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BSI Standards Publication

Aerospace series — Sealants — Test methods — Determination of low-temperature flexibility

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National foreword

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

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Aerospace series - Sealants - Test methods - Determination of low-temperature flexibility

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Luft- und Raumfahrt - Dichtmassen - Prüfverfahren - Bestimmung der Kälteflexibilität

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Foreword

This document (EN 3102:2013) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

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1 Scope

This European Standard defines the test method for the determination of the operability of a cured sealant during and after submission to a bending load at low temperatures (low-temperature flexibility).

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.

EN 2090, *Aerospace series - Aluminium alloy AL-P2024-T3 - Clad sheet and strip 0,3 mm <a <6 mm*

ISO 1817, *Rubber, vulcanized — Determination of the effect of liquids*

ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/ compression testing machines — Verification and calibration of the force-measuring system*

3 Terms and definitions

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

3.1
Low-temperature flexibility
The resistance of a sealant to cracking when submitted to a bending load at low temperatures using the test equipment as described in 5.1

4 Principle of the method

The sealant is applied on a strip of material (substrate). After curing of the sealant, the test pieces are directly and/or after exposure to the test media submitted to a bending test at low temperatures.

Following this bending test, the test pieces are visually inspected in order to detect any cracking.

5 Apparatus and accessories

5.1 Apparatus

— Tensile testing machine (suitable for tensile and compression tests) in accordance with ISO 7500-1, category 1, allowing for a speed of 960 mm/min;

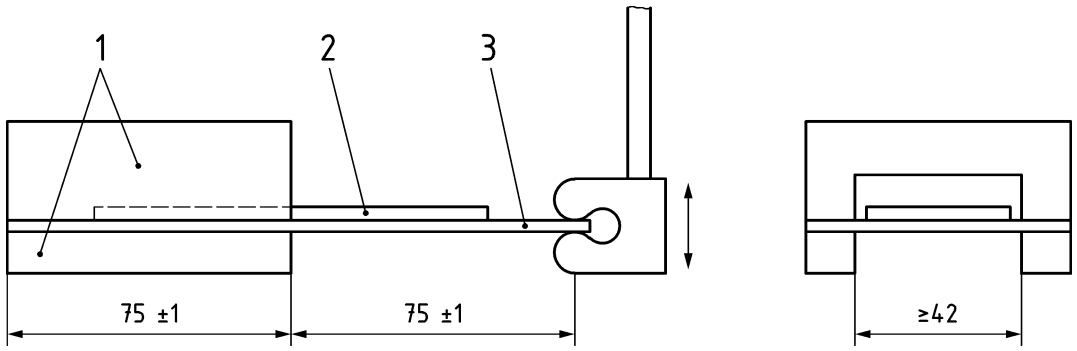
— mounting device — adapted to the tensile testing machine — for clamping of test pieces. The mounting device shall ensure the clamping of the test piece sideways from the sealant over a length of 75 mm. Installations allowing for the mounting of several test pieces simultaneously may also be used (an example of such a device is given in figure 1);

— load application device (adapted to the traverse of the tensile testing machine);

— cold chamber (adapted to the above-mentioned tensile testing machine, in which the required test temperature can be set (temperature tolerance: ± 1 °C);

— oven with forced aeration (temperature tolerance: ± 1 °C);

— spatula.



Key

1 Mounting device

2 Sealant

3 Material strip

Free motion: ± 20 mm (measured at the end of the test plate corresponding to approx. ± 15°)

Plate thickness: 1,0 mm

Figure 1 — Example of testing device

5.2 Accessories

— Cleaning agent, e.g. ethyl acetate;

— material strips (substrate) in material according to EN 2090, unless otherwise specified in the material standard;

— test fluid no 1, in accordance with ISO 1817.

6 Test pieces

6.1 Dimensions of material strips (substrates)

1,0 mm × 70 mm × 150 mm

6.2 Shape and manufacture

The test pieces shall be manufactured using material strips as per 6.1.

Immediately prior to the manufacture of the test pieces, the material strips (substrates) shall be cleaned and, if required by the material standard, a primer shall be applied.

Then a (2,5 ± 0,2) mm thick coat of sealant shall be applied over a length of 100 mm and a width of 40 mm by means of a spatula on one side only and in the middle of the material strip (substrate).

NOTE An open mould may be used for the manufacture of test pieces. The manufacture of test pieces shall be completed within the application time.

6.3 Curing and exposure methods

The test pieces shall be cured in accordance with the material standard and, if required, exposed according to the relevant method as defined in table 1. Testing or cooling to test temperature shall begin within 10 min after removal from the relevant test medium.

Table 1 — Exposure conditions

Method	Medium	Temperature	Time
A	without exposure		
B	dry heat	(95 ± 1) °C	(48 ± 2) h
C	dry heat	(120 ± 1) °C	7 d ± 2 h
D	test fluid no 1	(60 ± 1) °C	(120 ± 2) h
		followed by	
	test fluid no 1	(70 ± 1) °C	(60 ± 2) h
		followed by	
	test fluid no 1	(80 ± 1) °C	(6 ± 0,25) h
		followed by 6 cycles [a] at	
	dry heat	(130 ± 1) °C	(4 ± 0,25) h
	dry heat	(160 ± 1) °C	(40 ± 5) min.
	dry heat	(180 ± 2) °C	(60 ± 5) min.

[a] After each cycle the test pieces shall be cooled to 40 °C min. at a temperature of (23 ± 2) °C, before starting a new cycle with an exposure at 130 °C.

6.4 Number

Unless otherwise specified in the technical specification, two test pieces shall be used for each test and for each exposure.

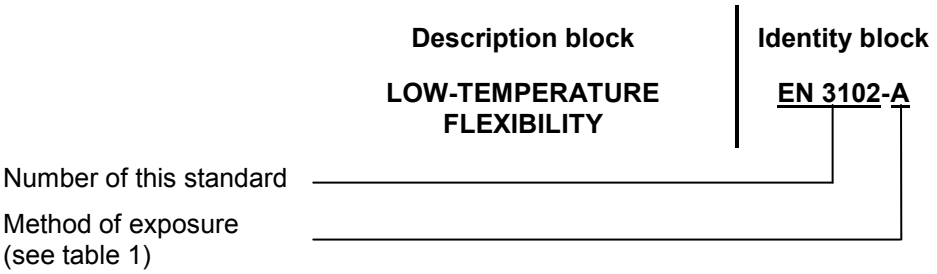
7 Procedure

The test piece shall be mounted in the clamping device over a length of 75 mm, avoiding any contact with the sealant. The temperature of the cold chamber shall be lowered to the temperature specified in the relevant material standard (unless otherwise specified: (−55 ± 3) °C), and maintained for 2 h, following this the test piece shall be submitted to 130 flexure cycles of ± 20 mm (measured at the end of the test plate; this corresponds to an angle of ± 15°). The test speed shall be 960 mm/min., so that one cycle is completed within 5 s.

On completion of the bending test, the test pieces shall be brought to a temperature of (23 ± 2) °C and the sealant visually inspected in order to detect any cracks, detachment or other damage.

8 Designation

EXAMPLE



9 Evaluation

Evaluation of whether or not cracking, detachment or other damage has occurred.

10 Test report

The test report shall include with reference to this standard:

— type and designation of product tested;

— number of production batch and date of manufacture;

— material used and conditioning of the material strip (substrate);

— curing conditions and, if required, the type of medium exposure;

— test temperature;

— number of test, test pieces;

— test result;

— conditions deviating from this standard or specifically agreed;

— date of test;

— department and person responsible.

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