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Thermal insulating products for building equipment and industrial installations — Determination of short-term water absorption by partial immersion of preformed pipe insulation

Produits isolants thermiques pour les équipements de bâtiments et les installations industrielles — Détermination de l'absorption d'eau à court terme par immersion partielle des coquilles isolantes préformées

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 88, *Thermal insulating materials and products*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 12623:2011), which has been technically revised.

The main changes are as follows:

— EN 13472:2012 and ISO 12623:2011 have been merged into one document;

— Clause 3, Terms and definitions, has been added and the numbering of the following clauses has been changed accordingly;

— Table A.1 has been technically revised;

— editorial revisions.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Thermal insulating products for building equipment and industrial installations — Determination of short-term water absorption by partial immersion of preformed pipe insulation

1 Scope

This document specifies the equipment and procedures for determining the short-term water absorption of preformed pipe insulation by partial immersion in water. It is applicable to thermal insulating products.

NOTE It is intended to simulate the water absorption caused by exposure to rain for 24 h during product installation.

This document has been prepared for products used to insulate building equipment and industrial installations, but it can also be applied to products used in other areas.

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.

ISO 12628, *Thermal insulating products for building equipment and industrial installations — Determination of dimensions, squareness and linearity of preformed pipe insulation*

3 Terms and definitions

No terms and definitions are listed in this document.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Principle

The short-term water absorption by partial immersion is determined by measuring the change in mass of a test specimen, the lower part of which is in contact with water for a period of 24 h.

The excess water adhering to the surface and not absorbed by the test specimen is drained according to Method A (7.2.2) or calculated, according to Method B (7.2.3), from the initial water uptake.

If the pipe insulation is cut from a flat product, then the short-term water absorption by partial immersion can be obtained from tests carried out on the flat product with similar properties according to ISO 29767, provided that the test is carried out in the direction giving the highest water uptake.

5 Apparatus

5.1 Balance, capable of determining the mass of a test specimen to an accuracy of 0,1 g or 0,5 %, whichever is less.

5.2 Water tank, with a device for keeping the water level constant to within ±2 mm, and a device to keep the test specimen in the required position during the test [see examples in Figure 1 a) and b)].

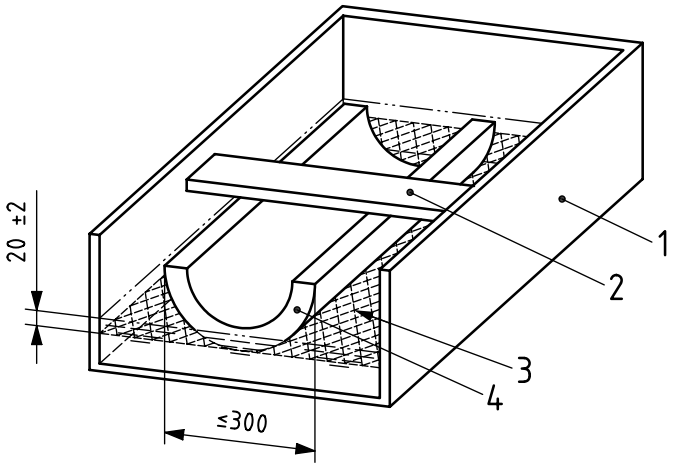
The supporting device shall be such that the test specimen contact area with water shall be at least 85 % and such that the original form of the test specimen is maintained.

5.3 Tap water, adjusted to a temperature of (23 ± 5) °C.

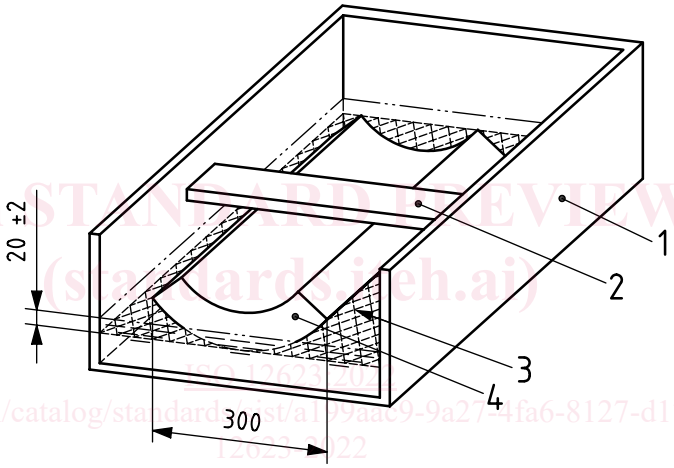
In tropical climates, different conditioning and testing conditions can be relevant. In this case, the temperature of the water shall be adjusted to (27 ± 5) °C and be stated clearly in the test report.

5.4 Equipment for drainage [see examples in Figure 2 a) and b)].

Dimensions in millimetres



a) Example of D_o ≤ 300 mm

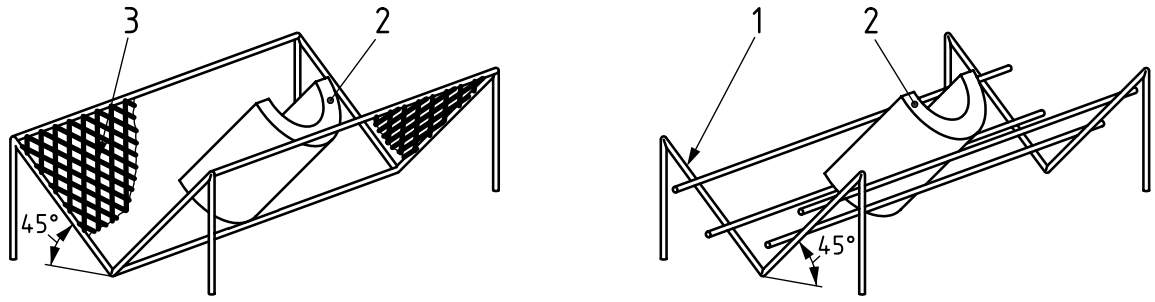


b) Example of D_o > 300 mm

Key

1 water tank
2 load to keep the test specimen in position
3 stainless steel mesh
4 test specimen

Figure 1 — Examples of partial immersion test devices



a) Example 1 **b) Example 2**

Key

1 perforated stainless steel
2 test specimen
3 stainless steel mesh

Figure 2 — Examples of equipment for drainage

6 Test specimens

6.1 Dimensions of test specimens

Test specimens shall be prepared from the product without reducing the original thickness. In the event that the outside diameter of the product is ≤ 300 mm, the test specimen shall have one face with an area equal to the full cross-sectional area of the product (e.g. full pipe section) or half the original cross-sectional area (e.g. half pipe section). For products with outside diameters > 300 mm, the face shall be a segment of the cross-section with an outside chord length of (300 ± 10) mm.

The length of the test specimen shall be adjusted so that the area of the immersed cylindrical surface will be (40 000 ± 400) mm^2. Annex A provides examples of the calculation of the length of test specimens as shown in Table A.1.

6.2 Preparation of test specimens

The test specimen shall not include product ends and shall be cut approximately 20 mm from the product end.

The test specimens shall be prepared by methods that do not change the original structure of the product. Any skins, facings and/or coatings shall be retained.

NOTE Special methods of preparation, when needed, are specified in the relevant product standard.

For products with a thickness < 25 mm, the ends shall be closed to avoid water pickup on the inner main surface of the test specimen (e.g. by use of glued aluminium foil on the ends).

6.3 Number of test specimens

The number of test specimens shall be as specified in the relevant product standard. If the number is not specified, then at least three test specimens shall be used.

NOTE In the absence of a product standard or any other technical specification, the number of test specimens can be agreed between parties.

6.4 Conditioning of test specimens

The test specimens shall be stored for at least 6 h at (23 ± 5) °C. In case of dispute, they shall be stored at (23 ± 2) °C and (50 ± 5) % relative humidity (RH) for the time specified in the relevant product standard.

In tropical climates, different conditioning and testing conditions can be relevant. In this case, the conditions shall be (27 ± 5) °C and (65 ± 5) % RH and shall be stated clearly in the test report.

7 Procedure

7.1 Test conditions

The test shall be carried out at (23 ± 5) °C. In case of dispute, it shall be carried out at (23 ± 2) °C and (50 ± 5) % RH.

In tropical climates, different conditioning and testing conditions can be relevant. In this case, the conditions shall be (27 ± 2) °C and (65 ± 5) % RH.

7.2 Test procedure

7.2.1 General

The choice of Method A or B shall be as specified in the relevant product standard.

NOTE In the absence of a product standard or any other technical specification, the choice of Method A or B can be agreed between parties.

The dimensions of the test specimens shall be measured in accordance with ISO 12628.

7.2.2 Method A (drainage)

Weigh the test specimen to the nearest 0,1 g or 0,5 %, whichever is less, to determine its initial mass m_0.

Place the test specimen with the outside surface downwards in the empty water tank and apply a sufficient load to keep the test specimen partially immersed when water is added. Carefully adjust the water added to the tank until the lowest point of the outside face of the test specimen is (20 ± 2) mm below the surface of the water [see examples in Figure 1 a) and b)]. Ensure that the water level remains constant during the test.

Remove the test specimen after 24 h and drain it for (10 ± 0,5) min by placing it supported on the exterior surface on a mesh, inclined at 45°, as shown in Figure 2 a) or b). Weigh the test specimen again to determine the mass m_{24}.

7.2.3 Method B (deduction of initial water uptake)

Weigh the test specimen to the nearest 0,1 g or 0,5 %, whichever is less, to determine its initial mass m_0.

Place the test specimen with the outside surface downwards in the water tank in such position that it is partially immersed in water with the lowest point of the outside face of the test specimen (20 ± 2) mm below the water level. Remove the test specimen after 10 s, holding it horizontally, and place it within 5 s in a plastic tray of known mass. Reweigh this tray with the test specimen to determine the mass of the test specimen including the initial water uptake m_1.

Replace the test specimen in the water tank in the same position and apply a sufficient load to keep the test specimen partially immersed in water, with the lowest point of the outside face of the test specimen (20 ± 2) mm below the water level [see examples in Figure 1 a) and b)]. Ensure that the water level remains constant during the test.

Remove the test specimen after 24 h, holding it horizontally and place it within 5 s in the plastic tray of known mass to determine the mass m_{24}.

Method B is only applicable if the initial water uptake is:

$$\frac{m_1 - m_0}{A_p} \leq 0{,}5\ \text{kg/m}^2 \quad (1)$$

where

m_1 is the mass of the test specimen including the initial water uptake in Method B, in kilogrammes;

m_0 is the initial mass of the test specimen as determined in Method B, in kilogrammes;

A_p is the immersed cylindrical surface area of the test specimen, in square metres.

8 Calculation and expression of results

The test result shall be the mean value of the individual values.

NOTE It is possible that results obtained with test specimens of different outside diameters and thicknesses will not be comparable.

Calculate the short-term water absorption by partial immersion, W_p, in kilogrammes per square metre using the following formulae:

Method A (drainage):

$$W_p = \frac{m_{24} - m_0}{A_p} \quad (2)$$

where

m_0 is the initial mass of the test specimen as determined in Method A, in kilogrammes;

m_{24} is the mass of the test specimen after partial immersion for 24 h (Method A), in kilogrammes;

A_p is the immersed cylindrical surface area of the test specimen, in square metres;

W_p shall be rounded to the nearest 0,01 kg/m^2.

Method B (deduction of initial water uptake):

$$W_p = \frac{m_{24} - m_1}{A_p} \quad (3)$$

where

m_1 is the mass of the test specimen including the initial water uptake in Method B, in kilogrammes;

m_{24} is the mass of the test specimen after partial immersion for 24 h (Method B), in kilogrammes;

A_p is the immersed cylindrical surface area of the test specimen, in square metres;

W_p shall be rounded to the nearest 0,01 kg/m^2.