International Standard 2233

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Packaging — Complete, filled transport packages — Conditioning for testing

Emballages — Emballages d'expédition complets et pleins — Conditionnement en vue des essais

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 2233 was prepared by Technical Committee ISO/TC 122, *Packaging*.

This second edition cancels and replaces the first edition (ISO 2233-1972), the table, giving the preferred conditions, and clause 4 of which have been technically revised.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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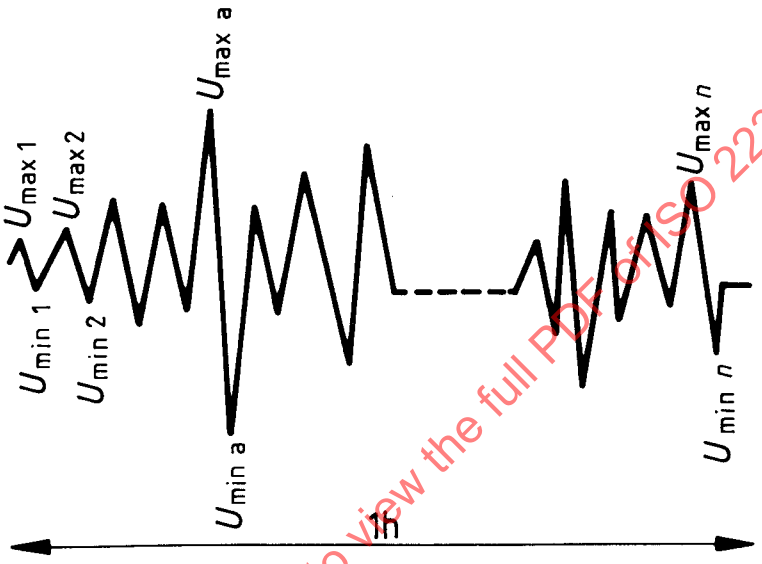
Annex

Note on the measurement of relative humidity

A continuous record of relative humidity will show a cyclic variation and it is necessary to determine precise values which define both the level and variation of this property.

Consider the typical record below:



a) The **mean relative humidity**, $\bar{U}$, during 1 h of n complete cycles with successive maximum values of $U_{max\ 1}$, $U_{max\ 2}$, ..., $U_{max\ n}$, and minimum successive values of $U_{min\ 1}$, $U_{min\ 2}$, ..., $U_{min\ n}$, is given by:

$$\bar{U} = \frac{1}{2n}(U_{max\ 1} + U_{max\ 2} + \ldots + U_{max\ n} + U_{min\ 1} + U_{min\ 2} + \ldots + U_{min\ n})$$

or

$$\bar{U} = \frac{\Sigma U_{max} + \Sigma U_{min}}{2n}$$

b) The **fluctuation of relative humidity** is given by the limits between $\bar{U}$ and the mean maximum relative humidity $\overline{U_{max}}$, and between $\bar{U}$ and the mean minimum relative humidity $\overline{U_{min}}$,

where $\overline{U_{max}} = \frac{\Sigma U_{max}}{n}$ and $\overline{U_{min}} = \frac{\Sigma U_{min}}{n}$

c) **Occasional excursions** are illustrated at $U_{max\ a}$ and $U_{min\ a}$.

Packaging — Complete, filled transport packages — Conditioning for testing

1 Scope and field of application

This International Standard specifies a method of conditioning of complete, filled transport packages for testing.

2 Principle

Exposure of the package to predetermined atmospheric conditions for a predetermined period of time.

3 Atmospheric conditions

One of the preferred conditions given in the table shall be selected.

Table

Condition	Temperature °C	Temperature K	Relative humidity (r.h.) %
A	−55	218	—
B	−35	238	—
C	−18	257	—
D	+ 5	278	85
E	+20	293	65
F	+20	293	90
G	+23	296	50
H	+27	300	65
J	+40	313	Uncontrolled r.h.
L	+40	313	90
M	+55	328	30

4 Control tolerances

4.1 Temperature

For conditions A, B and M, the tolerance is ± 3 °C. For conditions C and E to L inclusive, the tolerance on the specified temperature is ± 2 °C. For condition D, the tolerance is ± 1 °C.

NOTES

1 When using condition D, care should be taken to ensure that the dew point is not reached.

2 Temperature tolerances quoted are not necessarily those required to maintain the required tolerances on relative humidity; closer temperature tolerances may therefore be necessary in order to comply with the tolerances required for relative humidity.

4.2 Relative humidity

In cases where the relative humidity is specified (see the table), the mean relative humidity for any 1 h during the conditioning period shall not differ from the specified relative humidity by more than 5 %. A continuous fluctuation of relative humidity may occur but shall not exceed ± 5 % of the specified value. Occasional excursions are permitted provided that their frequency of occurrence, amplitude and duration are such that they do not adversely affect the conditioning of the packages.

NOTES

1 The mean value of relative humidity shall be obtained by taking the average of a minimum of ten measurements over a period of 1 h, or shall be derived from a continuous instrument trace.

2 The tolerance of ± 5 % relative humidity is quoted as this represents the maximum variation to be expected in conditioning chambers. Modern, well-designed conditioning chambers are capable of maintaining ± 2 % relative humidity. The response of most packages to changes in atmospheric moisture is relatively slow compared with the fluctuations of relative humidity within the chamber and, provided that the mean relative humidity within the working space, taken over any 1 h period during the duration of the test, lies within ± 5 % of the specified relative humidity, it may be assumed that the wider fluctuations such as may occur on opening the door have had little effect on the moisture content of the package.

3 The terms "mean relative humidity", "fluctuation of relative humidity" and "occasional excursions" are explained in the annex.

5 Apparatus

5.1 Conditioning chamber, having a working space the temperature and humidity of which is continuously recorded and which can be maintained at the specified conditions within the control tolerances given in clause 4.

The working space is that part of a conditioning chamber within which the specified controlled conditions are maintained. The boundaries of this space shall be specified for each chamber.

5.2 Drying chamber, to reduce the moisture content of certain packages to below that which will be attained by conditioning.

5.3 Recording equipment, sufficiently sensitive and stable to allow measurement of temperature to an accuracy of 0,1 °C and relative humidity to 1 %.

For the purposes of this International Standard, the record is deemed continuous if the period between individual readings is not greater than 5 min.

The recording equipment shall have sufficient speed of response to record accurately, to the precision stated above, changes in temperature of 4 °C per minute and changes in relative humidity of 5 % per minute.

6 Procedure

Place the package within the working space of the conditioning chamber (5.1) and expose to the specified conditions for a minimum period which shall be selected from

4 — 8 — 16 — 24 — 48 or 72 h,

or from

1 — 2 — 3 or 4 weeks.

The package shall be supported in such a way that its top, sides and at least 75 % of its base have free access to the conditioning atmosphere. The conditioning period shall be deemed to start 1 h after the specified conditions have been regained.

When the package is constructed of materials, such as fibreboard, that are known to show a hysteresis effect in their characteristics, it may be necessary to pre-dry before conditioning. This shall be done by placing the package for a minimum period of 24 h in the drying chamber (5.2) in conditions such that, when transferred to the specified conditions, it will approach equilibrium by taking up moisture. This is not necessary when the specified relative humidity is 40 % or below.

7 Test reports

The reports of tests on conditioned, complete, filled transport packages, such as horizontal impact test, stacking test, vertical impact test and vibration test, shall include the following information:

a) the condition (see the table) and time used for conditioning;

b) the temperature and relative humidity of the test area at the time of test.