INTERNATIONAL STANDARD

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Second edition
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Hygrothermal performance of building materials and products — Determination of hygroscopic sorption properties

Performance hygrothermique des matériaux et produits pour le bâtiment — Détermination des propriétés de sorption hygroscopique

Reference number
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Contents

Foreword

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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.

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ISO 12571 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 12571:2000), which has been technically revised.

Annexes A to D of this International Standard are for information only.

Hygrothermal performance of building materials and products — Determination of hygroscopic sorption properties

1 Scope

This International Standard specifies two alternative methods for determining hygroscopic sorption properties of porous building materials and products:

a) using desiccators and weighing cups (desiccator method);

b) using a climatic chamber (climatic chamber method).

The desiccator method is the reference method.

This International Standard does not specify the method for sampling.

The methods specified in this International Standard can be used to determine the moisture content of a sample in equilibrium with air at a specific temperature and humidity.

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 9346, *Hygrothermal performance of buildings and building materials — Physical quantities for mass transfer — Vocabulary*

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

3 Terms and definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9346 and the following apply.

3.1.1
equilibrium moisture content
moisture content of a porous material in equilibrium with the environment and the relative humidity of the ambient air, at a specified temperature

3.1.2
moisture content mass by mass
mass of evaporable water divided by mass of dry material

3.1.3
moisture content volume by volume
volume of evaporable water divided by volume of dry material

3.1.4

moisture content mass by volume

mass of evaporable water divided by volume of dry material

Note 1 to entry: The mass of water is determined by weighing the specimen before and after drying at the appropriate drying temperature until constant mass is reached.

3.1.5

sorption curve

curve established at a series of increasing equilibrium relative humidities at a given temperature

3.1.6

desorption curve

curve established at a series of decreasing equilibrium relative humidities at a given temperature

3.2 Symbols and units

Symbol	Quantity	Unit
m	mass of test specimen	kg
m_0	mass of dried test specimen	kg
u	moisture content mass by mass	kg/kg
ψ	moisture content volume by volume	m^3/m^3
w	moisture content mass by volume	kg/m^3

4 Principle

4.1 Sorption curve

The specimen is dried to constant mass. While maintaining a constant temperature, the specimen is placed consecutively in a series of test environments, with relative humidity increasing in stages. The moisture content is determined when equilibrium with each environment is reached. Equilibrium with the environment is established by weighing the specimen until constant mass is reached. A minimum of four test atmospheres shall be selected in the humidity range under consideration.

After establishing the moisture content at each relative humidity the sorption curve can be drawn.

4.2 Desorption curve

The starting point for desorption is a relative humidity of at least 95 %. This might be the last point of the sorption curve or might be reached by sorption from a dried test specimen. While maintaining a constant temperature, the specimen is placed consecutively in a series of test environments, with relative humidity decreasing in stages. The moisture content is determined when equilibrium with each environment is reached. Equilibrium with the environment is established by weighing the specimen until constant mass is reached. A minimum of four test atmospheres shall be selected in the humidity range under consideration. Finally, the specimen is dried to constant mass.

After establishing the moisture content at each relative humidity the desorption curve can be drawn.

NOTE A defined starting point for desorption has been chosen for better reproducibility.

5 Apparatus

5.1 Desiccator method

The test apparatus shall include:

a) **weighing cups** which do not absorb water and with tight-fitting lids;

b) **balance**, capable of weighing to an accuracy of ± 0,01 % of the mass of the test specimen;

NOTE If larger weighing cups are used, the weighing accuracy can be determined with respect to the total mass and the required accuracy of the test results.

c) **drying oven**, in accordance with ISO 12570;

d) **desiccator**, capable of maintaining the relative humidity within ± 2 % relative humidity;

e) **constant-temperature chamber**, capable of maintaining the specified test temperature to an accuracy of ± 0,5 K.

5.2 Climatic chamber method

The test apparatus shall include:

a) **weighing cups** which do not absorb water;

b) **balance**, capable of weighing to an accuracy of ± 0,01 % of the mass of the test specimen;

NOTE If larger weighing cups are used, the weighing accuracy can be determined with respect to the total mass and the required accuracy of the test results.

c) **drying oven**, in accordance with ISO 12570;

d) **climatic chamber**, capable of maintaining the relative humidity within ± 5 % relative humidity and the temperature within ± 2 K over the whole test area.

6 Test specimens

6.1 Specification of the test specimens

A test specimen shall be representative of the product and have a mass of at least 10 g. Specimens of materials with a dry density less than 300 kg/m^3 shall have an area of at least 100 mm × 100 mm. If it can be demonstrated from other references that the result will not be affected, a test specimen can be cut or crushed into smaller pieces to reduce the time to reach equilibrium with the environment.

6.2 Number of test specimens

A minimum of three specimens shall be tested. The procedure in Clause 7 shall be applied to each specimen.

7 Procedure

7.1 Test conditions

Reference sorption curves shall be established at a temperature of (23 ± 0,5) °C or (27 ± 0,5) °C in tropical countries. If agreed between the parties, sorption curves can be established at other temperatures for specific applications.

7.2 Desiccator method

7.2.1 General

Make up the appropriate saturated aqueous solution to achieve the necessary relative humidity in the desiccator.

Standard air relative humidities to be selected for measuring sorption curves are shown in Table 1. Choose 5 or more conditions that include No.2, No.4 and No.6 in Table 1.

NOTE Annex A gives the air relative humidities of various saturated solutions in equilibrium, and Annex B describes the preparation of various solutions.

Place the desiccator in the constant-temperature chamber (see Figure 1). The depth of saturated aqueous solution shall be 30 mm–50 mm.

Table 1 — Standard air relative humidities above saturated solutions in equlibrium

No.	Substance	Relative humidity (%)[a]	
1	KOH	9	8
2	$MgCl_2 \cdot 6H_2O$	33	33
3	$Mg(NO_3)_2 \cdot 6H_2O$	53	52
4	NaCl	75	75
5	KCl	85	84
6	KNO_3	93	93

[a] Relative humidities in left column correspond to air temperature 23 °C. Relative humidities in right column correspond to air temperature 27 °C.

7.2.2 Sorption curve

Weigh the weighing cup and lid when empty and dry. Put the test specimen into the weighing cup without the lid and dry it until constant mass in the drying oven at the temperature specified in ISO 12570.

Constant mass is reached if the change of mass between three consecutive weighings, each made at least 24 h apart, differs by less than 0,1 % of the total mass.

Put the test specimen in the weighing cup, with the lid beside it, into the desiccator containing the salt solution needed to give the appropriate relative humidity.

Periodically weigh the specimen until it is in equilibrium with the environment (constant mass). Immediately after removing the lid of the desiccator, put on the lid of the weighing cup, and move the weighing cup to the balance. After weighing the cup, return it to the desiccator with the lid beside it.

NOTE 1 Annex C gives an example of a detailed weighing procedure.

Repeat the procedure for increasing humidities. A minimum of four approximately evenly spaced humidities in increasing order shall be selected in the range of 30 % to 95 % relative humidity.

NOTE 2 It is possible that mould and mildew grow on specimens of wood based materials in atmospheres with relative humidities over 80 %. This might invalidate the test and can be prevented by adding a few drops of an appropriate fungicide to the solution.

7.2.3 Desorption curve

The starting point for desorption is a relative humidity of at least 95 %. This might be the last point of the sorption curve or might be reached by sorption from dried test specimen.

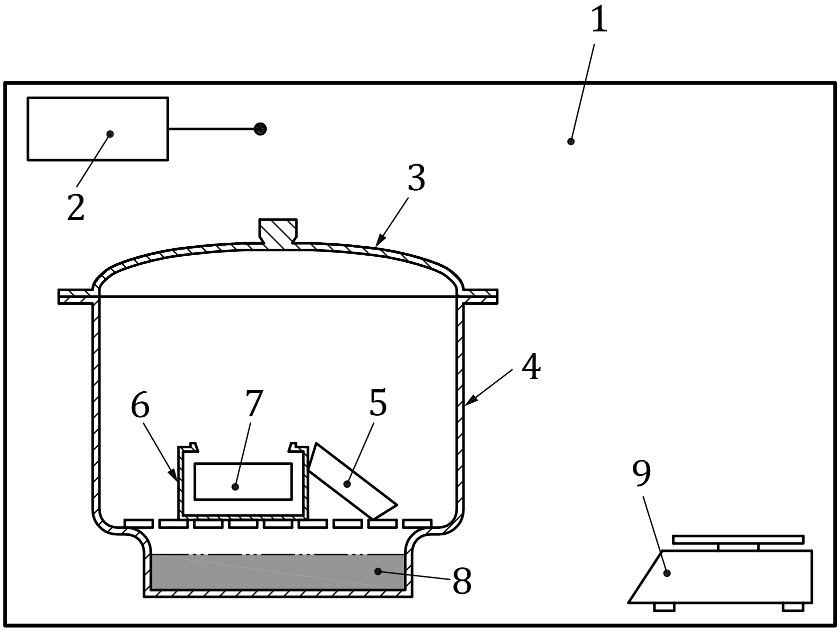
Put the test specimen in the weighing cup, with the lid beside it, into the desiccator containing the solution needed to give the appropriate relative humidity.

Periodically weigh the specimen until it is in equilibrium with the environment (constant mass). Immediately after removing the lid of the desiccator, put on the lid of the weighing cup, and move the weighing cup to the balance. After weighing the cup, return it to the desiccator with the lid beside it. Constant mass is reached if the change of mass between three consecutive weighings, each made at least 24 h apart, is less than 0,1 % of the total mass.

NOTE Annex C gives an example of a detailed weighing procedure.

Repeat the procedure for decreasing humidities. A minimum of four approximately evenly spaced humidities in decreasing order shall be selected in the range of 95 % to 30 % relative humidity.

NOTE Annex D gives an example of the method using a glass jar.



Key

1	constant temperature chamber
2	thermometer
3	lid of desiccator
4	desiccator
5	lid of weighing cup
6	weighing cup
7	test specimen
8	saturated salt solution
9	electronic balance

Figure 1 — Desiccator method

7.3 Climatic chamber method

7.3.1 Sorption curve

Put the test specimen, if necessary in the weighing cup, in the drying oven and dry it until constant mass at the temperature specified in ISO 12570. Constant mass is reached if the change of mass between three consecutive weighings, each made at least 24 h apart, is less than 0,1 % of the total mass.

Put the test specimen in the climatic chamber. At first the humidity in the climatic chamber is the lowest of the range of values chosen for the test (see below).

Periodically weigh the specimen in the climatic chamber until it is in equilibrium with the environment (constant mass).

Repeat the procedure for increasing humidities. A minimum of four approximately evenly spaced humidities in increasing order shall be selected in the range of 30 % to 95 % relative humidity.

7.3.2 Desorption curve

The starting point for desorption is at a relative humidity of at least 95 %. This might be the last point of the sorption curve or might be reached by sorption from dried test specimen.

Put the test specimen, if necessary in the weighing cup, in the climatic chamber.

Periodically weigh the specimen in the climatic chamber until it is in equilibrium with the environment (constant mass). Constant mass is reached if the change of mass between three consecutive weighings, each made 24 h apart, is less than 0,1 % of the total mass.

Repeat the procedure for decreasing humidities. A minimum of four approximately evenly spaced humidities in decreasing order shall be selected in the range of 95 % to 30 % relative humidity.

8 Calculation and expression of results

8.1 Hygroscopic sorption

The moisture content, u, is calculated as follows for each specimen:

$$u = \frac{m - m_0}{m_0} \qquad (1)$$

For the sorption curve or for the desorption curve, take the mean of the calculated moisture contents for a minimum of three specimens at each relative humidity.

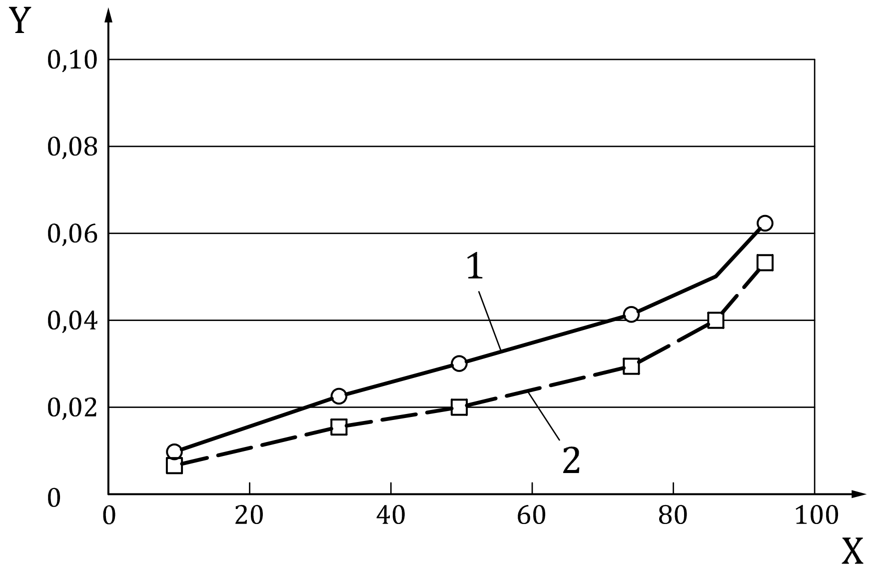
After calculation of the mean moisture content of the various test specimens at each relative humidity the sorption and desorption curves can be drawn by joining the data points with straight lines.

NOTE Curve fitting techniques can be used to fit functional relations to the data; see the references in Annex D for further information.

ISO 12570 gives methods for converting the values of u calculated from Formula (1) into the moisture content volume by volume ψ or moisture content mass by volume w.

8.2 Equilibrium moisture content curves

The sorption curve and the desorption curve are respectively drawn by using 5 or more air relative humidity conditions.



Key

X relative humidity, Φ, in percent

Y moisture content mass by mass, u, in kg/kg

1 desorption curve

2 sorption curve

Figure 2 — Equilibrium moisture content curve

9 Accuracy of measurement

9.1 Error in moisture content

The error in the moisture content, for a balance conforming with 5.1 b), can be estimated by using Formula (2):

$$\frac{\Delta u}{u} = \pm 0{,}0002 \frac{m_0}{m - m_0} \qquad (2)$$

9.2 Control of environmental conditions

9.2.1 Desiccator method

The relative humidity within the weighing cup is determined by the saturated solution used in the desiccator.

NOTE The relative humidity and the accuracy for various saturated solutions is given in Annex A.

The temperature in the constant-temperature chamber shall be carefully monitored with calibrated instruments.

9.2.2 Climatic chamber method

The temperature and the relative humidity in the whole testing area of the climatic chamber shall be carefully monitored with shielded calibrated instruments such as a wet and dry bulb psychrometer or a chilled mirror dewpoint meter.

10 Test report

The test report shall include the following:

a) reference to this International Standard, i.e. ISO 12571:2013;

b) product identification:

- product name, factory, manufacturer or supplier;
- type of product;
- production code number;
- the form in which the product arrived at the laboratory;
- other information if necessary, e.g. thickness, dry density;

c) test procedure:

- date of the start and duration of the test;
- the method of sampling;
- the method and temperature of drying;
- any factors which may have influenced the results;
- the test method used (desiccator or the climatic chamber);
- the test temperature;

d) results:

- table of the measured values (relative humidity, u and optionally ψ and w, if needed) and mean value at given temperature;
- graph showing sorption curves.

Annex A
(informative)

Air relative humidities above saturated solutions in equilibrium

Table A.1 gives the air relative humidities of 28 saturated solutions in equilibrium with the atmosphere of the chamber at temperature intervals of 5 K, together with the range of uncertainty at each temperature. The values for 23 °C and 27 °C are obtained by linear interpolation.

Table A.1 — Air relative humidities above saturated solutions in equilibrium

Temperature °C	**Relative humidity %**					
	Caesium fluoride CsF	Lithium bromide LiBr	Zinc bromide $ZnBr_2$	Potassium hydroxide KOH	Sodium hydroxide NaOH	Lithium chloride LiCl
0	5,52 ± 1,9	7,75 ± 0,83	8,86 ± 0,89	14,34 ± 1,70		11,23 ± 0,54
5	4,89 ± 1,6	7,43 ± 0,76	8,49 ± 0,74	12,34 ± 1,40	9,57 ± 2,8	11,26 ± 0,47
10	4,33 ± 1,4	7,14 ± 0,69	8,19 ± 0,61	10,68 ± 1,10	8,91 ± 2,4	11,29 ± 0,41
15	3,83 ± 1,1	6,86 ± 0,63	7,94 ± 0,49	09,32 ± 0,90	8,51 ± 2,2	11,30 ± 0,35
20	3,57 ± 1,0	6,61 ± 0,58	7,83 ± 0,43	08,67 ± 0,78	8,24 ± 2,1	11,31 ± 0,31
23	3,39 ± 0,94	6,47 ± 0,55	7,75 ± 0,39	08,23 ± 0,72	7,98 ± 1,9	11,30 ± 0,28
25	3,24 ± 0,87	6,37 ± 0,52	7,70 ± 0,36	07,89 ± 0,66	7,58 ± 1,7	11,30 ± 0,27
27	3,01 ± 0,77	6,29 ± 0,50	7,62 ± 0,31	07,38 ± 0,56	6,92 ± 1,5	11,29 ± 0,25
30	2,69 ± 0,63	6,16 ± 0,47	7,55 ± 0,25	06,73 ± 0,44	6,26 ± 1,2	11,28 ± 0,24
35	2,44 ± 0,52	5,97 ± 0,43	7,54 ± 0,20	06,26 ± 0,35	5,60 ± 1,0	11,25 ± 0,22
40	2,24 ± 0,44	5,80 ± 0,39	7,59 ± 0,17	05,94 ± 0,29	4,94 ± 0,85	11,21 ± 0,21
45	2,11 ± 0,40	5,65 ± 0,35	7,70 ± 0,16	05,72 ± 0,27	4,27 ± 0,73	11,16 ± 0,21
50	2,04 ± 0,38	5,53 ± 0,31	7,87 ± 0,17	05,58 ± 0,28	3,61 ± 0,65	11,10 ± 0,22
55	2,03 ± 0,40	5,42 ± 0,28	8,09 ± 0,19	05,49 ± 0,32		11,03 ± 0,23
60		5,33 ± 0,25				10,95 ± 0,26
Temperature °C	**Relative humidity %**					
	Calcium bromide $CaBr_2$	Lithium iodide LiI	Potassium acetate $KC_2H_3O_2$	Potassium fluoride KF	Magnesium chloride $MgCl_2$	Sodium iodide NaI

Table A.1 *(continued)*

0	21,62 ± 0,13	21,68 ± 0,30	23,38 ± 0,53		33,66 ± 0,33	42,42 ± 0,99
5	20,20 ± 0,12	20,61 ± 0,25	23,40 ± 0,32		33,60 ± 0,28	41,83 ± 0,83
10	18,50 ± 0,12	19,57 ± 0,20	23,11 ± 0,25		33,47 ± 0,24	40,88 ± 0,70
15	17,30 ± 0,12	18,56 ± 0,16	22,75 ± 0,30		33,30 ± 0,21	39,65 ± 0,59
20	16,50 ± 0,12	17,96 ± 0,14	22,51 ± 0,32	30,85 ± 1,30	33,07 ± 0,18	38,76 ± 0,52
23		17,56 ± 0,13	22,15 ± 0,40	29,42 ± 1,22	32,90 ± 0,17	38,17 ± 0,50
25		16,76 ± 0,12	21,61 ± 0,53	27,27 ± 1,10	32,78 ± 0,16	37,55 ± 0,47
27		16,57 ± 0,10		24,59 ± 0,94	32,64 ± 0,15	36,51 ± 0,43
30		15,57 ± 0,08		22,68 ± 0,81	32,44 ± 0,14	34,73 ± 0,39
35		14,55 ± 0,06		21,46 ± 0,70	32,05 ± 0,13	32,88 ± 0,37
40		13,49 ± 0,05		20,80 ± 0,62	31,60 ± 0,13	31,02 ± 0,37
45		13,38 ± 0,05		20,60 ± 0,56	31,10 ± 0,13	29,21 ± 0,40
50		11,22 ± 0,05		20,77 ± 0,53	30,54 ± 0,14	27,50 ± 0,45
55		09,98 ±0,06			29,93 ± 0,16	25,95 ± 0,52
60					29,26 ± 0,18	
Temperature °C	**Relative humidity %**					
	Potassium carbonate K_2CO_3	Magnesium nitrate $Mg(NO_3)_2$	Sodium bromide NaBr	Cobalt chloride $CoCl_2$	Potassium iodide KI	Strontium chloride $SrCl_2$
0	43,13 ± 0,66	60,35 ± 0,55	63,51 ± 0,72		73,30 ± 0,34	77,13 ± 0,12
5	43,13 ± 0,50	58,86 ± 0,43	62,15 ± 0,60		72,11 ± 0,31	75,66 ± 0,09
10	43,14 ± 0,39	57,36 ± 0,33	60,68 ± 0,51		70,98 ± 0,28	74,13 ± 0,06
15	43,15 ± 0,33	55,87 ± 0,27	59,14 ± 0,44		69,90 ± 0,26	72,52 ± 0,05
20	43,16 ± 0,33	54,38 ± 0,23	58,20 ± 0,42	64,92 ± 3,5	69,28 ± 0,25	71,52 ± 0,05
23	43,16 ± 0,36	53,49 ± 0,22	57,57 ± 0,40	63,68 ± 3,2	68,86 ± 0,24	70,85 ± 0,04
25	43,16 ± 0,39	52,89 ± 0,22	56,95 ± 0,39	61,83 ± 2,8	68,47 ± 0,24	70,16 ± 0,04
27	43,16 ± 0,43	52,29 ± 0,23	56,03 ± 0,38	58,63 ± 2,2	67,89 ± 0,23	69,12 ± 0,03
30	43,17 ± 0,50	51,40 ± 0,24	54,55 ± 0,38	55,48 ± 1,8	66,96 ± 0,23	
35		49,91 ± 0,29	53,17 ± 0,41	52,56 ± 1,5	66,09 ± 0,23	
40		48,42 ± 0,37	51,95 ± 0,47	50,01 ± 1,4	65,26 ± 0,24	
45		46,93 ± 0,47	50,93 ± 0,55	48,02 ± 1,4	64,49 ± 0,26	
50		45,44 ± 0,60	50,15 ± 0,65	46,74 ± 1,5	63,78 ± 0,28	
55			49,66 ± 0,78		63,11 ± 0,31	
60						
Temperature °C	**Relative humidity %**					
	Sodium nitrate $NaNO_3$	Sodium chloride NaCl	Ammonium chloride NH_4Cl	Potassium bromide KBr	Ammonium sulphate $(NH_4)_2SO_4$	Potassium chloride KCl

Table A.1 *(continued)*

0	78,57 ± 0,52	75,51 ± 0,34	80,55 ± 0,96	85,09 ± 0,26	82,77 ± 0,90	88,61 ± 0,53
5	77,53 ± 0,45	75,65 ± 0,27	79,89 ± 0,59	83,75 ± 0,24	82,42 ± 0,68	87,67 ± 0,45
10	76,46 ± 0,39	75,67 ± 0,22	79,23 ± 0,44	82,62 ± 0,22	82,06 ± 0,51	86,77 ± 0,39
15	75,36 ± 0,35	75,61 ± 0,18	78,83 ± 0,42	81,67 ± 0,21	81,70 ± 0,38	85,92 ± 0,33
20	74,69 ± 0,33	75,47 ± 0,14	78,57 ± 0,40	81,20 ± 0,21	81,34 ± 0,31	85,11 ± 0,29
23	74,25 ± 0,32	75,36 ± 0,13	78,30 ± 0,47	80,89 ± 0,21	81,13 ± 0,29	84,65 ± 0,27
25	73,81 ± 0,32	75,29 ± 0,12	77,90 ± 0,57	80,64 ± 0,21	80,99 ± 0,28	84,34 ± 0,26
27	73,14 ± 0,31	75,21 ± 0,12		80,27 ± 0,21	80,85 ± 0,29	84,05 ± 0,26
30	72,06 ± 0,32	75,09 ± 0,11		79,78 ± 0,22	80,63 ± 0,30	83,62 ± 0,25
35	71,00 ± 0,34	74,87 ± 0,12		79,43 ± 0,24	80,27 ± 0,37	82,95 ± 0,25
40	69,99 ± 0,37	74,68 ± 0,13		79,18 ± 0,26	79,91 ± 0,49	82,32 ± 0,25
45	69,04 ± 0,42	74,52 ± 0,16		79,02 ± 0,28	79,56 ± 0,65	81,74 ± 0,28
50	68,15 ± 0,49	74,43 ± 0,19		78,95 ± 0,32	79,20 ± 0,87	81,20 ± 0,31
55	67,35 ± 0,57	74,41 ± 0,24		78,94 ± 0,35		80,70 ± 0,35
60		74,50 ± 0,30				80,25 ± 0,41
Temperature °C	**Relative humidity %**					
	Strontium nitrate Sr(NO$_3$)$_2$	Potassium nitrate KNO$_3$	Potassium sulphate K$_2$SO$_4$	Potassium chromate K$_2$CrO$_4$	—	—
0	92,38 ± 0,56	96,33 ± 2,9	98,77 ± 1,10		—	—
5	90,55 ± 0,38	96,27 ± 2,1	98,48 ± 0,91			
10	88,72 ± 0,28	95,96 ± 1,4	98,18 ± 0,76			
15	86,89 ± 0,29	95,41 ± 0,96	97,89 ± 0,63			
20	85,79 ± 0,35	94,62 ± 0,66	97,59 ± 0,53	97,88 ± 0,49		
23	85,06 ± 0,38	94,00 ± 0,60	97,42 ± 0,47	97,56 ± 0,46		
25		93,58 ± 0,55	97,30 ± 0,45	97,08 ± 0,41		
27		93,07 ± 0,57	97,18 ± 0,43	96,42 ± 0,37		
30		92,31 ± 0,60	97,00 ± 0,40	95,89 ± 0,37		
35		90,79 ± 0,83	96,71 ± 0,38	95,50 ± 0,40		
40		89,03 ± 1,2	96,41 ± 0,38	95,25 ± 0,48		
45		87,03 ± 1,8	96,12 ± 0,40			
50		84,78 ± 2,5	95,82 ± 0,45			

Annex B
(informative)

Preparation of saturated solutions

A mixture of distilled water and the quantity of substance necessary to produce a saturated solution according to Table B.1, is heated to the given temperature (where the excess of substance is just dissolved) and is then cooled slowly to room temperature, stirring continuously.

Reagent grade chemicals should be used for preparation.

Saturated solutions can be corrosive and harmful to health, and care should be taken in their preparation and handling.

Solutions should be checked regularly to ensure that they retain a mixture of solid and liquid and have not become contaminated.

References to more detailed descriptions of the preparation of saturated solutions are given in Annex D.

Table B.1 — Solubility of difference substances at given temperatures

Substance	**Water of crystallisation** [a]	**Solubility**	
		at temperature of water (°C)	g per 100 ml of distilled water
Caesium fluoride CsF	$0 \cdot H_2O$	18	367
	$1½ \cdot H_2O$	18	336,5
Lithium bromide LiBr	$0 \cdot H_2O$	4	145
	$0 \cdot H_2O$	90	254
	$2 \cdot H_2O$	20	246
Zinc bromide $ZnBr_2$		20	447
		100	675
Potassium hydroxide KOH		15	107
		100	178
Sodium hydroxide NaOH		0	42
		100	347
Lithium chloride LiCl	$0 \cdot H_2O$	0	63,7
	$0 \cdot H_2O$	95	130
	$1 \cdot H_2O$	30	86,2
Calcium bromide $CaBr_2$	$0 \cdot H_2O$	20	142
	$0 \cdot H_2O$	100	312
	$6 \cdot H_2O$	0	594
	$6 \cdot H_2O$	25	1 360
Lithium iodide LiI	$0 \cdot H_2O$	20	165
	$0 \cdot H_2O$	90	433
	$3 \cdot H_2O$	0	151
	$3 \cdot H_2O$	90	201,2

[a] Molecule of crystal water per molecule of salt.

Table B.1 *(continued)*

Substance	**Water of crystallisation** [a]	**Solubility**	
		at temperature of water (°C)	g per 100 ml of distilled water
Potassium acetate		20	253
$KC_2H_3O_2$		62	492
Potassium fluoride	$0 \cdot H_2O$	18	92,3
KF	$2 \cdot H_2O$	18	349,3
	$0 \cdot H_2O$	20	54,25
Magnesium chloride	$0 \cdot H_2O$	100	72,7
$MgCl_2$	$6 \cdot H_2O$	20	167
	$6 \cdot H_2O$	100	367
	$0 \cdot H_2O$	25	184
Sodium iodide	$0 \cdot H_2O$	100	203
NaI	$2 \cdot H_2O$	0	317,9
	$2 \cdot H_2O$	100	1550
	$0 \cdot H_2O$	20	112
	$0 \cdot H_2O$	100	156
Potassium carbonate	$1\frac{1}{2} \cdot H_2O$	20	129,4
K2CO3	$1\frac{1}{2} \cdot H_2O$	100	268,3
	$2 \cdot H_2O$	20	146,9
	$2 \cdot H_2O$	100	331
Magnesium nitrate	$6 \cdot H_2O$	20	125
$Mg(NO_3)_2$			
	$0 \cdot H_2O$	50	116
Sodium bromide	$0 \cdot H_2O$	100	121
NaBr	$2 \cdot H_2O$	0	79,5
	$2 \cdot H_2O$	81	118,6
	$0 \cdot H_2O$	7	45
Cobalt chloride	$0 \cdot H_2O$	96	105
$CoCl_2$	$6 \cdot H_2O$	0	76,7
	$6 \cdot H_2O$	100	190,7
Potassium iodide	$\frac{1}{2} \cdot H_2O$	0	127,5
KI	$\frac{1}{2} \cdot H_2O$	100	208
Sodium nitrate		25	92,1
$NaNO_3$		100	180
	$0 \cdot H_2O$	20	53,8
Strontium chloride	$0 \cdot H_2O$	100	100,8
$SrCl_2$	$6 \cdot H_2O$	0	106,2
	$6 \cdot H_2O$	40	205,8
Sodium chloride		0	35,7
NaCl		100	39,12
Ammonium chloride		0	29,7
NH_4Cl		100	75,8

[a] Molecule of crystal water per molecule of salt.

Table B.1 *(continued)*

Substance	Water of crystallisation [a]	Solubility	
		at temperature of water (°C)	g per 100 ml of distilled water
Potassium bromide KBr		0 100	53,48 102
Ammonium sulphate $(NH_4)_2SO_4$		0 100	70,6 103,8
Potassium chloride KCl		20 100	34,7 56,7
Strontium nitrate $Sr(NO_3)_2$	$0 \cdot H_2O$	18	70,9
	$0 \cdot H_2O$	90	100
	$4 \cdot H_2O$	0	60,43
	$4 \cdot H_2O$	100	206,5
Potassium nitrate KNO_3		0 100	13,3 247
Potassium sulphate K_2SO_4		25 100	12 24,1
Potassium chromate K_2CrO_4		20 100	62,9 79,2

[a] Molecule of crystal water per molecule of salt.

EXAMPLE Using caesium fluoride with 11/2 water of crystallization content 366,5 g salt is dissolved in 100 ml of distilled water at 18 °C to obtain a saturated salt solution.

Annex C
(informative)

Example of the procedure for determining a point on a sorption curve

a) Prepare the aqueous solution needed for the selected relative humidity in the desiccator.

b) Weigh the weighing cup and lid when empty and dry (m_1).

c) Put the test specimen into the weighing cup without the lid and dry it to constant mass in the oven. Weigh the weighing cup, lid and test specimen (m_2).

d) Calculate the mass of the test specimen after drying: $m_0 = m_2 - m_1$.

e) Put the test specimen in the weighing cup, with the lid beside it, into the desiccator containing the solution. Place the desiccator into an insulated water bath.

f) Periodically weigh the specimen until it has reached constant mass. Remove the desiccator from the water bath, open it and immediately place the lid on the weighing cup and move the cup to the balance. After weighing (giving m_3), return the cup to the desiccator with the lid beside. Close the desiccator and return to the water bath.

g) Constant mass is reached if the change in mass between three consecutive weighings made at least 24 h apart is less than 0,1 % of the total mass of the specimen.

h) Calculate the mass of the test specimen at equilibrium with the relative humidity: $m = m_3 - m_1$.

i) Calculate the moisture content: $u = \frac{m - m_0}{m_0}$.

j) Repeat this procedure for the other relative humidities.

Annex D
(informative)

Method using a glass jar

Prepare the appropriate saturated aqueous solution to achieve the necessary relative humidity in the jar.

NOTE Annex A gives the air relative humidities of various saturated solutions in equilibrium, and Annex B describes the preparation of various solutions.

Place the jar in the constant-temperature chamber.

Hang the test specimen into the jar using a damp proof dish and a non-corrosive thin metal wire.

Weigh the test specimen without glass cap.

The weight of the test specimen m is calculated as follows.

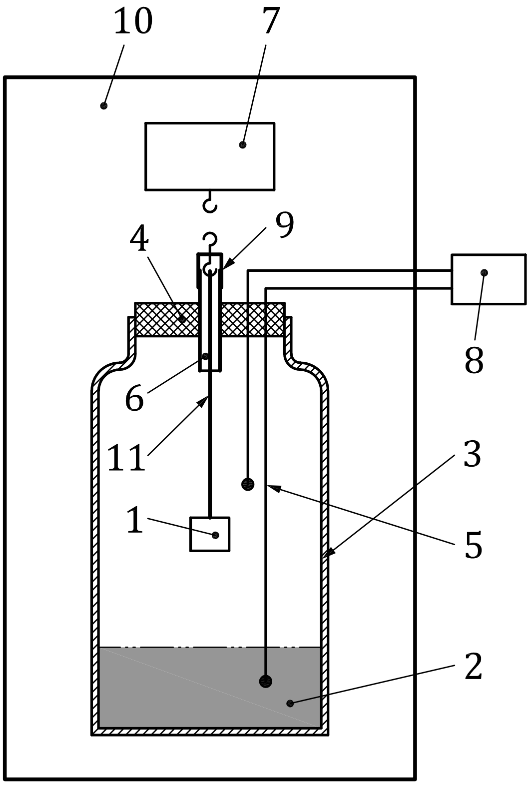
$m = m_\mathrm{m} - m_\mathrm{a}$

where

m_m is the weight of the test specimen with damp proof dish and the non-corrosive thin metal wire;

m_a is the weight of the damp proof dish and the non-corrosive thin metal wire.

This equipment is shown in Figure D.1.



Key

1	test specimen
2	saturated solution
3	glass jar
4	rubber plug
5	thermo-couple
6	glass tube
7	electronic balance
8	thermometer
9	glass cap
10	constant temperature chamber
11	non corrosive thin metal wire

Figure D.1 — Method using a glass jar

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