
**Thermal insulation products —
Determination of ageing by settlement —**

**Part 1:
Blown loose-fill insulation for ventilated attics**

*Produits isolants thermiques — Détermination du tassement après
vieillessement —*

Partie 1: Isolant en vrac soufflé pour combles ventilés

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 18393-1 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*.

ISO 18393 consists of the following parts, under the general title *Thermal insulation products — Determination of ageing by settlement*:

— *Part 1: Blown loose-fill insulation for ventilated attics*

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Introduction

Blown loose-fill insulation is subject to settlement, which is a reduction of insulation thickness and results in a degradation of the thermal performance of the insulation. It is necessary to know the thickness of the insulation when the settlement is completed in order to predict the long-term heat loss of the structure where the insulation is applied.

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Thermal insulation products — Determination of ageing by settlement —

Part 1: Blown loose-fill insulation for ventilated attics

1 Scope

This part of ISO 18393 specifies a test method for the determination of settlement of blown loose-fill insulation applied horizontally in ventilated attics.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 12570, *Hygrothermal performance of building materials and products — Determination of moisture content by drying at elevated temperature*

ISO 29466, *Thermal insulating products for building applications — Determination of thickness*

3 Terms and definitions

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

3.1 attic

ventilated loft space of a building enclosed between the roof and the ceiling

4 Principle

A test specimen is made by blowing the product into a box, using a machine as approved by the manufacturer. The box with the blown specimen is subjected to moisture and temperature cycling. At the beginning and during the climate cycling, the thickness is monitored and the change is calculated.

5 Test equipment

5.1 Specimen container

Perforated metal box with the dimensions of the holes of 4 mm² and a grid thickness of 1 mm.

The inside dimensions of the box are:

- length: 800 mm ± 10 mm;
- width: 700 mm ± 10 mm;
- height: 300 mm + ⁺²⁰₀ mm.

The thickness measurement shall be made according to ISO 29466 to the nearest 1 mm at nine positions evenly distributed over the area of the box.

EXAMPLE Nine rulers, graduated in mm, of 320 mm long with a maximum diameter of 8 mm, are fixed at the base and are parallel with the vertical sides of the box and evenly distributed across the base.

5.2 Climate chamber

The climate chamber shall be large enough to accommodate the specimen boxes and it shall provide a controlled climate for the whole specimen area in a range from $(5 \pm 1) ^\circ\text{C}$ to $(60 \pm 1) ^\circ\text{C}$, and $(50 \pm 5) \% \text{RH}$ to $(85 \pm 5) \% \text{RH}$.

6 Test specimens

6.1 Preparations of test specimens

In the specimen box, the insulation is blown to a thickness of 300 mm in accordance with the manufacturer's recommendations for installation and the product standards.

6.2 Number of test specimens

The number of test specimens shall be as specified in the product standard. If a number is not specified in the standard, at least one specimen shall be used.

6.3 Conditioning of test specimens

The test specimens shall be stored for at least 6 h at $(23 \pm 2) ^\circ\text{C}$. In case of dispute, it shall be carried out at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \% \text{RH}$ until stabilization at constant weight is achieved according to ISO 12570.

In tropical climates, different conditioning and testing conditions may be relevant. In this case, the conditions shall be $(27 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \% \text{RH}$ and be stated clearly in the test report.

7 Test procedure

To avoid disturbances to the test specimen, e.g. by shock, the test box with the installed insulation shall be carefully placed into the climate chamber. Care shall also be taken to avoid any disturbances during the measurement, e.g. the container being shifted back and forth.

The chamber shall be controlled to the following conditions:

- a) Period 1: 40 days with a temperature and humidity cycle every 12 h between;
- b) Period 2: 40 days at $(23 \pm 1) ^\circ\text{C}$ with $(85 \pm 5) \% \text{RH}$;
- c) Period 3: 40 days at $(60 \pm 1) ^\circ\text{C}$ with $(5 \pm 5) \% \text{RH}$;
- d) Period 4: 40 days at $(26 \pm 1) ^\circ\text{C}$ with $(85 \pm 5) \% \text{RH}$.

The settlement of the insulation is recorded from each of the nine positions at fixed intervals and at least three times a week.

The readings shall be taken to the nearest millimetre.

When experience has been gained with a product, the periods can be shortened, but not less than 20 days for each period.

8 Calculations and expression of results

For each specimen, the mean value of the readings from the nine positions is one test result. This shall be used to create a graph of settlement over time, based upon a best fit equation of an order sufficient to provide a correlation coefficient $R \geq 0,95$.

9 Test report

The test report shall include the following information:

- a) reference to this part of ISO 18393, i.e. ISO 18393-1:2012;
- b) product identification, product name, producer or supplier and traceable production code;
- c) installed density;
- d) start and end dates of test;
- e) test procedure with applied periods and specified climate conditions. The monitoring of the climate cycle shall be part of the test report;
- f) all test results and the average settlement.

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