
**Wood-based panels — Determination of
formaldehyde release —**

**Part 3:
Gas analysis method**

*Panneaux à base de bois — Détermination du dégagement de
formaldéhyde —*

iTeh STANDARD PREVIEW
Partie 3: Méthode d'analyse des gaz
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ISO 12460-3:2008

<https://standards.iteh.ai/catalog/standards/sist/dc049f54-9d19-4c1f-bf45-1db30ef48508/iso-12460-3-2008>



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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
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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.

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 12460-3 was prepared by Technical Committee ISO/TC 89, *Wood-based panels*.

ISO 12460 consists of the following parts, under the general title *Wood-based panels — Determination of formaldehyde release*:

- *Part 1: Formaldehyde emission by the 1-cubic-metre chamber method*
- *Part 2: Small-scale chamber method* [ISO 12460-3:2008](https://standards.iteh.ai/catalog/standards/sist/dc049f54-9d19-4c1f-bf45-1db30ef48508/iso-12460-3-2008)
- *Part 3: Gas analysis method*
- *Part 4: Desiccator method*

The extraction (or perforation) method will form the subject of a future Part 5.

Introduction

ISO 12460-1 specifies the 1-cubic-metre chamber reference method for the determination of formaldehyde release. Derived test methods specified in ISO 12460-2, ISO 12460-3 and ISO 12460-4 are intended for factory production control.

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Wood-based panels — Determination of formaldehyde release —

Part 3: Gas analysis method

1 Scope

This part of ISO 12460 specifies a procedure for determination of accelerated formaldehyde release from wood-based panels using the gas analysis method.

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 16979, *Wood-based panels — Determination of moisture content*

[ISO 12460-3:2008](#)

ISO 16999, *Wood-based panels — Sampling and cutting of test pieces*
[https://standards.iso.org/standards/catalog/iso/16999-4c1fbf45-1db30ef48508/iso-12460-3-2008](#)

3 Principle

A test piece of known surface area is placed in a closed chamber in which the temperature, humidity, air flow and pressure are controlled to defined values. Formaldehyde released from the test piece mixes with the air in the chamber. This air is continually drawn from the chamber and passes through gas wash bottles, containing water, which absorbs the released formaldehyde. At the end of the test, the formaldehyde concentration is determined photometrically. The formaldehyde release is calculated from this concentration, the sampling time and the exposed area of the test piece, and is expressed in milligrams per square meter hour.

4 Reagents

Use only reagents of recognized analytical grade, unless otherwise specified, and distilled or demineralized water or water of equivalent purity.

4.1 Acetylacetone solution.

Add 4 ml acetylacetone (pentane-2,4-dione, C₅H₈O₂) to a 1 000 ml volumetric flask (5.2.6) and make up to the mark with water.

4.2 Ammonium acetate solution.

Dissolve 200 g ammonium acetate (C₂H₃O₂NH₄) in water in a 1 000 ml volumetric flask (5.2.6) and make up to the mark with water.

Commercially prepared solutions may be used, provided they can be shown to give results equivalent to those obtained with solutions prepared in the laboratory.

4.3 Iodine standard solution, $c(I_2) = 0,05 \text{ mol/l}$.

Standardize the solution before use.

4.4 Sodium thiosulfate standard solution, $c(Na_2S_2O_3) = 0,1 \text{ mol/l}$.

Standardize the solution before use.

4.5 Sodium hydroxide standard solution, $c(NaOH) = 1 \text{ mol/l}$.

Standardize the solution before use.

4.6 Sulfuric acid standard solution, $c(H_2SO_4) = 1 \text{ mol/l}$.

Standardize the solution before use.

4.7 Starch solution, 1 % mass fraction.

5 Apparatus

5.1 Test apparatus

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The set-up (see Figure 1) comprises the following main components.

5.1.1 Air filter.

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5.1.2 Wash bottle, of capacity 500 ml, containing about 400 ml distilled water.

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5.1.3 Desiccator, of capacity 500 ml, containing silica gel.

5.1.4 Air pump.

5.1.5 Needle valve.

5.1.6 Air flow meter.

5.1.7 Test chamber, of diameter 90 mm to 100 mm and of such a length as to give an internal volume of $(4\ 000 \pm 200)$ ml, with double casing of stainless steel, glass or other suitable inert material.

5.1.8 Air-heating equipment, e.g. copper coil inside double casing.

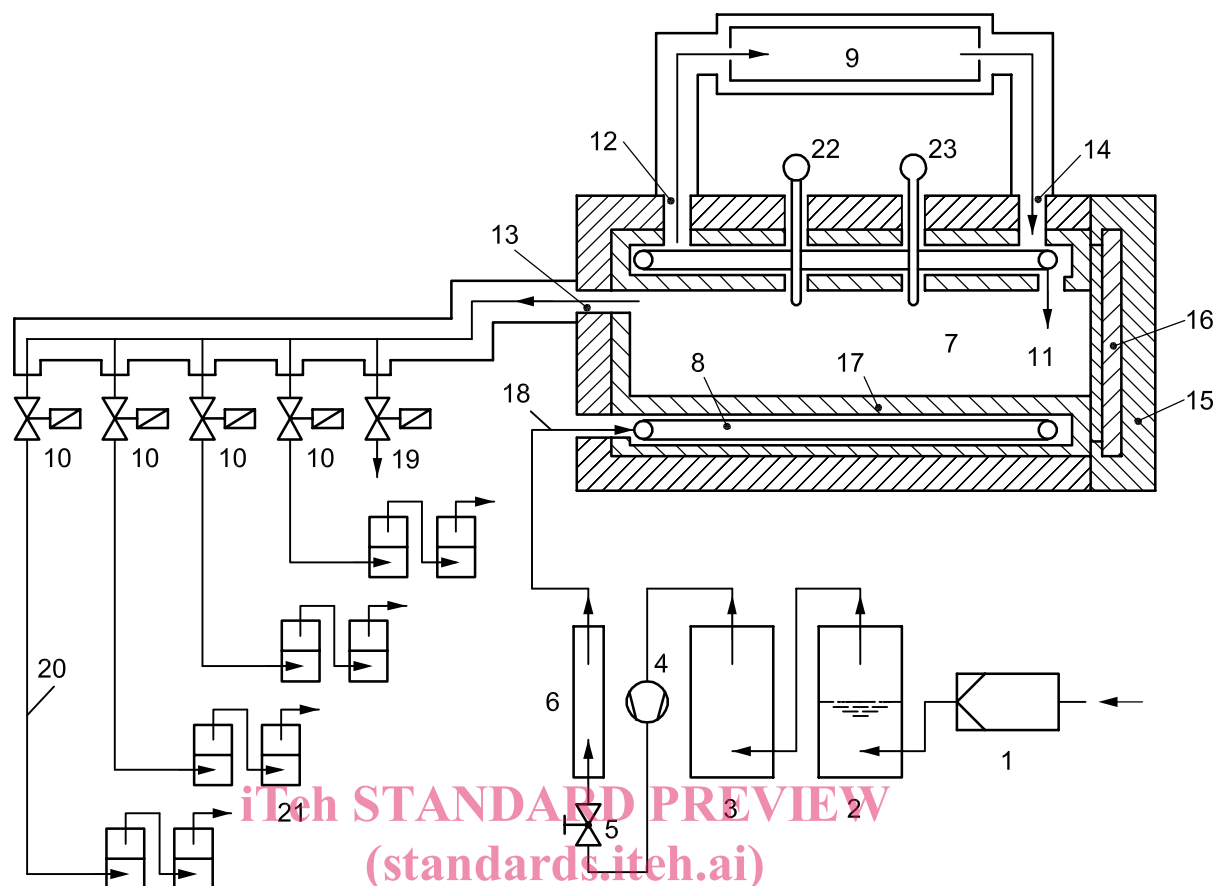
5.1.9 Thermostat.

5.1.10 Magnetic valves.

5.1.11 Wash bottles, each of capacity 100 ml, four pairs.

5.1.12 Pressure gauge.

5.1.13 Thermometer.

**Key**

1	air filter	7	test chamber	13	test air outlet	19	magnetic purging valve
2	wash bottle	8	air-heating coil	14	heating medium inlet	20	connection tube
3	desiccator	9	thermostat	15	insulation	21	wash bottles (pair)
4	air pump	10	magnetic valves	16	test chamber door	22	pressure gauge
5	needle valve	11	test chamber air inlet	17	double casing	23	thermometer
6	air flow meter	12	heating medium outlet	18	heating coil air inlet		

Figure 1 — Gas analysis test apparatus**5.2 Laboratory equipment**

Usual laboratory equipment and in particular the following.

5.2.1 Ventilated oven, as specified in ISO 16979.

5.2.2 Spectrophotometer, with cells of optical pathlength 50 mm, capable of measuring absorbance at 412 nm.

5.2.3 Water bath, capable of maintaining a temperature of $(60 \pm 1) ^\circ\text{C}$.

5.2.4 Volumetric flasks, six, each of capacity 100 ml.

5.2.5 Volumetric flasks, four, each of capacity 250 ml.

5.2.6 Volumetric flasks, two, each of capacity 1 000 ml.

5.2.7 **Wash bottles**, eight, each of capacity 100 ml.

5.2.8 **Bulb pipettes**, of capacities 5 ml, 10 ml, 15 ml, 20 ml, 25 ml, 50 ml, and 100 ml.

5.2.9 **Flasks with stoppers**, six, each of capacity 50 ml.

5.2.10 **Microburette**.

5.2.11 **Burette**, of capacity 50 ml.

5.2.12 **Balance**, capable of measuring to 0,001 g.

6 Test pieces

6.1 Selection of test pieces for production control

Sampling and cutting of the test pieces shall be in accordance with ISO 16999.

All test pieces have to be placed in a hermetically sealed container immediately after cutting and stored at room temperature.

Test pieces are taken uniformly distributed over the width of the (cooled) board, but excluding a 500 mm wide strip at each end of the board.

6.1.1 For the determination of formaldehyde release, three test pieces of dimensions $400 \text{ mm} \times 50 \text{ mm} \times d$, where d is the board thickness.

6.1.2 For the determination of moisture content, five or six test pieces of dimensions $25 \text{ mm} \times 25 \text{ mm} \times d$.

6.2 Selection of test pieces for other purposes

The procedure of taking test pieces (e.g. from boards already installed) shall be recorded and included in the test report. The number and dimensions of the test pieces shall comply with 6.1.

6.3 Preparation of test pieces

The test pieces shall be edge sealed.

NOTE Three coats of polyurethane lacquer or self-adhesive aluminium tape have proved to be suitable.

7 Procedure

7.1 Number of determinations

Two determinations shall be made, each using different test pieces (6.1.1). If the individual mean values of a duplicate determination differ from each other by more than $0,5 \text{ mg/m}^2 \text{ h}$, then a third determination shall be carried out.

NOTE For internal inspection, a single determination can be sufficient.

7.2 Determination of moisture content

Moisture content can be determined according to ISO 16979 using different test pieces (see 6.1.2).

7.3 Determination of formaldehyde release

Seal the edges of the test pieces in accordance with 6.3.

Close the chamber (5.1.7) and pre-heat it to $(60 \pm 0,5)$ °C.

Connect two wash bottles (5.1.11), each containing between 20 ml and 30 ml of water, in series to the outlet of each magnetic valve (5.1.10) using flexible tubing.

NOTE The water volume is chosen to maintain the test chamber at 1,0 kPa to 1,2 kPa above atmospheric pressure.

Place a test piece (6.1.1) in the pre-heated test chamber. After closing the test chamber and starting the test, the test piece is uniformly exposed to practically formaldehyde-free air, heated to $(60 \pm 0,5)$ °C, with a relative humidity ≤ 3 %. Immediately set the air flow rate into the chamber at (60 ± 3) l/h, by starting the pump (5.1.4) and adjusting the needle valve (5.1.5) as necessary after reading the air flow meter (5.1.6). This air is led into one of a series of pairs of wash bottles (5.1.2) via a series of magnetic valves (5.1.10).

Determine the formaldehyde released from the test piece at hourly intervals for up to 4 h from starting the test. Connect up a new series of wash bottles every hour. This exchange should be automatic.

Over the whole test period, monitor (Figure 1, label 22) the pressure in the test chamber and maintain it at 1,0 kPa to 1,2 kPa above that of the ambient atmosphere.

Transfer the contents of each pair of wash bottles to a 250 ml volumetric flask (5.2.5). Rinse the bottles and their associated tubing thoroughly with water and transfer the rinsings to the flask.

CAUTION — Care should be taken that the combined contents of the bottles and rinsings do not exceed a volume of 250 ml. (standards.iteh.ai)

Make the flask up to the mark with water and determine the formaldehyde content as specified in 7.4.

7.4 Determination of formaldehyde content of the aqueous solutions

7.4.1 General

Determine photometrically the formaldehyde content of the aqueous solution from each sampling period of 1 h.

7.4.2 Principle

The determination is based on the Hantzsch reaction in which aqueous formaldehyde reacts with ammonium ions and acetylacetone to yield diacetylhydrolutidine (DDL). DDL has an absorption maximum at 412 nm. The reaction is highly specific to formaldehyde (see Reference [4]).

NOTE Other suitable photometric procedures can also be used.

7.4.3 Procedure

Pipette (5.2.8) 10 ml of aqueous solution (7.3) into a 50 ml flask (5.2.9) and add 10 ml acetylacetone solution (4.1) and 10 ml ammonium acetate solution (4.2). Stopper the flask, shake and warm it for 10 min in a water bath (5.2.3) at 60 °C. Store the solution at room temperature for about 1 h protected from light. Then determine the absorbance of the solution at a wavelength of 412 nm against distilled water using a spectrophotometer (5.2.2). A blank value is determined in parallel with distilled water and taken into consideration in the determination of the gas analysis value.