
**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 de gaz
(standards.iteh.ai)

ISO 12460-3:2015

<https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 12460-3:2015

<https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Principle	1
4 Reagents	1
5 Apparatus	2
5.1 Main composites of test apparatus (see Figure 1).....	2
5.2 Laboratory equipment.....	2
6 Sampling and preparation of test pieces	3
6.1 Preparation of test pieces.....	3
6.2 Selection of test pieces for factory production control.....	3
6.3 Selection of test pieces for other purposes.....	4
6.4 Selection of test pieces in case of dispute.....	4
7 Procedure	4
7.1 Number of determinations.....	4
7.2 Determination of moisture content.....	4
7.3 Determination of formaldehyde release.....	4
7.4 Determination of formaldehyde content of the aqueous solutions.....	5
7.4.1 General.....	5
7.4.2 Principle.....	5
7.4.3 Analytical Procedure.....	5
7.4.4 Calibration curve.....	5
8 Expression of results	7
8.1 Gas analysis value.....	7
8.2 Calculation of results.....	7
8.2.1 Calculation of results of test pieces.....	7
8.2.2 Calculation of emission report value.....	8
8.3 Moisture content.....	8
9 Test report	8
Bibliography	11

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 89, *Wood-based panels*.

This second edition cancels and replaces the first edition (ISO 12460-3:2008), which has been technically revised.

The objective of the revision was to improve the detection limit and the reproducibility of the method with regard to boards with low formaldehyde content.

Compared to ISO 12460-3:2008, the following modifications have been made:

- a) in [6.1](#) preparation of test pieces is described more in detail;
- b) in [6.2](#) recommendation of maximum time 72 h after sampling for formaldehyde determination is added;
- c) in [6.4](#) conditioning for sampling and testing in case of dispute is added;
- d) in [7.1](#) and [8.2.2](#) procedure and evaluation of third determination are modified;
- e) in [7.3](#) use of smaller gas wash bottles and volumetric flasks to improve the sensitivity is included as an option;
- f) in [7.4.3](#) the use of a mixed reagent is included as an option to reduce the amounts of aqueous solution and hence improve the sensitivity;
- g) in [7.4.3](#) temperature of water bath increased to 60 °C and cooling procedure is modified;
- h) in [7.4.4.1](#) minimum interval of check of the calibration curve is extended to once a month;
- i) in [Clause 9](#) age and treatment of the sample are included in the test report;
- j) in [Figure 2](#) calibration curve is modified.

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 3: Gas analysis method*
- *Part 4: Desiccator method*
- *Part 5: Extraction method (called the perforator method)*

Additional parts dealing with small-scale chamber method is planned.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 12460-3:2015](https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015)

<https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 12460-3:2015](https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015)

<https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015>

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 uncoated and coated wood-based panels using the gas analysis method. The procedure is also suitable for the testing of other materials (e.g. edge bands, floor coverings, foams, foils, laminated wood products, veneered wood products, coated wood products).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 16999, *Wood-based panels — Sampling and cutting of test pieces*

[ISO 12460-3:2015](https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015)

3 Principle

<https://standards.iteh.ai/catalog/standards/sist/3e133520-f55b-4a05-979c-60f3ae11448c/iso-12460-3-2015>

A test piece of known surface area is placed in a closed chamber in which the temperature, humidity, airflow, and pressure are controlled to defined values. Formaldehyde released from the test pieces 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 or fluorimetrically. The formaldehyde release is calculated from this concentration, the sampling time, and the exposed area of the test pieces and is expressed in milligrams per square meter and hour (mg/m²h).

4 Reagents

Reagents of recognized analytical purity and distilled or demineralised water (referred throughout the following text as distilled water) shall be used for the analysis.

4.1 4 ml Acetylacetone solution are added to a 1 000 ml volumetric flask and made up to the mark with distilled water.

4.2 200 g ammonium acetate solution are dissolved with distilled water in a 1 000 ml volumetric flask and made up to the mark.

Optionally, a premixed reagent of acetylacetone and ammonium acetate as described in ISO 12460-4 can be used.

4.3 Formaldehyde solution commercially available (concentration typically between 35 % mass fraction to 40 % mass fraction).

- 4.4 **Standard iodine solution** $c(I_2) = 0,05 \text{ mol/l}$
- 4.5 **Standard sodium thiosulphate solution** $c(Na_2S_2O_3) = 0,1 \text{ mol/l}$
- 4.6 **Standard sodium hydroxide solution** $c(NaOH) = 1 \text{ mol/l}$
- 4.7 **Standard sulphuric acid solution** $c(H_2SO_4) = 1 \text{ mol/l}$
- 4.8 **Starch solution** 1 % by mass

5 Apparatus

5.1 Main composites of test apparatus (see [Figure 1](#))

- 5.1.1 **Air filter** (1).
- 5.1.2 **Wash bottle**, 500 ml, containing ca. 400 ml distilled water (2).
- 5.1.3 **Desiccator**, 500 ml, containing silica gel (3).
- 5.1.4 **Air pump** (4).
- 5.1.5 **Needle valve** (5).
- 5.1.6 **Equipment for measuring rate of air flow through apparatus** (6).
- 5.1.7 **Test chamber** (diameter: 90 mm to 100 mm with a length which gives an internal volume of $(4\,000 \pm 200)$ ml with double casing of stainless steel or glass (7)).
- 5.1.8 **Heating equipment for air** (e.g. copper coil inside the double casing) (8).
- 5.1.9 **Thermostat** (9).
- 5.1.10 **Magnetic valves** (10).
- 5.1.11 **4 pairs of gas wash bottles**, 100 ml or optionally, 4 pairs of gas wash bottles, 30 ml (21).
- 5.1.12 **Pressure monitor** (22).
- 5.1.13 **Temperature monitor** (23).
- 5.1.14 **Test piece holder**, constructed as a shelf with three rods made from stainless steel or another inert material (24).

NOTE The test apparatus described in [Figure 1](#) is based on a waterborne heating system. A test apparatus with an electrical heating system can be used optionally.

5.2 Laboratory equipment

- 5.2.1 **Ventilated oven**, as described in ISO 16979 for determination of moisture content (if requested).

- 5.2.2 Spectrophotometer**, with cells of 50 mm optical path length and 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 Water bath**, capable of maintaining a temperature in the range of $20 ^\circ\text{C}$ to $25 ^\circ\text{C}$.
- 5.2.5 Six volumetric flasks**, 100 ml (calibrated at $20 ^\circ\text{C}$).
- 5.2.6 Four volumetric flasks**, 250 ml or optionally, four volumetric flasks, 100 ml (calibrated at $20 ^\circ\text{C}$).
- 5.2.7 two volumetric flasks**, 1 000 ml (calibrated at $20 ^\circ\text{C}$).
- 5.2.8 Volumetric pipettes** (calibrated at $20 ^\circ\text{C}$), 1 ml, 2 ml, 5 ml, 10 ml, 15 ml, 20 ml, 25 ml, 50 ml, 100 ml.
- 5.2.9 Six flasks**, 50 ml (with stoppers).
- 5.2.10 Microburette.**
- 5.2.11 Burette**, 50 ml, graduated (calibrated at $20 ^\circ\text{C}$).
- 5.2.12 Balance**, capable of measuring to 0,001 g.

ITeH STANDARD PREVIEW
(standards.iteh.ai)

6 Sampling and preparation of test pieces

6.1 Preparation of test pieces

Three test pieces, each with the dimensions of $(400 \pm 1) \text{ mm} \times (50 \pm 1) \text{ mm} \times$ board thickness, shall be prepared for the determination of formaldehyde release giving a total emitting surface area of $0,04 \text{ m}^2$.

If the sample available does not allow the preparation of test pieces of the specified dimension, then the combined emitting surface area of the test piece(s) should be as close as possible to $0,04 \text{ m}^2$.

For testing layer glued materials (e.g. plywood, veneered particleboard), specimens shall be cut from the respective panel with the fibre direction of the faces perpendicular to the longitudinal axis of the specimen.

Each test piece has to be hermetically wrapped immediately after cutting and stored at ambient temperature.

Before testing, each test piece shall be stored hermetically wrapped at least one day at ambient temperature in order to improve the repeatability. For factory production control with hot test pieces, a valid correlation has to be established.

For testing, the test pieces shall be edge sealed with temperature resistant (i.e. $\geq 60 ^\circ\text{C}$) self-adhesive aluminium tape or an alternative sealing method if equivalence has been demonstrated. The emitting (unsealed) surface area of the sealed test piece has to be measured and calculated in square metres (m^2).

6.2 Selection of test pieces for factory production control

Sampling and cutting of the test pieces shall be performed according to the principles of ISO 16999.

Test pieces are taken, uniformly distributed over the width of the (cooled) board, but excluding a 250 mm wide strip from the end of each board.

The formaldehyde determination should be carried out not more than 72 h after sampling.