INTERNATIONAL STANDARD

**ISO 12623**

First edition
2011-01-15

# 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 des bâtiments et les installations industrielles — Détermination de l'absorption d'eau à court terme par immersion partielle des coquilles isolantes préformées*

Reference number
ISO 12623:2011(E)

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Published in Switzerland

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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 12623 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 12623 includes the original EN 13472 prepared by Technical Committee CEN/TC 88 *Thermal insulating materials and products*. However,

— Subclause 5.4, “conditioning of test specimen”,

— Subclause 6.1, “test conditions”, and

— Clause 9, “test report”

have been modified to reflect conditions for tropical countries.

This International Standard is one of a series of standards which specify test methods for determining dimensions and properties of thermal insulating materials and products. The original EN 13472 supports a series of product standards for thermal insulating materials and products which derive from the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to constructive products (Directive 89/106/EEC) through the consideration of the essential requirements.

This International Standard is one of a series of existing European Standards on test methods for products used to insulate building equipment and industrial installations which is comprised of the following group of International Standards:

| ISO standard | Title | Respective EN standard |
|---|---|---|
| ISO 12623 | *Thermal insulating products for building equipment and industrial installations — Determination of short-term water absorption by partial immersion of preformed pipe insulation* | EN 13472 |
| ISO 12624 | *Thermal insulation products — Determination of trace quantities of water soluble chloride, fluoride, silicate, sodium ions and pH* | EN 13468 |
| ISO 12628 | *Thermal insulating products for building equipment and industrial installations — Determination of dimensions, squareness and linearity of preformed pipe insulation* | EN 13467 |
| ISO 12629 | *Thermal insulating products for building equipment and industrial installations — Determination of water vapour transmission properties of preformed pipe insulation* | EN 13469 |

A further series of existing European Standards on test methods was adopted by ISO. This “package” of standards comprises the following group of interrelated standards:

| ISO standard | Title | Respective EN standard |
|---|---|---|
| ISO 29465 | *Thermal insulating products for building applications — Determination of length and width* | EN 822 |
| ISO 29466 | *Thermal insulating products for building applications — Determination of thickness* | EN 823 |
| ISO 29467 | *Thermal insulating products for building applications — Determination of squareness* | EN 824 |
| ISO 29468 | *Thermal insulating products for building applications — Determination of flatness* | EN 825 |
| ISO 29469 | *Thermal insulating products for building applications — Determination of compression behaviour* | EN 826 |
| ISO 29470 | *Thermal insulating products for building applications — Determination of the apparent density* | EN 1602 |
| ISO 29471 | *Thermal insulating products for building applications — Determination of dimensional stability under constant normal laboratory conditions (23 degrees C/50 % relative humidity)* | EN 1603 |
| ISO 29472 | *Thermal insulating products for building applications — Determination of dimensional stability under specified temperature and humidity conditions* | EN 1604 |
| ISO 29764 | *Thermal insulating products for building applications — Determination of deformation under specified compressive load and temperature conditions* | EN 1605 |
| ISO 29765 | *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces* | EN 1607 |
| ISO 29766 | *Thermal insulating products for building applications — Determination of tensile strength parallel to faces* | EN 1608 |
| ISO 29767 | *Thermal insulating products for building applications — Determination of short-term water absorption by partial immersion* | EN 1609 |

| ISO standard | Title | Respective EN standard |
|---|---|---|
| ISO 29768 | *Thermal insulating products for building applications — Determination of linear dimensions of test specimens* | EN 12085 |
| ISO 29769 | *Thermal insulating products for building applications — Determination of behaviour under point load* | EN 12430 |
| ISO 29770 | *Thermal insulating products for building applications — Determination of thickness for floating-floor insulating products* | EN 12431 |
| ISO 29771 | *Thermal insulating materials for building applications — Determination of organic content* | EN 13820 |
| ISO 29803 | *Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)* | EN 13497 |
| ISO 29804 | *Thermal insulation products for building applications — Determination of the tensile bond strength of the adhesive and of the base coat to the thermal insulation material* | EN 13494 |
| ISO 29805 | *Thermal insulation products for building applications — Determination of the mechanical properties of glass fibre meshes* | EN 13496 |

The Application of Agreement on technical cooperation between ISO and CEN (Vienna Agreement), Modes 1, 2, 4 and 5, was not approved by CEN/TC 88 and the necessity not seen by its stakeholders.

# 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 International Standard 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.

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 in accordance with EN 1609, provided that the test is carried out in the direction giving the highest water uptake.

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

No existing International Standards supersede this one.

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

## 3 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 (6.2.2) or calculated, according to Method B (6.2.3), from the initial water uptake.

## 4 Apparatus

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

**4.2 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 Figures 1a) and 1b)].

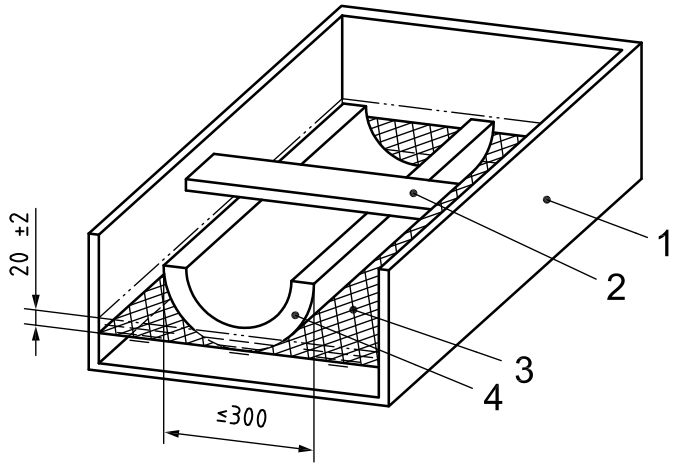
The supporting device shall be such that the test specimen contact area with water shall be at least 85 % and such that the original form of the test specimen is maintained.

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

In tropical countries, 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.

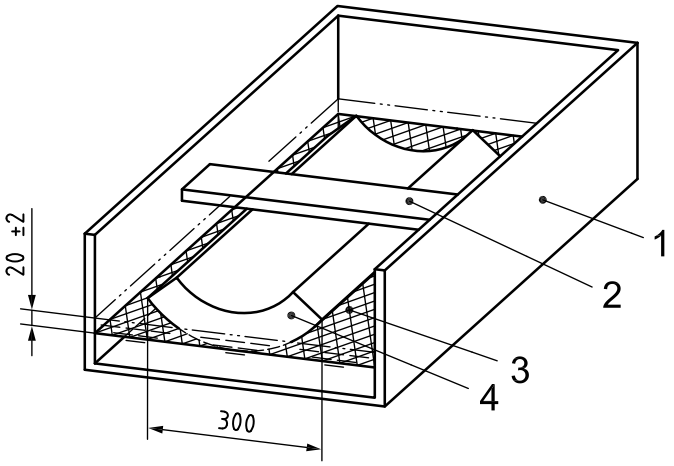
**4.4 Equipment**, for drainage [see examples in Figures 2a) and 2b)].

Dimensions in millimetres




**a) Example of** $D_o \leqslant 300$ mm

**Figure 1** (*continued*)

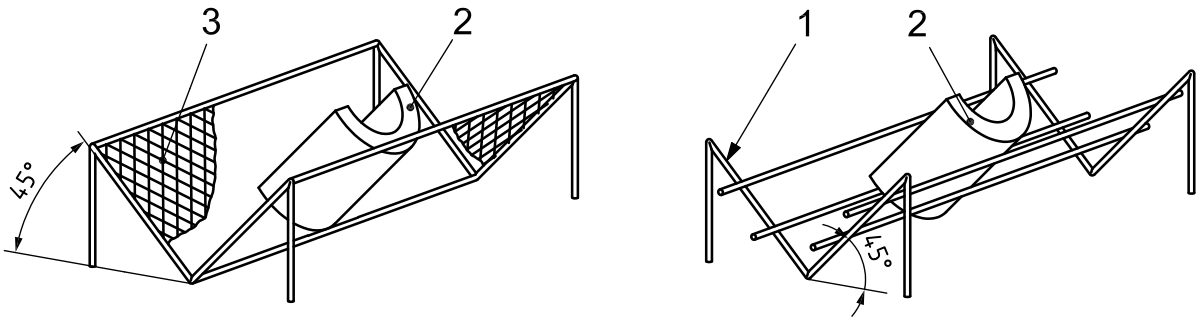



**b) Example of** $D_o > 300$ mm

**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)** **b)**

**Key**

1 perforated stainless steel
2 test specimen
3 stainless steel mesh

**Figure 2 — Examples of equipment for drainage**

## 5 Test specimens

### 5.1 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 $\leqslant$ 300 mm, the test specimen shall have one face with an area equal to the full cross-sectional area of the product or half the original cross-sectional area. For products with outside diameters $>$ 300 mm, the face shall be a segment of the cross-section with an outside chord length of (300 $\pm$ 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) $mm^2$.

### 5.2 Preparation of test specimens

The test specimens shall be cut so that they do not include product ends.

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).

### 5.3 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 European technical specification, the number of test specimens can be agreed between parties.

### 5.4 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) % RH (relative humidity) for the time specified in the relevant product standard.

In tropical countries, 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.

## 6 Procedure

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

### 6.2 Test procedure

#### 6.2.1 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 European 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.

### 6.2.2 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 $(20 \pm 2)$ mm below the surface of the water [see examples in Figures 1a) and 1b)]. 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 2a) or 2b). Weigh the test specimen again to determine the mass $m_{24}$.

### 6.2.3 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 $(20 \pm 2)$ 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 $(20 \pm 2)$ mm below the water level [see examples in Figures 1a) and 1b)]. 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:

$$\frac{m_1 - m_0}{A_p} \leqslant 0{,}5 \text{ kg/m}^2 \tag{1}$$

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.

## 7 Calculation and expression of results

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

NOTE Results obtained with test specimens of different outside diameters and thicknesses might not be comparable.

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

**Method A (drainage):**

$$W_p = \frac{m_{24} - m_0}{A_p} \tag{2}$$

**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 (Methods A and 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$^2$.

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

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

where

$D_o$ is the outside diameter, in metres;

$l$ is the length of the test specimen, in metres;

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

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

## 8 Accuracy of measurement

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

## 9 Test report

The test report shall include the following information:

a) reference to this International Standard;

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 5 and 6, if applicable;

5) conditioning and testing conditions in tropical countries, 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 may 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.

# Annex A
(informative)

# Table with 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 m$^2$.

The values have been calculated from Equation (4) for $A_p$ given in Clause 7 and Equation (A.1):

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

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 radiants and not in degrees.

**Table A.1 — Examples of 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 |
| 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 |

**Table A.1** (*continued*)

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 $l$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

**Table A.1** (*continued*)

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 $l$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 194 | 80 | 354 | 177 | 169,9 | 235,4 | 219 | 80 | 379 | 189,5 | 175,7 | 227,7 |
| 245 | 20 | 285 | 142,5 | 152,8 | 261,7 | 273 | 20 | 313 | 156,5 | 160,0 | 250,0 |
| 245 | 30 | 305 | 152,5 | 158,0 | 253,2 | 273 | 30 | 333 | 166,5 | 164,9 | 242,6 |
| 245 | 40 | 325 | 162,5 | 162,9 | 245,5 | 273 | 40 | 353 | 176,5 | 169,7 | 235,7 |
| 245 | 50 | 345 | 172,5 | 167,8 | 238,4 | 273 | 50 | 373 | 186,5 | 174,3 | 229,5 |
| 245 | 60 | 365 | 182,5 | 172,5 | 231,9 | 273 | 60 | 393 | 196,5 | 178,9 | 223,6 |
| 245 | 70 | 385 | 192,5 | 177,1 | 225,9 | 273 | 70 | 413 | 206,5 | 183,3 | 218,3 |
| 245 | 80 | 405 | 202,5 | 181,5 | 220,4 | 273 | 80 | 433 | 216,5 | 187,6 | 213,2 |
| 324 | 20 | 364 | 182 | 172,2 | 232,2 | 356 | 20 | 396 | 198 | 179,5 | 222,8 |
| 324 | 30 | 384 | 192 | 176,8 | 226,2 | 356 | 30 | 416 | 208 | 183,9 | 217,5 |
| 324 | 40 | 404 | 202 | 181,3 | 220,6 | 356 | 40 | 436 | 218 | 188,2 | 212,5 |
| 324 | 50 | 424 | 212 | 185,7 | 215,5 | 356 | 50 | 456 | 228 | 192,4 | 207,9 |
| 324 | 60 | 444 | 222 | 189,9 | 210,6 | 356 | 60 | 476 | 238 | 196,5 | 203,5 |
| 324 | 70 | 464 | 232 | 194,1 | 206,1 | 356 | 70 | 496 | 248 | 200,6 | 199,4 |
| 324 | 80 | 484 | 242 | 198,2 | 201,9 | 356 | 80 | 516 | 258 | 204,5 | 195,6 |
| 406 | 20 | 446 | 223 | 190,3 | 210,2 | 406 | 70 | 546 | 273 | 210,3 | 190,2 |
| 406 | 30 | 466 | 233 | 194,5 | 205,7 | 406 | 80 | 566 | 283 | 214,1 | 186,9 |
| 406 | 60 | 526 | 263 | 206,5 | 193,7 | | | | | | |

# Bibliography

[1] ISO 29767:2008, *Thermal insulating products for building applications — Determination of short-term water absoption by partial immersion*

ICS 91.100.60

Price based on 12 pages