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REDLINE VERSION

INTERNATIONAL STANDARD

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Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 2-38: Tests – Sealing for ~~pressurized~~ fibre optic sealed closures and hardened connectors using air pressure

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

Part 2-38: Tests – Sealing for ~~pressurized~~ fibre optic sealed closures and hardened connectors using air pressure

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IEC 61300-2-38 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 2006. It constitutes a technical revision.

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

a) addition of sealed hardened connectors;

b) recommended test severities from IEC 61753-1;

c) test configurations for hardened connectors and adaptors.

The text of this standard is based on the following documents:

Draft	Report on voting
86B/4768/FDIS	86B/4783/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, 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- withdrawn,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 2-38: Tests – Sealing for ~~pressurized~~ fibre optic sealed closures and hardened connectors using air pressure

1 Scope

This part of IEC 61300 presents ~~a~~ two methods for testing the sealing performance of a fibre optic sealed closure and ~~sealing system of the closures, when required by the relevant specification~~ hardened connector using air pressure.

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

3 Terms and definitions

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

ISO and IEC maintain terminological 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

3.1
hardened fibre optic connector
water and dust tight connector

Note 1 to entry: A hardened fibre optic connector is typically used for a connection in outside plant.

[SOURCE: IEC 61753-1:2018, 3.8]

3.2
sealed closure
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: Although often referred to as hermetic sealed closures, humidity can enter the inner closure by diffusion.

Note 3 to entry: Sealed boxes or sealed wall outlets shall be treated as sealed closures.

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[SOURCE: IEC 61753-1:2018, 3.17, modified – Note 4 to entry has been deleted.]

4 Test methods

~~A number of closures are assembled following the manufacturer's instructions. The specimens are then sealed, pressurized and tested for leaks by using the pressure gauge (see 3.2.4) and measuring the time to failure.~~

Assemble the protective housings or hardened connectors following the manufacturer's instructions.

The tests shall be carried out ~~according to the~~ at standard ~~test~~ atmospheric conditions as defined in IEC 61300-1, unless otherwise specified in the relevant ~~specification~~ performance specification. The test samples are then sealed, pressurized and tested for leaks by using method A or method B.

Method A is a performance criterion test for leaks when the ~~specimen~~ test sample is pressurized with air, submerged in a water bath, and monitored for any escape of air bubbles. This test method is generally used to check the sealing of the closure or hardened connector after installation of the test sample or after a performance test. In the field, the test is usually done with soap water to check for leaks.

Method B is a performance criterion test for leaks when the ~~specimen~~ test sample is pressurized with air and the pressure loss is monitored by using a gauge. This test method is generally used to check the sealing of the ~~closure~~ sealed protective housing or sealed hardened connector during mechanical tests at a specified test temperature, by measuring the pressure before and after the test. Since atmospheric pressure can change over time, this test should not exceed the duration of 2 h between the first and the last measurement of the overpressure inside the closure, unless the change in overpressure is compensated by the change in atmospheric pressure during the measurement period.

5 Apparatus

5.1 Elements of apparatus

The apparatus consists of the following elements:

- pressurizer;
- capillary gas connection;
- pressure gauge;
- water bath.

~~**3.2.1 Cable**~~

~~Suitable cable to assemble the specimen shall be used.~~

5.2 Pressurizer

The test samples shall be pressurized with a pressurizer. A pressurizer provides means of pressurizing the ~~closures~~ test samples.

5.3 Capillary gas connection

A suitable capillary gas connection ~~are needed for fitting~~ shall fit into the ~~specimen~~ test sample or cable to allow the ~~specimen~~ test sample to be pressurized.

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5.4 Pressure gauge

A pressure gauge is a gauge to measure the pressure inside the ~~closures~~ test sample. Gauges with a suitable range of at least 40 kPa and a resolution of ~~0,5 kPa~~ at least 0,1 kPa to determine a ~~5 %~~ 2 kPa drop in pressure shall be used.

5.5 Water bath

A water bath ~~is needed~~ filled with fresh water is used for method A. The water bath shall be deep enough to fully immerse the test samples.

6 Procedure

6.1 Method A

~~Assemble the specimen using the smallest and the largest cable diameter for which the specimen is designed.~~

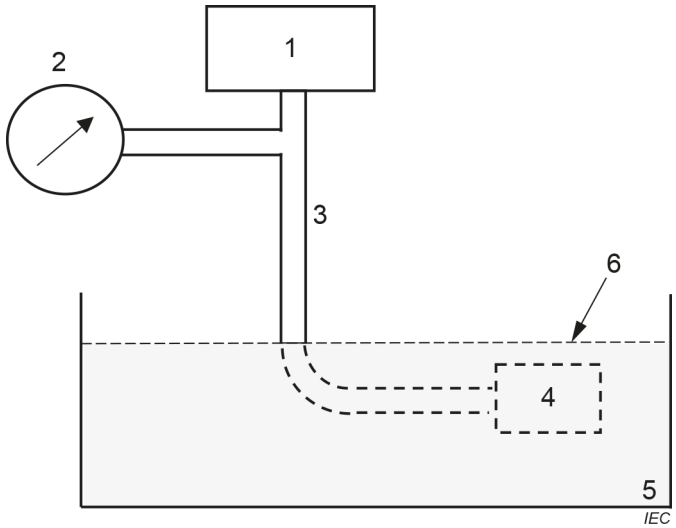
~~Install the pressure gauge into the specimen or cable.~~

~~Seal the cable ends at their extremities.~~

~~Pressurize the closure.~~

~~Submerge the specimen and cable in a water bath just below the water surface at the required temperature. No escape of air bubbles, indicating a leakage, shall be observed during the test.~~

A test configuration for method A is shown in Figure 1.



Key

1 regulated pressurizer

2 pressure gauge, utilized for monitoring the overpressure

3 capillary gas connection, utilized for transferring pressurized air to the sealed protective housing

4 sealed protective housing

5 water bath, utilized for immersing the test sample

6 water surface

Figure 1 – Configuration for method A

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a) Prepare the test samples using the smallest and the largest cable diameter for which the test samples are designed.

b) Install the pressure gauge into the test sample or cable. Make sure that the cable can transfer the overpressure into the test sample.

c) Seal the open cable ends at their extremities with a cap.

d) Hardened connectors shall be installed on a sealed closure or pressure vessel and equipped with one or more adaptors or sockets for making a connection with the hardened connector. See Annex A for the test configuration for hardened connectors.

e) Submerge the test sample and cables in a water bath. Remove the trapped air on the outside of the test sample. Place test sample and cable just below the water surface.

NOTE Immersion of the test sample deep under the water surface could create a higher compression force onto the sealing material and mask potential leak paths.

f) Pressurize the test sample with the pressurizer. The pressurizer shall remain switched on during the test to provide a constant overpressure in the test sample.

g) No escape of air bubbles, indicating a leakage, shall be observed for at least 15 min.

6.2 Method B

~~Assemble the specimen using the smallest and the largest cable diameter for which the specimen is designed.~~

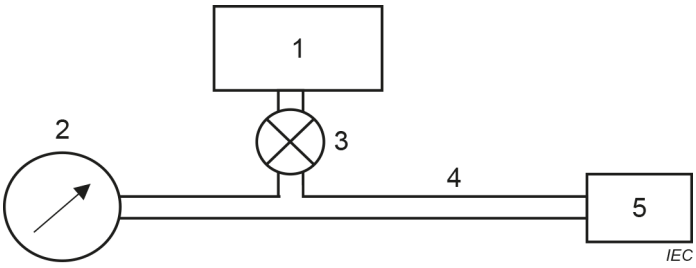
~~Install the pressure gauge into the specimen or cable.~~

~~Seal the cable ends at their extremities.~~

~~Pressurize the closure at specified temperature.~~

~~With the specimen at the test temperature, the air pressure shall be monitored using the installed gauge. A record of air pressure versus time shall be kept and plotted. The pressure in the specimen shall not decay more than the specified amount.~~

A test configuration for method B is shown in Figure 2.



Key

1 regulated pressurizer

2 pressure gauge, utilized for monitoring the overpressure

3 valve to shut off pressurizer once test pressure is stable

4 capillary gas connection, utilized for transferring pressurized air to the sealed protective housing

5 sealed protective housing

Figure 2 – Configuration for method B

a) Prepare the test samples using the smallest and the largest cable diameter for which the test samples are designed.

b) Install the pressure gauge into the test sample or cable. Verify that the air pressure applied to the cable is transferred as overpressure into the test sample.

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c) Seal the open cable ends at their extremities with a cap.

d) Connect the test sample with the capillary gas connection to the pressurizer. Pressurize the test sample at specified temperature.

e) Hardened connectors shall be installed on a sealed closure or pressure vessel with an inner volume between 1 dm^3 and 5 dm^3 and equipped with one or more adaptors or sockets for making a connection with the hardened connector. See Annex A for the test configuration for sealed hardened connectors.

NOTE The additional pressure vessel is not required for method A as pressure remains regulated during the test (no valve to shut off pressurizer).

f) After the test sample is conditioned at the test pressure and test temperature, the pressurizer shall be isolated from the test sample circuit by closing the valve of the pressurizer output. The air pressure inside the test sample shall be monitored using the installed gauge. Measure and record the pressure before and after the mechanical test at the same test temperature. The pressure in the test sample shall not decay more than the specified amount.

7 Severity

The severity is determined by the initial overpressure, the ~~time~~ duration for the test and the allowable leakage or pressure ~~decay~~ loss during the test.

~~The following preferred severities may be specified for the sealing procedure.~~

~~– The test overpressure for specimens for unpressurized systems is 40 kPa.~~

~~– The test overpressure for specimens for pressurized systems is 98 kPa.~~

Table 1 shows the specified test severities in relation to the performance categories. It is recommended to verify the test severities with the relevant IEC 61753 performance standards and IEC 62005 reliability documents for the normative values.

Table 1 – Recommended severities

IEC 61753-1 category	Category description	Test overpressure kPa	Duration for method A min	Maximum allowed pressure loss for method B kPa
C	Indoor environments	20 ± 2	At least 15	2
A	Outdoor aerial environment	20 ± 2	At least 15	2
G	Outdoor ground level environment	20 ± 2	At least 15	2
S	Outdoor subterranean or subsurface environment	40 ± 2	At least 15	2

8 Details to be specified and reported

The following details, as applicable, shall be specified in the relevant specification and shall be reported in the test report:

- number and type of test samples;
- type and diameter of the cable to be used in the test;

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- the procedure for mounting the ~~specimen~~ test samples;
- ~~duration of test;~~
- test temperature;
- pre-conditioning of test samples, if any;
- method of leak detection (method A or method B);
- overpressure level;
- duration for method A;
- ~~allowable leakage for Method A;~~
- ~~allowable pressure decay for Method B;~~
- maximum allowable pressure loss for method B;
- ~~water head (Method A);~~
- deviations from test procedure;
- additional pass/fail criteria.

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Annex A
(normative)

Test configuration for sealing test of sealed hardened connectors and adaptors

A.1 General description for sealing test

For the sealing test of hardened connectors and adaptors, two test methods are available in this document: method A and method B.

Method A is conducted by pressurizing the test sample with air, submerging in a water bath, and monitoring for any escape of air bubbles which indicates a leakage. This method is generally used to check the sealing performance of the hardened fibre optic connector after installation of the test sample and after a performance test. In the field, the test is usually done with soap water to check for leaks.

Method B is conducted by pressurizing the test sample with air and using a pressure gauge to monitor whether there is any pressure loss which indicates a leakage. This test method is generally used to check the sealing performance of the hardened fibre optic connector during mechanical performance tests at a specified test temperature, by measuring the pressure before and after the test.

A.2 Example of a test configuration for method A

An example of a test configuration for method A is shown in Figure A.1.

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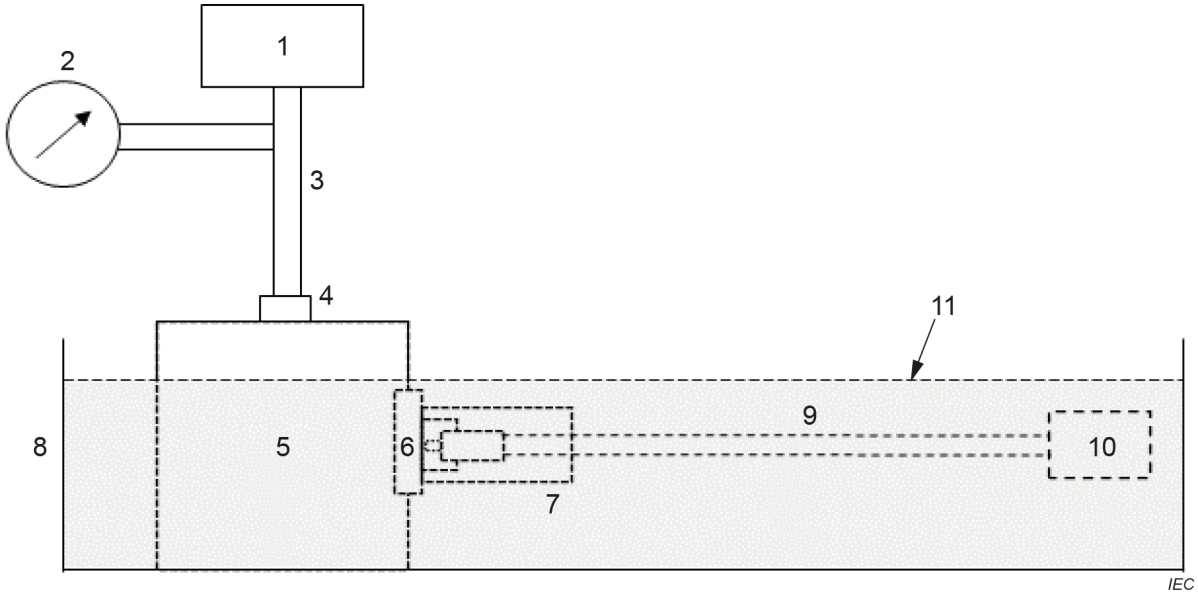

Key

1 regulated pressurizer

2 pressure gauge, utilized for monitoring the overpressure

3 capillary gas connection, utilized for transferring pressurized air to the sealed hardened connector

4 air pressure test access valve, utilized for connecting part 3 and part 5

5 pressure vessel or sealed closure, utilized for fixing the test samples, filled with pressurized air and maintaining the air pressure inside without any leakage

6 hardened adaptor or socket, fixed on the panel of part 5

7 hardened connector plug, mated with the hardened adaptor or socket

8 water bath, utilized for immersing the test sample

9 optical cable on which the hardened connector plug is assembled

10 sealing cap, utilized for sealing the open extremity of the optical cable or hardened connector plug with a sealed protective cap

11 water surface

More than 1 adaptor or socket per pressure vessel is allowed.

Figure A.1 – Example of a test configuration for method A

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