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Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples

Papier, carton et pâtes — Atmosphère normale de conditionnement et d'essai et méthode de surveillance de l'atmosphère et de conditionnement des échantillons

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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.

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).

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This document was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 172, *Pulp, paper and board,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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This third edition cancels and replaces the second edition (ISO 187:1990), which has been technically revised.

The main changes are as follows:

— introduction has been revised;

— normative references have been removed;

— definition of conditioning has been revised;

— content has been added to Clause 5 and Clause 6;

— Annex A has been simplified.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The physical properties of paper are affected by its moisture content which, in turn, is dependent on the relative humidity (RH) of the surrounding atmosphere and its history. In order that tests can be made on paper in a defined physical state, it is brought into equilibrium in an atmosphere of standardized temperature and relative humidity.

The moisture content of a given paper in equilibrium with a given atmosphere varies according to whether the equilibrium is reached by sorption or by desorption of moisture and how far the moisture content is from its equilibrium value. This hysteresis influences those physical properties that change with moisture content. Preconditioning paper from low relative humidity and then bringing it into the standard atmosphere will avoid most of the hysteresis effect. Typically, the variation in the moisture content of a given sample is less than 0,15 % when the sample is later conditioned to 50 % RH and 23 °C. Unless otherwise specified, the equilibrium condition should be attained from a low relative humidity.

For a number of years, three standard test atmospheres have been in common use:

20 °C/65 % RH;

23 °C/50 % RH;

27 °C/65 % RH.

Since 1993, the atmosphere of 23 °C /50 % RH has been considered the ISO standard test atmosphere for testing of pulp, paper, and board. However, this atmosphere can be difficult to attain in some countries located in tropical zones, and in such countries the 27 °C /65 % RH atmosphere is permitted.

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Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples

1 Scope

This document specifies the standard atmospheres for conditioning and testing pulp, paper and board, the conditioning procedure and the procedures for measuring the temperature and relative humidity.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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3.1
relative humidity
RH
ratio, expressed as a percentage, of the actual water vapour content of the air to the water vapour content of air saturated with water vapour at the same temperature and pressure

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3.2
conditioning
process of establishing a reproducible moisture content equilibrium of a sample in an atmosphere of specified temperature and relative humidity

Note 1 to entry: This equilibrium is considered to be attained when the results of two consecutive weighings of the sample, carried out at an interval of time of not less than 1 h, do not differ by more than 0,25 %.

4 Principle

Exposure of a sample to a specific conditioning atmosphere in such a manner that a reproducible state of moisture content equilibrium is reached.

5 Standard atmosphere

The standard atmosphere for testing pulp, paper and board shall be (23 ± 1) °C and (50 ± 2) % RH. In tropical countries, an atmosphere of (27 ± 1) °C and (65 ± 2) % RH can be used.

A test atmosphere shall be deemed to be within the requirements of this document if all the test results determined as described in Annex A are within the prescribed limits.

Even short-term excursions of temperature or humidity beyond these limits, to the extent that the equilibrium moisture content of the sample will be affected, are not permitted. Whenever the test

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atmosphere is known to have been outside the limits and if there is any chance that the moisture content of samples has been changed by such excursions, all samples shall be reconditioned repeating Clause 6 before any further testing is done. If the samples have been subjected to a relative humidity exceeding 75 %, they shall be discarded as dried-in strain in the sample can have been released, causing a permanent change in properties.

For laboratory sheets prepared according to ISO 5269-1 or to ISO 5269-3 using the conventional sheet former, if it is known or suspected that the relative humidity has fallen below the lower limit, to the extent that the moisture content can have decreased, the sheets shall be discarded and new samples prepared. If this is not possible and the samples are tested, the circumstance shall be reported.

6 Conditioning procedure

6.1 Preconditioning of the sample

For tests in which the hysteresis of the equilibrium moisture content can lead to important errors, the sample shall be pre-conditioned for 24 h in air of relative humidity between 10 % and 35 % and a temperature not above 40 °C before conditioning. Laboratory sheets prepared in the conventional sheet former (see ISO 5269-1 and ISO 5269-3) shall not be preconditioned. Ensure that the water content of the air in the pre-conditioning atmosphere is lower than in the conditioning atmosphere.

6.2 Conditioning

The specimens of the sample shall be held such that the conditioning air has free access to all their surfaces so that their moisture contents attain a state of equilibrium with the water vapour in the atmosphere. This equilibrium is considered to be attained when the difference of two consecutive weighings (M_n and M_{n+1}) of the specimens of the sample at least 1 h apart is lower or equal to 0,25 % of the mass M_n. The interval between weighings needs to be longer for higher grammage papers and the degree of agreement expected between successive weighings should take account of the known cycling characteristics of the test room.

Handle preconditioned and conditioned sheets or specimens as little as possible; especially avoid touching or breathing on test areas.

NOTE With good air circulation a conditioning period of 4 h is usually sufficient for paper. A minimum time of 5 h to 8 h will be required for higher grammage papers. Boards of higher grammage and specially treated materials can require a conditioning period of 48 h or longer.

6.3 Testing

Unless allowed by the individual ISO Standard, test specimens in the standard testing atmosphere.

7 Test report

The test report of a testing that is done in this standard atmosphere shall include the following information:

a) reference to this document, i.e. ISO 187:2022;

b) the conditioning atmosphere used;

c) the time for which the sample was conditioned;

d) whether the sample was preconditioned before conditioning;

e) any deviation, by agreement or otherwise from this document;

f) the date of the test.

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Annex A
(normative)

Measurement of temperature and relative humidity

A.1 General

This annex describes the procedure for the measurement of the temperature and the relative humidity of the conditioned laboratory.

NOTE The interdependence of temperature and relative humidity is described in Annex B.

A.2 Apparatus

A.2.1 Thermo-hygrometer

The laboratory temperature and relative humidity shall be covered by the working range of the thermo-hygrometer. The temperature shall be measured to the nearest 0,1 °C. The relative humidity shall be measured to the nearest 2 % RH

NOTE Aspirated psychrometer or other apparatus can be used provided they have the same accuracy.

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A.3 Measurement of temperature and relative humidity

Temperature and relative humidity data (from every sensor) shall be measured and stored every 2 minutes. Get 10-minute average data based on 2-minute average data and store. Use 10-minute average data as a test result.

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Test at sufficient locations to ensure that the test results are properly representative of the areas under test.

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Annex B
(informative)

Interdependence of temperature and relative humidity

B.1 General

Specification of the temperature limits within which the atmosphere is required to be maintained does not of itself specify the closeness of temperature control needed; it can be necessary for the temperature variation (from time to time and from point to point) in the working space to be maintained within tighter limits to ensure that the relative humidity remains within the prescribed limits. During the time the conditioned air flows through the room, the air will become warmer or cooler owing to heat gains or losses. This change in temperature (with no addition or removal of moisture) will cause a change in relative humidity.

As the air becomes warmer, the relative humidity will decrease, and as it becomes colder its relative humidity will increase. The magnitude of this effect is shown in Table B.1. For example, where the air temperature shall be maintained between 22 °C and 24 °C, the real change in air temperature would need to be kept within about ±0,7 °C in the absence of independent humidity control to maintain a relative humidity control of ±2 %.

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Table B.1 — Change in relative humidity (RH) per 0,5 °C change in temperature while water vapour content remains constant

Air temperature	Change in RH per 0,5 °C	
°C	at 50 % RH	at 65 % RH
15	1,61	2,09
20	1,55	2,01
25	1,49	1,93
30	1,43	1,86

B.2 Test rooms

The test room should be the minimum size necessary to perform the required tests, and the conditioning equipment shall have sufficient capacity to handle the worst disturbance and heaviest load likely to be encountered. The test room should be a regular shape, with no small alcoves, to ensure even circulation of air. All equipment that could intermittently generate or absorb heat or moisture should be avoided in the room and the number of personnel in the room should be as low and as constant as possible.

All cooling, heating, humidification and dehumidification should be done outside the room and be controlled by sensors inside the room or in inlet air ducts. Fresh air should be admitted to the system at the rate of about 0,8 m^3/min for each person normally in the room. It is desirable to maintain a positive air pressure in the room to minimize disturbance caused by opening the door. Such a step can remove the need for an air lock.

Sinks and other vessels that result in exposed water should not be allowed in the room. Likewise, unnecessary sources of heat should not be allowed. However, this does not prohibit the conduct of tests that require the use of water or heat generating apparatus, providing the air conditioning plant is of sufficient capacity to carry the load.

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