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**Commercial refrigerated cabinets — Methods of test —
Part III : Temperature test**

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

International Standard ISO 1992/III (originally ISO/DIS 2335) was drawn up by Technical Committee ISO/TC 86, *Refrigeration*, and circulated to the Member Bodies in June 1971.

It has been approved by the Member Bodies of the following countries :

Australia	Hungary	South Africa, Rep. of
Belgium	Ireland	Spain
Czechoslovakia	Italy	Sweden
Denmark	Japan	Switzerland
Egypt, Arab Rep. of	Netherlands	Turkey
France	Poland	United Kingdom
Germany	Romania	U.S.S.R.

No Member Body expressed disapproval of the document.

Other parts in this series under the general title, *Commercial refrigerated cabinets – Methods of test*, are as follows :

- Part I : *Calculation of linear dimensions, areas and volumes.*
- Part II : *General test conditions.*
- Part IV : *Defrosting test.*
- Part V : *Water vapour condensation test.*
- Part VI : *Electrical energy consumption test.*
- Part VII : *Test for odour of material.*

(Parts IV to VII are at present at the stage of draft.)

Commercial refrigerated cabinets — Methods of test — Part III : Temperature test

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies methods for the determination of test package temperatures in commercial refrigerated cabinets intended for the sale and/or display of food products.¹⁾

2 DEFINITION

M-package : Test package with temperature sensor.¹⁾

3 PROCEDURE

3.1 Loading the cabinet

The cabinet shall be filled up to the load limit with test packages. On each shelf and bin, M-packages, with the largest face area horizontal, shall be located as indicated in figure 1, in two cross-sections, one with the centre line of the M-package within 150 mm of the centre of the cabinet and one with the centre line of the M-package within 150 mm of one end (the end nearest to the compressor compartment if relevant). If the horizontal or vertical distance between centre lines of two M-packages in the same cross-section of the shelf or bin exceeds 600 mm, an additional M-package shall be placed half-way between these.

In addition to these M-packages, two extra M-packages shall be located within the useful net volume so that the maximum and minimum test package temperatures will be recorded.

3.2 Running in

The cabinet shall be switched on and run in to stable conditions. The test room shall be maintained at the desired climate class as specified in 4.1.6 in part II, while the temperatures of the M-packages are recorded. These recordings will vary cyclically and the length of the cycle is dependent on the time between two successive defrost periods.

Stable operating conditions are deemed to be reached when the temperatures at corresponding points on the temperature curve agree within $\pm 0,5$ °C during a period of about 24 h, and when there is no trend away from the mean temperature.

Doors or lids on closed cabinets shall be opened to an angle of 90° (lids fully open) ten times at regular intervals in each hour for 8 consecutive hours in each 24 h and each door or lid shall remain open on each occasion for a period of 10 s. (The requirements of this paragraph do not apply to compartments exclusively used for storage purposes but only to compartments intended for retail sale.)

If night-covers are supplied, two tests are required in order to comply with 5.7 in part II. The night-covers and cabinet lighting should be manipulated as follows :

- 1st test : night-covers removed and cabinet lighting on continuously during the test period;
- 2nd test : night-covers removed and cabinet lighting switched on for a period of 10 h followed by a period of 14 h with the night-covers on and the cabinet lighting switched off.

3.3 Test period

After the running in period, the temperatures of all M-packages shall be recorded for a period beginning and ending at corresponding points on the time/temperature cycle.

This period of time is called the test period and shall be not less than 24 h in duration.

For all condensing units which are installed remote from the cabinet and for those applications in which the cabinet manufacturers specify a suitable condensing unit, sufficient measurements shall be made during the test period, in accordance with part II, to establish that the actual heat extraction rate conforms to that stated by the cabinet manufacturers for the operating conditions specified.

1) See part II.

4 EXPRESSION OF RESULTS

4.1 Plotting temperature curves of M-packages

From the recorded temperatures of all M-packages on each shelf and in each bin, the following curves shall be prepared, as a function of time :

- a) the temperature of the warmest M-package;
- b) the temperature of the coldest M-package;
- c) the arithmetical mean temperature of all the M-packages which have at least one surface visible from any position.

In the case of multiple temperature cabinets, curves a), b) and c) shall be prepared for each separate temperature zone.

When plotting the curve of the arithmetical mean temperatures, one point shall be established when the warmest M-package is at a peak temperature and other points shall be of sufficient number to ensure an accurate mean temperature/time curve. In any case, mean temperature shall be plotted with a frequency of not less than four readings per hour.

All other M-package temperatures shall be available for reference if required.

4.2 Calculation of average mean temperature

For curve c), the average mean temperature θ_m , as a function of time, for the test period T shall be calculated so that :

$$\theta_m = \frac{1}{T} \int_0^T \theta dt \quad (\text{see figure 2})$$

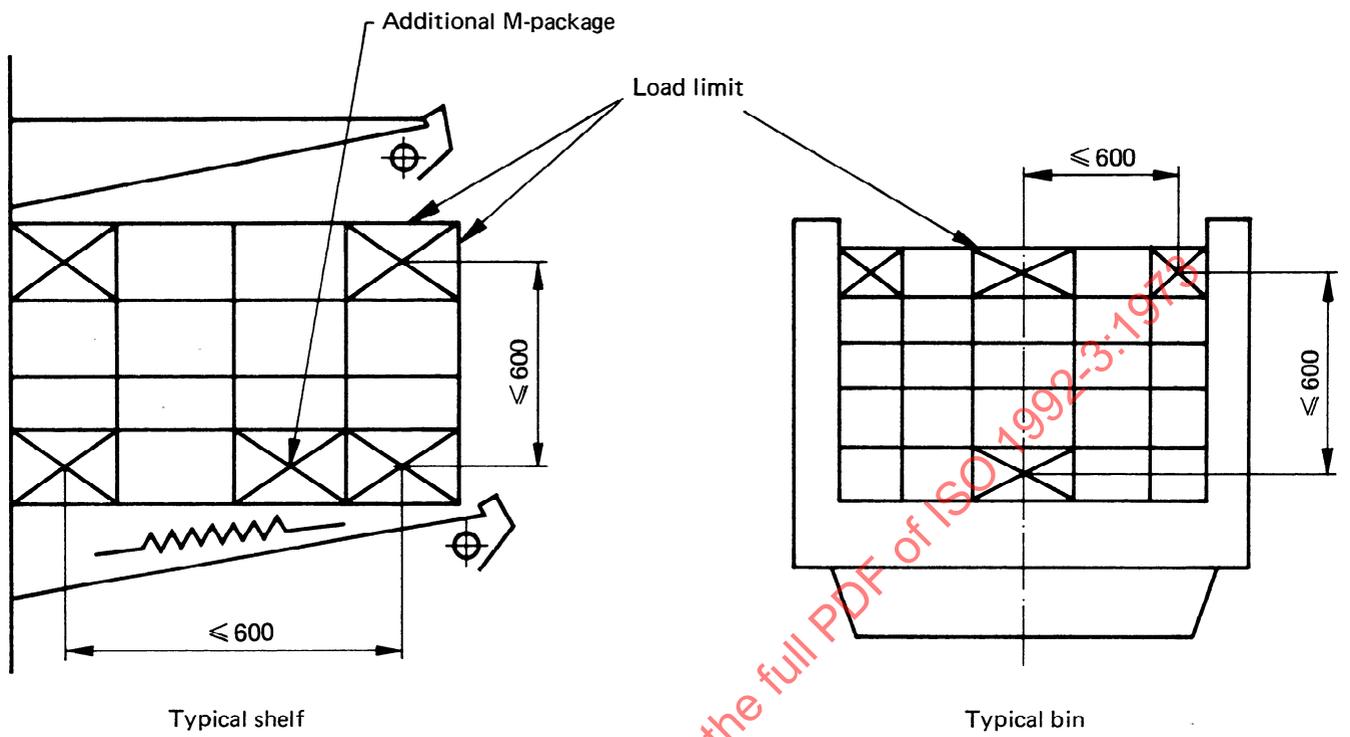
5 REPORT

The test report for each test shall include :

- 5.1 A statement of each test room climate for which the cabinet is intended and in which the test has been made.
- 5.2 A statement indicating whether the test was made with or without night-covers.
- 5.3 The time/temperature curves a), b) and c) (see 4.1).
- 5.4 The average mean temperature as a function of time (see 4.2).
- 5.5 If relevant (see 3.3), the actual heat extraction rate at specified operating conditions and the measurements and calculations used to determine this rate.

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Dimensions in millimetres



 = M-package

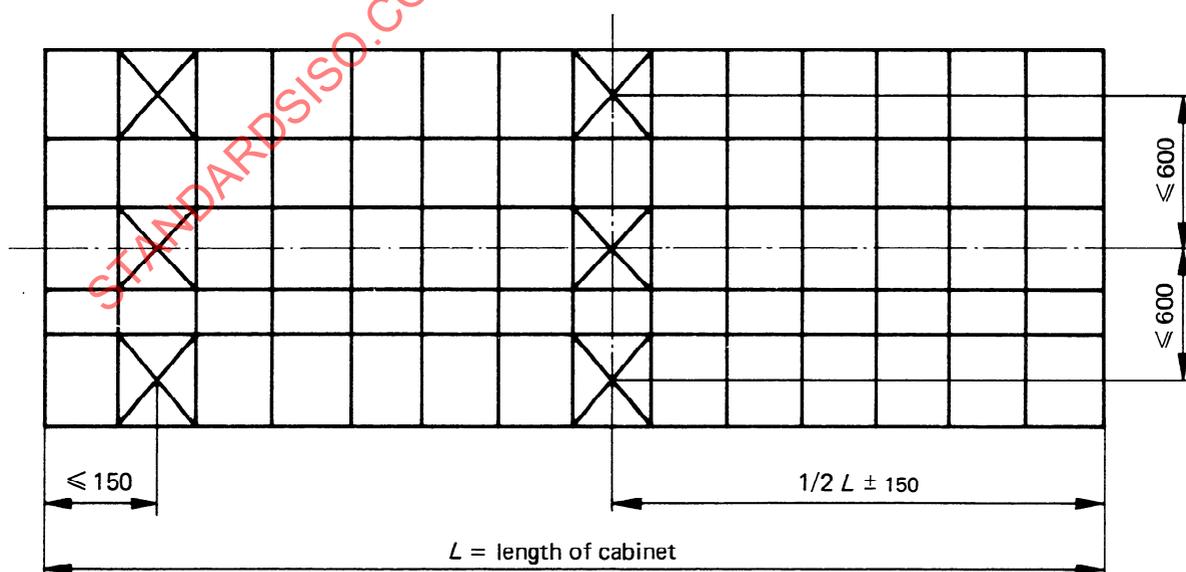


FIGURE 1 – Location of M-packages

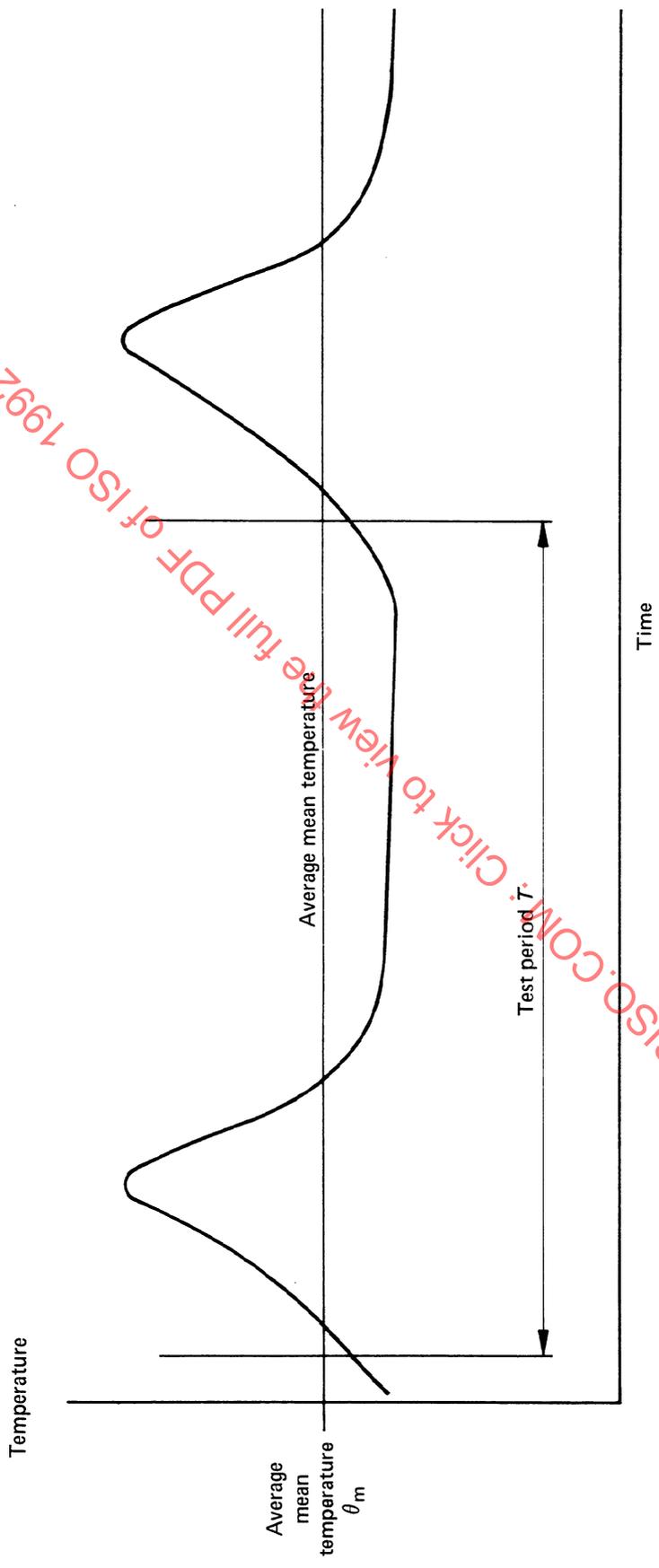


FIGURE 2 – Curve of the arithmetical mean temperature of M-packages (see 4.1 c)

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