

INTERNATIONAL STANDARD

ISO
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Paper and board — Accelerated ageing —

Part 1:

Dry heat treatment at 105 °C

Papier et carton — Vieillissement accéléré —

Partie 1: Traitement à la chaleur sèche à 105 °C



Reference number
ISO 5630-1:1991(E)

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.

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.

International Standard ISO 5630-1 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

This second edition cancels and replaces the first edition (ISO 5630-1:1982), which has been technically revised.

ISO 5630 consists of the following parts, under the general title *Paper and board — Accelerated ageing*:

- *Part 1: Dry heat treatment at 105 °C*
- *Part 2: Moist heat treatment at 90 °C and 25 % relative humidity*
- *Part 3: Moist heat treatment at 80 °C and 65 % relative humidity*
- *Part 4: Dry heat treatment at 120 or 150 °C*

Annex A of this part of ISO 5630 is for information only.

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Introduction

Exposure of paper and board to a hostile environment such as some types of radiation, elevated temperature or chemical attack over a period of hours, may provide information concerning the natural changes that may occur in the material over a period of years [1], [2].

Environments that have been used include exposure to visible and ultraviolet radiation, to dry heat, to moist heat, and to sulfur dioxide gas.

Properties compared before and after such exposure include mechanical, chemical and optical properties.

NOTE 1 Mechanical properties typically used to demonstrate the effect of exposure include fold endurance (ISO 5626), tensile strength (ISO 1924), tearing resistance (ISO 1974), or bursting strength (ISO 2758, ISO 2759). Folding endurance is the most sensitive indicator of deterioration of paper in ageing, and changes may show up before there is a change in other mechanical characteristics. However, there are situations where a degraded paper might not survive even a single fold; and therefore, other tests should be used.

Chemical properties typically may include pH (ISO 6588), and alkali solubility (ISO 692).

The optical property typically measured is diffuse blue reflectance (ISO brightness) (ISO 2470).

It has been determined that the degradation of cellulose is very sensitive to moisture [3], [4]. Comparison of accelerated ageing with natural ageing indicates that some moisture should be present in an accelerated ageing atmosphere [5], [6]. Dry-accelerated ageing of cellulose is much less sensitive and probably does not rank papers in order of stability as accurately as moist accelerated ageing. It is much simpler to use and may be adequate for many purposes, but moist-accelerated ageing should be used where the greatest correlation with natural ageing is needed.

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Paper and board — Accelerated ageing —

Part 1:

Dry heat treatment at 105 °C

1 Scope

This part of ISO 5630 specifies a method for accelerating the ageing of paper and board by dry heat treatment at 105 °C.

This procedure is not applicable to certain high purity papers such as are used for insulation in electrical equipment for which ISO 5630-4 is more suitable.

This part of ISO 5630 does not give any preference for the tests to be made on the paper or board. It is left to the parties concerned to determine which tests are appropriate for the type of paper or board being evaluated.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 5630. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 5630 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 186:1985, *Paper and board — Sampling to determine average quality*.

ISO 187:1990, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*.

3 Principle

Samples of paper or board are heated in a ventilated oven for a specified time at 105 °C. Agreed properties of the sample are compared before and after this treatment.

4 Apparatus

4.1 Oven, ventilated, with a rate of air change of not less than 10 per hour, capable of maintaining a temperature of $105\text{ °C} \pm 2\text{ °C}$ and so designed that during the test, test samples are not exposed to light or to direct radiation from heating elements.

The design should be such that the test samples are uniformly exposed to the oven conditions. Not more than 15 min should be required to bring the oven back to working conditions after loading.

4.2 Test equipment, complying with the relevant International Standard, if any, or with another appropriate standard method.

4.3 Desiccator, or other preconditioner, maintained at 10 % to 35 % relative humidity.

5 Sampling

Where possible, sampling shall be carried out in accordance with ISO 186.

6 Preparation of samples

For each property being evaluated (see Introduction), select and prepare two sets of samples in accordance with the relevant International Standard, if any, or with another appropriate standard method.

Protect the test pieces from strong light.

Avoid handling the samples with bare hands and avoid exposure to the atmosphere of a chemical laboratory.

7 Procedure for heat treatment

Carry out the heat treatment in the dark.

Suspend the samples to be heat treated in the oven (4.1) so that the samples are at least 100 mm from the oven walls and do not touch each other and so that uncontaminated air at $105\text{ }^{\circ}\text{C} \pm 2^{\circ}\text{C}$ can circulate freely round each sample. Leave the samples in the oven for $72\text{ h} \pm 1\text{ h}$ preferably, but if another treatment time is considered more suitable, the time used shall be $24\text{ h} \pm 1\text{ h}$, $48\text{ h} \pm 1\text{ h}$ or $144\text{ h} \pm 1\text{ h}$.

NOTES

2 By agreement between vendor and purchaser, all the above specified times may be used, and the result of tests plotted as a function of the treatment time. In this case a total of five sets of samples are required.

3 The oven should not contain more than one type of paper or board at any time in order to prevent the possibility of contamination by distillation or sublimation products.

While the treatment is being carried out, keep the remaining samples in the dark, away from heat, and avoid exposure to the atmosphere of a chemical laboratory.

8 Conditioning

8.1 At least 2 h before completion of the heat treatment, place the untreated samples in the desiccator or other preconditioner (4.3) at 10 % to 35 % relative humidity.

8.2 On completion of the heat treatment, transfer both the treated and untreated samples to the same conditioned atmosphere, regulated in accordance with ISO 187.

9 Procedure for testing

Prepare sufficient test pieces from treated and untreated samples in accordance with the relevant International Standard, if any, or another standard

method relevant to the required test, for each property being evaluated (see Introduction).

Carry out the test as described in the relevant International Standard or another standard method, as appropriate, taking care to avoid handling the test area with bare hands at all times.

10 Test report

10.1 The test report shall include the following information:

- reference to this part of ISO 5630;
- reference to the International Standard, if any, or to another standard method to which the testing conformed.

10.2 The test report shall also include, as specified by the standard method to which the testing procedures conformed, the following particulars:

- all the indications necessary for complete identification of the sample;
- date and place of testing;
- the time and temperature of the heat treatment;
- the temperature and relative humidity of the atmosphere used to condition the samples;
- the number of tests carried out;
- the mean value and standard deviation of the measured value of the appropriate property of the untreated material;
- the mean value and standard deviation of the measured value of the appropriate property of the treated material;
- any deviations from the relevant International Standard or other standards used, or any circumstances or influence which might have affected the test results.