
**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

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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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.

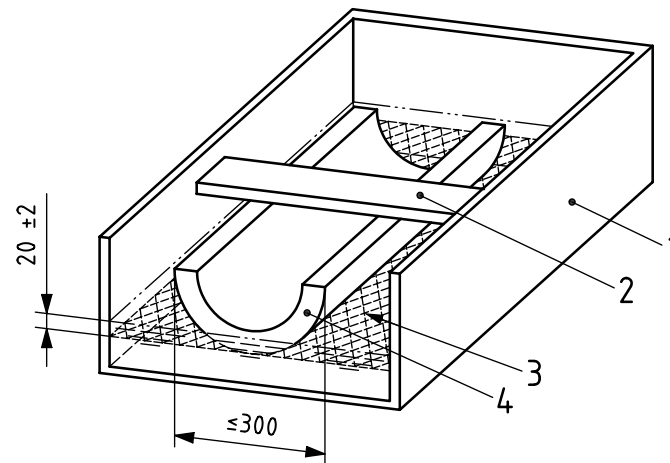
5.3 Tap water, adjusted to a temperature of (23 ± 5) °C.

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.

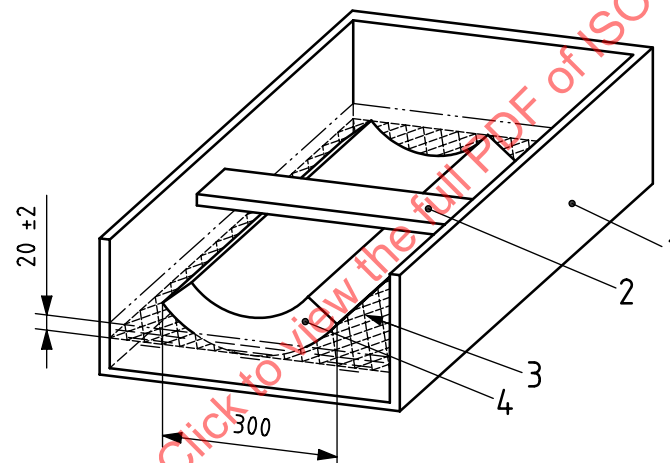
5.4 Equipment for drainage [see examples in [Figure 2](#) a) and b)].

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Dimensions in millimetres



a) Example of $D_o \leq 300$ mm

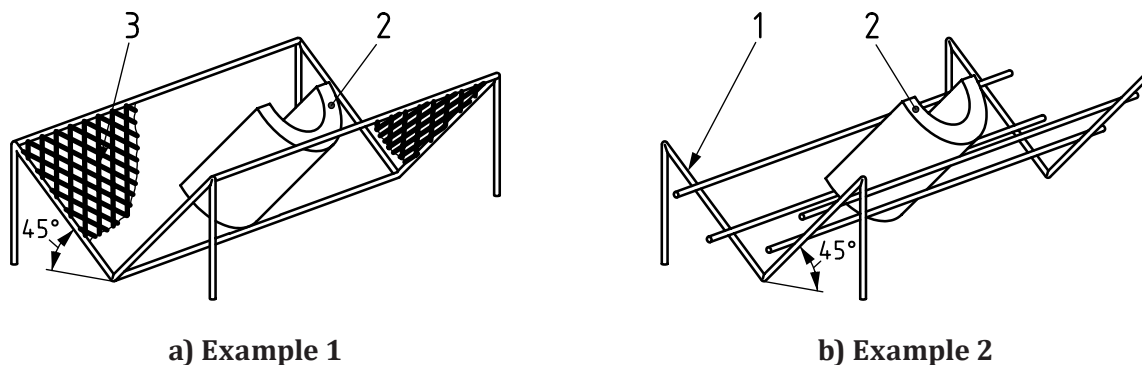


b) Example of $D_o > 300$ mm

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

**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 $(40\,000 \pm 400)$ mm². [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 $(23 \pm 5) ^\circ\text{C}$. In case of dispute, they shall be stored at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ 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 $(27 \pm 5) ^\circ\text{C}$ and $(65 \pm 5) \%$ RH and shall be stated clearly in the test report.

7 Procedure

7.1 Test conditions

The test shall be carried out at $(23 \pm 5) ^\circ\text{C}$. In case of dispute, it shall be carried out at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ RH.

In tropical climates, different conditioning and testing conditions can be relevant. In this case, the conditions shall be $(27 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \%$ 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 $(10 \pm 0,5)$ 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/m².

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/m².

The calculation of A_p , necessary for both Methods A and B, is as follows:

$$A_p = \arccos \left[\frac{\frac{D_o}{2} - 0,02}{\frac{D_o}{2}} \right] \times D_o \times l \quad (4)$$

where

D_o is the outside diameter, in metres;

l is the length of the test specimen, in metres.

The calculated arc cos angle shall be in radians and not in degrees.

9 Accuracy of measurement

NOTE It has not been possible to include a statement on the accuracy of the method in this version of this document, but it is intended to include such a statement when the document is next revised.

10 Test report

The test report shall include the following information:

- a) reference to this document, i.e. ISO 12623:2022;
- b) product identification;
 - 1) product name, factory, manufacturer or supplier;
 - 2) production code number;
 - 3) type of product;
 - 4) packaging;
 - 5) the form in which the product arrived at the laboratory;
 - 6) other information as appropriate, e.g. nominal dimensions, nominal density;
- c) test procedure;
 - 1) pre-test history and sampling, e.g. who sampled and where;
 - 2) conditioning;
 - 3) dimensions of the test specimens;
 - 4) deviation from [Clauses 6](#) and [7](#), if applicable;
 - 5) conditioning and testing conditions in tropical climates, if applicable;
 - 6) date of testing;
 - 7) general information relating to the test including reference to Method A or B and, if relevant, initial water uptake;
 - 8) events which can have affected the results;

Information about the apparatus and identity of the technician should be available in the laboratory but it need not be recorded in the report.

- d) results;
- e) all individual values and the mean value.

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Annex A (informative)

Examples of calculation of the length of test specimens

Table A.1 gives the length and other dimensions of test specimens necessary to achieve an immersed cylindrical surface area, A_p , of 0,040 m².

The values have been calculated from Formula (4) for A_p given in Clause 8 and Formula (A.1):

$$l = \frac{A_p}{D_o \times \arccos \left[\frac{\frac{D_o}{2} - 0,02}{\frac{D_o}{2}} \right]} \quad (\text{A.1})$$

where

D_o is the outside diameter, in metres;

l is the length of the test specimen, in metres.

The calculated arc cos angle shall be in radians and not in degrees.

Table A.1 — Examples of the calculation of the length of test specimens

Dimensions in millimetres

Inner diameter	Nominal thickness	Outer diameter D_o	Outer radius	Outer arc length	Length l	Inner diameter	Nominal thickness	Outer diameter D_o	Outer radius	Outer arc length	Length l
17	20	57	28,5	72,3	553,5	21	20	61	30,5	74,4	537,8
17	30	77	38,5	82,4	485,7	21	30	81	40,5	84,2	474,8
17	40	97	48,5	91,4	437,4	21	40	101	50,5	93,2	429,4
17	50	117	58,5	99,7	401,0	21	50	121	60,5	101,3	394,8
17	60	137	68,5	107,4	372,4	21	60	141	70,5	108,9	367,3
17	70	157	78,5	114,6	349,0	21	70	161	80,5	116,0	344,9
17	80	177	88,5	121,4	329,6	21	80	181	90,5	122,7	326,1
27	20	67	33,5	77,5	516,4	34	20	74	37	80,9	494,4
27	30	87	43,5	87,0	459,7	34	30	94	47	90,1	443,8
27	40	107	53,5	95,7	418,1	34	40	114	57	98,5	405,9
27	50	127	63,5	103,6	385,9	34	50	134	67	106,3	376,3
27	60	147	73,5	111,1	360,1	34	60	154	77	113,6	352,3
27	70	167	83,5	118,0	338,9	34	70	174	87	120,4	332,3
27	80	187	93,5	124,6	321,0	34	80	194	97	126,8	315,4
42	30	102	51	93,6	427,4	48	30	108	54	96,1	416,3
42	40	122	61	101,7	393,3	48	40	128	64	104,0	384,5
42	50	142	71	109,3	366,1	48	50	148	74	111,4	359,0
42	60	162	81	116,3	343,9	48	60	168	84	118,4	337,9

Table A.1 (continued)

Inner diameter	Nominal thickness	Outer diameter D_o	Outer radius	Outer arc length	Length l	Inner diameter	Nominal thickness	Outer diameter D_o	Outer radius	Outer arc length	Length l
42	70	182	91	123,0	325,2	48	70	188	94	124,9	320,2
42	80	202	101	129,3	309,3	48	80	208	104	131,2	305,0
60	20	100	50	92,7	431,4	76	20	116	58	99,3	402,7
60	30	120	60	100,9	396,3	76	30	136	68	107,0	373,7
60	40	140	70	108,5	368,6	76	40	156	78	114,3	350,1
60	50	160	80	115,6	345,9	76	50	176	88	121,0	330,5
60	60	180	90	122,3	327,0	76	60	196	98	127,5	313,8
60	70	200	100	128,7	310,8	76	70	216	108	133,6	299,5
60	80	220	110	134,8	296,8	76	80	236	118	139,4	286,9
89	40	169	84,5	118,7	337,0	102	40	182	91	123,0	325,2
89	50	189	94,5	125,2	319,4	102	50	202	101	129,3	309,3
89	60	209	104,5	131,5	304,3	102	60	222	111	135,4	295,5
89	70	229	114,5	137,4	291,1	102	70	242	121	141,1	283,4
89	80	249	124,5	143,1	279,5	102	80	262	131	146,7	272,7
108	20	148	74	111,4	359,0	114	20	154	77	113,6	352,3
108	30	168	84	118,4	337,9	114	30	174	87	120,4	332,3
108	40	188	94	124,9	320,2	114	40	194	97	126,8	315,4
108	50	208	104	131,2	305,0	114	50	214	107	133,0	300,8
108	60	228	114	137,1	291,7	114	60	234	117	138,8	288,1
108	70	248	124	142,8	280,1	114	70	254	127	144,5	276,8
108	80	268	134	148,3	269,7	114	80	274	137	149,9	266,8
133	20	173	86,5	120,0	333,2	140	20	180	90	122,3	327,0
133	30	193	96,5	126,5	316,2	140	30	200	100	128,7	310,8
133	40	213	106,5	132,7	301,5	140	40	220	110	134,8	296,8
133	50	233	116,5	138,6	288,7	140	50	240	120	140,6	284,6
133	60	253	126,5	144,2	277,4	140	60	260	130	146,1	273,7
133	70	273	136,5	149,7	267,3	140	70	280	140	151,5	264,0
133	80	293	146,5	154,9	258,2	140	80	300	150	156,7	255,3
159	20	199	99,5	128,4	311,6	168	20	208	104	131,2	305,0
159	30	219	109,5	134,5	297,5	168	30	228	114	137,1	291,7
159	40	239	119,5	140,3	285,1	168	40	248	124	142,8	280,1
159	50	259	129,5	145,9	274,2	168	50	268	134	148,3	269,7
159	60	279	139,5	151,2	264,5	168	60	288	144	153,6	260,4
159	70	299	149,5	156,4	255,7	168	70	308	154	158,7	252,0
159	80	319	159,5	161,5	247,7	168	80	328	164	163,7	244,4
194	20	234	117	138,8	288,1	219	20	259	129,5	145,9	274,2
194	30	254	127	144,5	276,8	219	30	279	139,5	151,2	264,5
194	40	274	137	149,9	266,8	219	40	299	149,5	156,4	255,7
194	50	294	147	155,2	257,8	219	50	319	159,5	161,5	247,7
194	60	314	157	160,2	249,6	219	60	339	169,5	166,3	240,5
194	70	334	167	165,1	242,2	219	70	359	179,5	171,1	233,8