INTERNATIONAL STANDARD ISO 2233

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Packaging — Complete, filled transport packages — Part II : Conditioning for testing

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FOREWORD

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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.

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

It was approved in July 1971 by the Member Bodies of the following countries :

Australia	Ireland	Spain
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Packaging — Complete, filled transport packages — Part II : 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

The package is exposed to predetermined atmospheric conditions for a predetermined period of time.

3 ATMOSPHERIC CONDITIONS

One of the following conditions shall be selected :

Condition	Temperature °C	Relative humidity %
1	−55	–
2	−18	–
3	+ 5	85
4	+20	65
5	+23	50
6	+20	90
7	+38	85
8	+60	30

4 CONTROL TOLERANCES

4.1 Temperature

For conditions 2 to 7 inclusive, the tolerance on the specified temperature is ± 2 °C. For conditions 1 and 8, the tolerance is ± 3 °C.

4.2 Relative humidity

In cases where the relative humidity is specified, the mean relative humidity for any 1 h during the conditioning period shall not differ from the specified relative humidity by more than 2 %. A continuous fluctuation of relative humidity may occur but shall not exceed ± 2 % 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, or shall be derived from a continuous instrument trace.

2 The tolerance of ± 2 % relative humidity is quoted as this represents the total variation to be expected in well-designed conditioning chambers. 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 ± 2 % 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 Appendix.

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 section 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 purpose 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.

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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 :

— relative humidity, temperature and time of conditioning; temperature and relative humidity of test area at time of test; and whether these values comply with the requirements of this International Standard.

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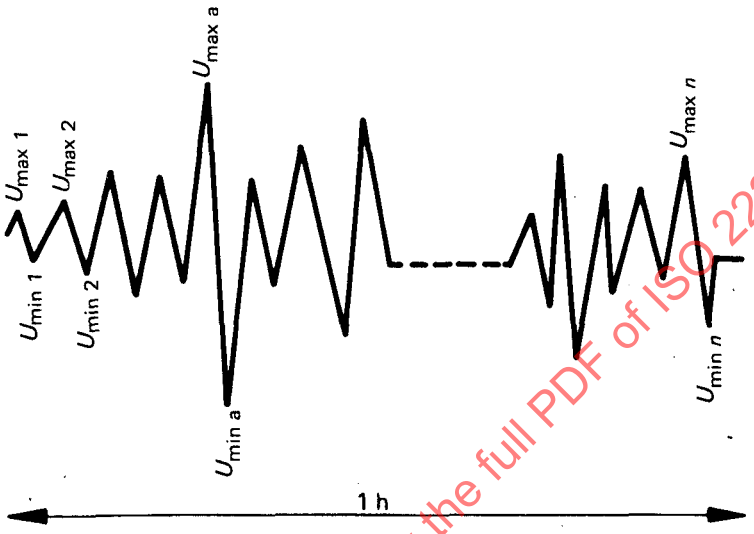
APPENDIX

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 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 $\overline{U_{min}}$.

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 $U_{min\ a}$.

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