IEC 61300-2-9

Edition 3.0 2017-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Dispositifs d'interconnexion et composants passifs fibroniques – Procédures fondamentales d'essais et de mesures –
Partie 2-9: Essais – Chocs

IEC 61300-2-9:2017-01(en-fr)

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INTERNATIONAL
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ICS 33.180.20

ISBN 978-2-8322-4946-8

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

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FOREWORD

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International Standard IEC 61300-2-9 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This bilingual version (2017-10) corresponds to the monolingual English version, published in 2017-01.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

a) inserted clause "Terms and definitions";
b) added precise descriptions to clause "Apparatus";

c) added sub clause "Testing" into clause "Procedure";

d) added "Bibliography".

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

CDV	Report on voting
86B/3979/CDV	86B/4017/RVC

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.

The French version of this standard has not been voted upon.

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

A list of all parts in the IEC 61300 series, published under the general title *Fibre optic interconnecting devices and passive components*, 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

- 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- withdrawn,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 2-9: Tests – Shock

1 Scope

This part of IEC 61300 defines a test method to reveal mechanical weakness and/or degradation of fibre optic devices when subjected to repetitive or non-repetitive mechanical shocks. It simulates infrequent repetitive or non-repetitive shocks likely to be encountered in normal service or during transportation.

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 60068-1, *Environmental testing – Part 1: General and guidance*

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

ISO 2041, *Mechanical vibration, shock and condition monitoring – Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2041 and IEC 60068-1 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

3.1
check point
point located on the fixture, on the table surface of the shock machine, or on the DUT as close as possible to the fixing point and rigidly connected to it

Note 1 to entry A number of check points may be used to ensure the test requirements are satisfied.

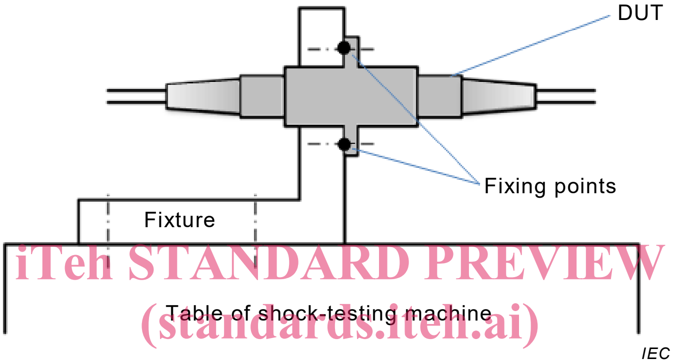
Note 2 to entry If the DUT is attached by more than four fixing points, the relevant specification should state the number of fixing points that are to be used as check points.

Note 3 to entry In special cases, for example, for large or complex DUTs, the check points will be prescribed by the relevant specification.

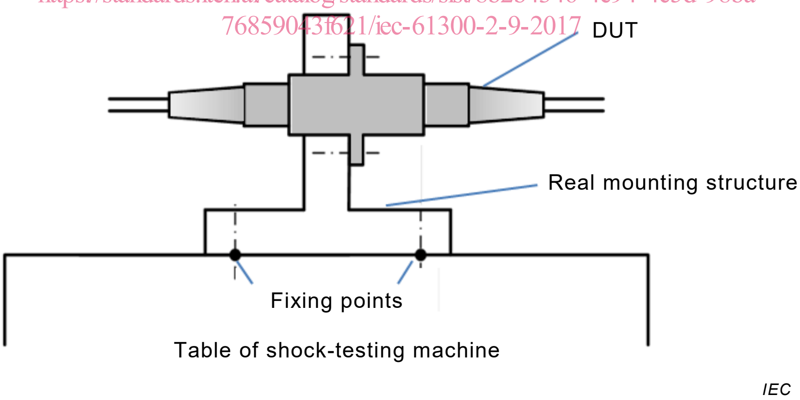
Note 4 to entry If a small DUT is mounted on one fixture or a large number of small DUTs are mounted on one fixture, or where there are a number of fixing points, a single check point (that is the reference point) may be selected for the derivation of the control signal. This signal is then related to the fixture rather than to the fixing points of the DUT(s). This procedure is only valid when the lowest resonance frequency of the loaded fixture is well above the upper frequency of the test.

3.2
fixing point
point on the DUT in contact with the fixture (Figure 1a) or the table of the shock machine at a location where the DUT is normally fastened in service

Note 1 to entry If a part of the real mounting structure is used as the fixture, the fixing points are taken as those where the real mounting structure contacts the table (Figure 1b) and not where the product contacts the real mounting structure.



a) Fixing points using a fixture



b) Fixing points using a real mounting structure as a fixture

Figure 1 – Fixing points

3.3
repetition rate
number of shocks per second

3.4
shock severity
combination of the peak acceleration, the duration of the nominal pulse and the number of shocks

3.5
velocity change
absolute value of the sudden change of velocity resulting from the application of the specified acceleration

4 General description

A device under test (DUT) is mounted on the table of the shock machine and is subjected to half-sinusoidal shock pulses. The DUT is exposed to two or three shock pulses applied in each direction of three mutually perpendicular axes in accordance with severities (see Clause 7).

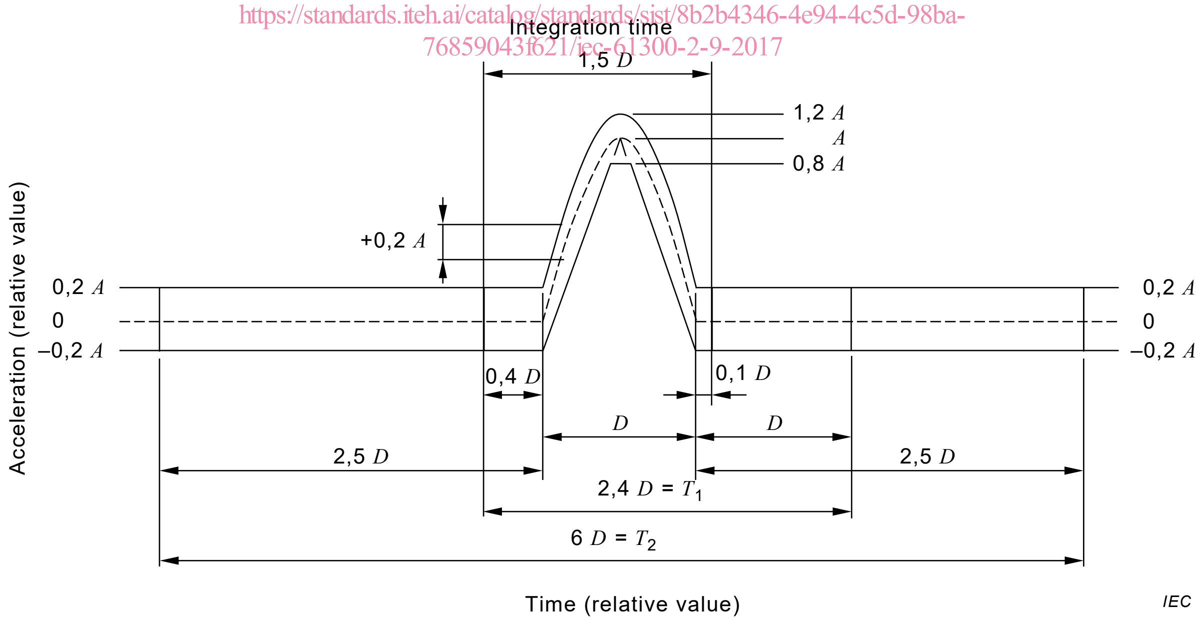
Wherever possible, the severity of the pulse applied to the DUT should be such as to reproduce the effects of the actual transport or operational environment to which the DUT will be subjected, or to satisfy the design requirements. The DUT is always mounted to the fixture or the table of the shock machine during testing.

5 Apparatus

5.1 Shock machine

5.1.1 General

The shock machine may be of the free fall, resilient rebound, nonresilient, hydraulic, compressed gas or other activating type. The shock machine shall be capable of generating a calibrated acceleration when loaded with a DUT, with or without a fixture. The shock machine shall be capable of generating a half-sinusoidal excitation measured at the checkpoints, within the tolerance shown by the solid lines in Figure 2.



Key

– – – nominal pulse

A = peak acceleration of nominal pulse

—— tolerence

T_1 = minimum time during which the pulse shall be monitored for shocks produced using a conventional shock machine

D = duration of nominal pulse

T_2 = minimum time during which the pulse shall be monitored for shocks produced using a vibration generator

Figure 2 – Pulse shape and limits of tolerance for half-sine pulse

5.1.2 Repetition rate

The repetition rate shall be such that the relative motion within the DUT between shocks shall be substantially zero and the value of acceleration at the check point shall be within the limits shown in Figure 2.

5.1.3 Velocity change tolerances

For all pulse shapes, the actual velocity change shall be within ±15 % of the value corresponding to the nominal pulse.

Where the velocity change is determined by integration of the actual acceleration pulse, this shall be effected from 0,4 D before the pulse to 0,1 D beyond the pulse, where D is the duration of the nominal pulse.

If the velocity change tolerance cannot be achieved without the use of elaborate facilities, the relevant specification shall state the alternative procedure to be adopted.

5.1.4 Cross axis motion

The positive or negative peak acceleration at the check point(s), perpendicular to the intended shock direction, shall not exceed 30 % of the value of the peak acceleration of the nominal pulse in the intended direction, when determined by 5.1.5.

If the cross axis motion tolerance cannot be achieved, the relevant specification shall state the alternative procedure to be adopted.

5.1.5 Acceleration measuring system

The characteristics of the measuring system shall be such that it can be determined that the true value of the actual pulse, as measured above, in the intended direction at the checkpoint(s) is within the tolerances required by Figure 2.

The requirements of Figure 3 apply to the frequency response of the measuring system without the use of a low-pass filter on the control signal. When a low-pass filter is used, the characteristics of the filter should be such that its cut-off frequency fg (–3 dB point) is not lower than:

$$fg = \frac{1{,}5}{D}$$

where

fg is the cut-off frequency of a low-pass filter in kHz;

D is the duration of nominal pulse in ms.

The frequency response of the overall measuring system, which includes the accelerometer, can have a significant effect on the accuracy and shall be within the limits shown in Figure 3 and Table 1.

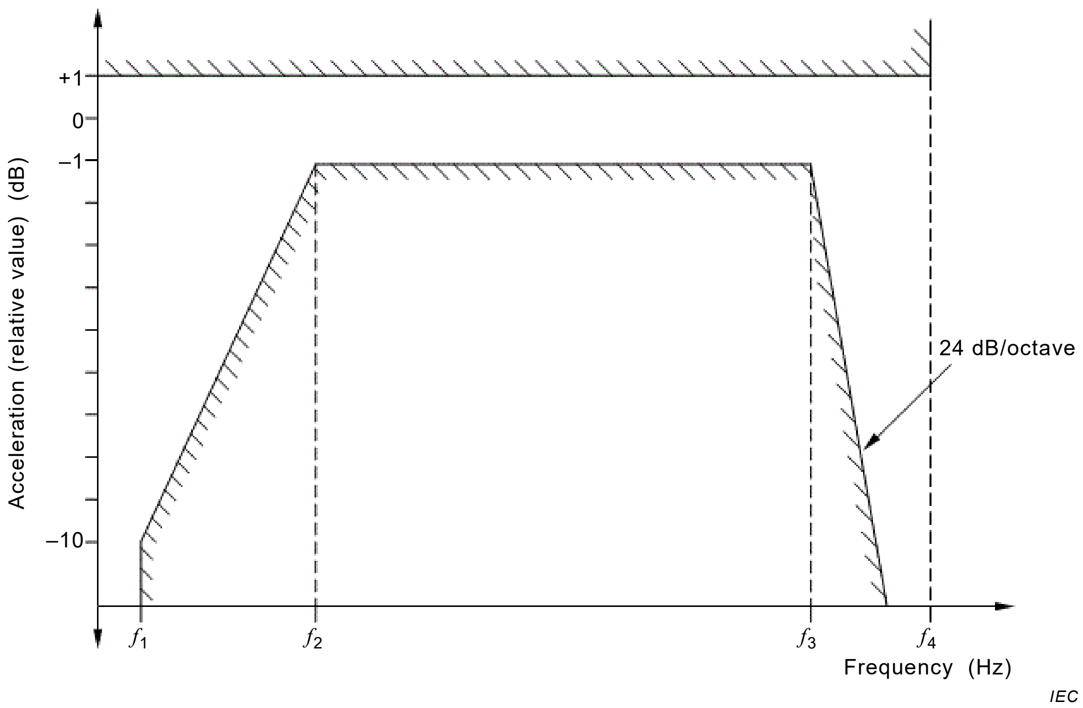


Figure 3 – Frequency characteristics of the overall measuring system without low-pass filter

Table 1 – Required frequency characteristic values for the overall measuring system

Duration of pulse ms	Low-frequency cut-off Hz		High-frequency cut-off kHz	Frequency beyond which the response may rise above +1 dB kHz
D	f_1	f_2	f_3	f_4
1	4	20	10	20
11	0,5	2	1	2
SOURCE: adapted from IEC 60068-2-27:2008				

5.2 Mounting fixture

The DUT shall be prepared and mounted with accessories as specified in the relevant specification and fastened to the table of the shock machine.

5.3 Optical power measuring equipment

Unless otherwise specified, measuring equipment specified in IEC 61300-3-28 shall be connected to the DUT for monitoring the transient loss to detect fast variation of attenuation.

6 Procedure

6.1 Preparation of DUT

Prepare the DUT according to the manufacturer´s instructions or as specified in the relevant specification.

6.2 Pre-conditioning

Pre-condition the DUT for 2 h at the standard atmospheric condition specified in IEC 61300-1 unless otherwise specified in the relevant specification.

6.3 Initial examinations and measurements

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

6.4 Testing

The DUT shall be mounted rigidly to the fixture in a manner that simulates normal mounting as closely as possible. A minimum length of 200 mm of optical fibre/cable shall be unsupported on both ends of the DUT and be attached free of tension to the table of a shock machine. Conduct the procedure as outlined in 6.5 and 6.6.

The number of shocks prescribed by the relevant specification shall be applied successively in each direction of three mutually perpendicular axes of the DUT. When testing a number of identical DUTs, they may be oriented so that the shocks are applied simultaneously along these three axes (see Clause 7).

Where the position of the DUT, when mounted or transported, is known, and since shocks are generally of greatest significance in one direction of one axis, the relevant specification shall state the specified number of shocks that shall be applied and in which axis, direction and position. Otherwise, three axes and two directions shall be tested. For example, usually the highest levels of shock acceleration are along the vertical axis. When the position during transportation is known, the shocks should be applied in what will be the vertical axis in the upward direction. Where the position is unknown, the specified number of shocks shall be applied in each of the axes prescribed by the relevant specification (see Clause 7).

The relevant specification shall state whether the DUT shall operate during testing and if any functional monitoring is required.

6.5 Recovery

Allow the DUT to remain on the fixture for 1 min unless otherwise specified in the relevant specification.

6.6 Final examination and measurements

On completion of the test, remove all fixtures, clean the DUT in accordance with the manufacturer's instruction and inspect the DUT and make final measurements as defined by the relevant specification, to ensure that there is no permanent damage to the DUT. The relevant specification shall provide the criteria upon which the acceptance or rejection of the DUT shall be based.

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

- broken, loose or damaged parts and/or accessories,
- broken or damaged cable sheath, seals, strain relief or fibres, and
- displaced, bent, broken or damaged parts.