sample has axial symmetry, the number of axes to be tested can be reduced to two. The vibration endurance shall be performed by sweeping continuously between minimum and maximum frequency at a specified rate. An example of vibration apparatus test is outlined in Figure 1.

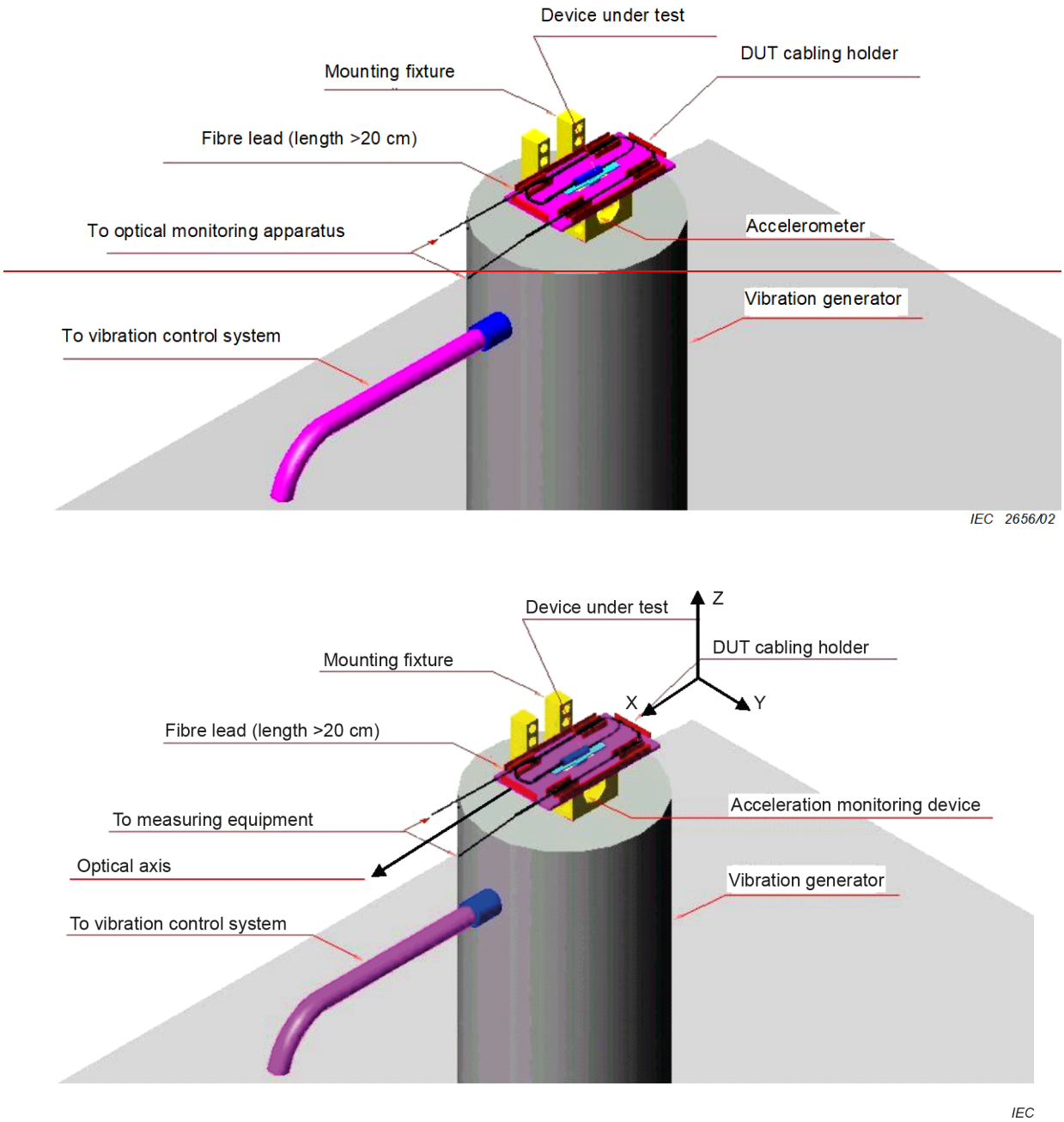

Figure 1 – Example of vibration apparatus

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6.5 Monitoring

The ~~attenuation and/or return~~ transient loss of the DUT shall be monitored during and after the test using ~~an x-y plotter,~~ a recording mean such as a computer, oscilloscope or ~~/and~~ a digital data acquisition system ~~for recording~~ with memory as described in IEC 61300-3-28, unless otherwise specified in the relevant specification. Any change in optical performance shall be within the limit given in the relevant specification.

6.6 Recovery

Allow the DUT to remain under standard ~~test~~ atmospheric conditions for more than or equal to 2 h, as defined in IEC 61300-1, unless otherwise specified in the relevant specification. ~~Clean the DUT in accordance with the manufacturer's instructions.~~

6.7 Final examination and measurement

~~On~~ After completion of the test, ~~remove all~~ the DUT shall be removed from the fixtures, and ~~make~~ the final measurements shall be made, as defined by the relevant specification, to ensure that there is no permanent damage to the DUT. The results of the final measurement shall be within the limit established in the relevant specification.

Unless otherwise specified, visually examine the DUT in accordance with IEC 61300-3-1. Check for evidence of any degradation in the DUT. ~~This may include, for example~~
The following are possible examples of degradation:

– broken, loose or damaged parts or accessories;
– breaking or damage to the cable jacket, seals, strain relief, or fibres;
– displaced, bent, broken or chipped parts.

7 Severity

The severity consists of the combination of frequency range, vibration amplitude, sweep rate and either number of sweeps or ~~endurance~~ duration per axis. The severity shall be specified in the relevant specification. Recommended values of the test parameters are given below in ~~Table 1 and 2~~ Table 1 through Table 7 for the various configurations.

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Table 1 – Recommended values of the test parameters for connectors and passive components

Category	Parameter	Value
Categories C, ~~U,~~ C^{HD}, OP, OP+, OP+^{HD} and E	Frequency range	10 Hz to 55 Hz
	Sweep rate	1 oct/min
	Number of sweeps	15/axis
	Amplitude	0,75 mm
~~Category O~~	~~Frequency range~~	~~10 Hz – 55 Hz~~
	~~Sweep rate~~	~~1 oct/min for passive components~~ ~~45 Hz/min for connectors~~
	~~Duration~~	~~2 h/axis~~
	~~Amplitude~~	~~1,52 mm for passive components~~ ~~0,75 mm for connectors~~
Categories I and I^{HD}	Frequency range	2 Hz to 200 Hz
	Sweep rate	1 oct/min
	Number of sweeps	15/axis
	Amplitude	15 mm at frequencies below 9 Hz
	Acceleration	50 m/s^2 at frequencies above 9 Hz
NOTE Categories are defined in IEC 61753-1.		

Table 2 – Recommended values of the test parameters for fibre management systems ~~and closures~~

Category	Parameter	Value
Categories C, ~~A, G and S~~ C^{HD}, OP, OP+, OP+^{HD} and OP^{HD}	Frequency range	5 Hz to 500 Hz
	Sweep rate	1 oct/min
	Number of sweeps	10/axis
	Amplitude	3,5 mm below 9 Hz
	Acceleration	~~9,8~~ 10 m/s^2 above 9 Hz
NOTE Categories are defined in IEC 61753-1.		

Table 3 – Recommended values of the test parameters for mechanical splices and field mountable connectors

Category	Parameter	Value
Categories C, C^{HD}, OP, OP+, OP+^{HD} and OP^{HD}	Frequency range	10 Hz to 55 Hz
	Sweep rate	1 oct/min
	Number of sweeps	15/axis
	Amplitude	0,75 mm
NOTE Categories are defined in IEC 61753-1.		

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Table 4 – Recommended values of the test parameters for wall outlets and optical distribution frame modules

Category	Parameter	Value
Categories C and C^{HD}	Frequency range	5 Hz to 500 Hz
	Sweep rate	1 oct/min
	Number of sweeps	10/axis
	Amplitude	1,5 mm at frequencies below 9 Hz
	Acceleration	5 m/s^2 above 9 Hz
NOTE Categories are defined in IEC 61753-1.		

Table 5 – Recommended values of the test parameters for hardened optical connectors

Category	Parameter	Value
Categories A, G, and S	Frequency range	5 Hz to 500 Hz
	Sweep rate	1 oct/min
	Number of sweeps	10/axis
	Amplitude	3,5 mm below 9 Hz
	Acceleration	10 m/s^2 above 9 Hz
NOTE Categories are defined in IEC 61753-1.		

Table 6 – Recommended values of the test parameters for boxes and closures

Category	Parameter	Value
Categories C and C^{HD}	Frequency range	5 Hz to 500 Hz
	Sweep rate	1 oct/min
	Number of sweeps	10/axis
	Amplitude	1,5 mm at frequencies below 9 Hz
	Acceleration	5 m/s^2 above 9 Hz
Categories A, G, and S	Frequency range	5 Hz to 500 Hz
	Sweep rate	1 oct/min
	Number of sweeps	10/axis
	Amplitude	3,5 mm below 9 Hz
	Acceleration	10 m/s^2 above 9 Hz
NOTE Categories are defined in IEC 61753-1.		

Table 7 – Recommended values of the test parameters for street cabinets

Category	Parameter	Value
Category A	Frequency range	5 Hz to 500 Hz
	Sweep rate	1 oct/min
	Number of sweeps	10/axis
	Amplitude	1,2 mm at frequencies below 9 Hz
	Acceleration	4 m/s^2 above 9 Hz
NOTE Categories are defined in IEC 61753-1.		

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