
International Standard



5160/1

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Commercial refrigerated cabinets — Technical specifications — Part 1 : General requirements

Meubles frigorifiques commerciaux — Spécifications techniques — Partie 1 : Exigences générales

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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 5160/1 was developed by Technical Committee ISO/TC 86, *Refrigeration*, and was circulated to the member bodies in February 1978.

It has been approved by the member bodies of the following countries:

| | | |
|----------------|-----------------------|----------------|
| Australia | Israel | Sweden |
| Bulgaria | Mexico | Switzerland |
| Chile | Netherlands | Turkey |
| Czechoslovakia | New Zealand | United Kingdom |
| Finland | Poland | USA |
| France | South Africa, Rep. of | USSR |
| Hungary | Spain | Yugoslavia |

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Germany, F. R.
Italy

Commercial refrigerated cabinets — Technical specifications —

Part 1 : General requirements

1 SCOPE AND FIELD OF APPLICATION

This International Standard gives guidance in the selection and use of materials and specifies the marking and performance requirements for commercial refrigerated cabinets intended for the sale and/or display of food products.

It is to be read in conjunction with ISO 5160/2, which covers in detail the requirements for cabinets of specific types or intended for particular applications.

Any provisions contained in this International Standard for which no test method is specified should be considered as being of a purely informative character.

2 REFERENCES

ISO 534, *Paper — Determination of the thickness of single sheets.*¹⁾

ISO 817, *Organic refrigerants — Number designation.*

ISO/R 1662, *Refrigerating plants — Safety requirements.*

ISO 1992, *Commercial refrigerated cabinets — Methods of test :*

Part 1 : Calculation of linear dimensions, areas and volumes.

Part 2 : General test conditions.

Part 3 : Temperature test.

Part 4 : Defrosting test.

Part 5 : Water vapour condensation test.

Part 6 : Electrical energy consumption test.

*Part 8 : Accidental mechanical contact test.*²⁾

ISO 4120, *Sensory analysis — Methodology — Triangular test*²⁾

ISO 5160/2, *Commercial refrigerated cabinets — Technical specifications — Part 2 : Particular requirements.*²⁾

3 DEFINITIONS

3.1 load limit : For each part of the cabinet, boundary surface consisting of a plane or several planes within which all test packages can be maintained within the limits for the product temperature class declared.

3.2 load line : Boundary line denoting the edge of the load limit surface.

3.3 refrigerated shelf area : Shelf area where the load limit is not less than 100 mm, measured perpendicularly above the plane of the shelf and within the bounds of any load limit.

The refrigerated shelf areas shall be declared separately for each product temperature class.

3.4 display opening : The product of the smallest length and width (or height, as appropriate) of the opening area of the cabinet.

3.5 net volume : The volume intended for products within the load limit.

Parts necessary for the proper functioning of the cabinet, including shelves used in the calculation of refrigerated shelf area, shall be fitted as intended and the volume of these parts shall be deducted when the net volume is determined.

Each volume should be declared separately for each product temperature class.

3.6 overall dimensions : The dimensions of the rectangular parallelepiped with vertical sides within which the cabinet, including its projecting accessories, is contained. For cabinets having detachable ends, overall dimensions shall be given with and without ends.

1) At present at the stage of draft. (Revision of ISO/R 534-1967).

2) At present at the stage of draft.

3.7 normal conditions of use : Those operating conditions which occur when the cabinet, including all permanently located accessories, has been set up and sited in accordance with the recommendations of the manufacturer and is in service for the sale and/or display of food products.

The effects of actions by non-technical personnel for the purposes of loading, unloading, cleaning, defrosting, the manipulation of accessible controls and of any removable accessories, etc., according to the manufacturer's instructions shall be within the scope of this definition, but not those resulting from interventions by technical personnel for the purposes of maintenance or repair.

4 MANUFACTURE

4.1 Construction

4.1.1 The cabinet and its parts shall be constructed with adequate strength and rigidity for normal conditions of handling, transport and use and attention shall be given to the following points :

- a) interior fittings, including shelves, baskets, rails, etc., and their supports, shall be sufficiently strong for the duty required;
- b) where sliding shelves, baskets, trays or drawers are fitted they shall retain their shape and ease of movement when fully loaded;
- c) any fitments which are provided with stops to prevent accidental removal shall be self-supporting when fully loaded and withdrawn to the limit of the stops.

4.1.2 Any part (for example, defrost and drip tray heaters) which might in normal circumstances constitute an accident hazard shall, as far as is reasonably practicable, be effectively guarded when the cabinet and associated refrigerating system are installed and operating.

The instructions for use and cleaning [see 7.3 b)] shall draw attention to any possible hazards that are not effectively guarded.

4.1.3 Pipes and connections to moving or resiliently-mounted parts shall be arranged so as to not foul or to transmit harmful vibrations to other parts. All other pipes and connections shall be securely anchored and sufficient free length and/or vibration eliminators shall be provided to prevent failure due to fatigue. Where necessary, pipes and valves shall be adequately thermally insulated.

4.1.4 When glass panels and/or mirrors are used, adequate steps shall be taken to minimize the risk of chipping or splintering.

4.1.5 There shall be no sharp edges or corners liable to cause injury under normal conditions of use.

4.1.6 Where drains, drip trays or re-evaporation receptacles are fitted, they shall have ample capacity and shall be easily accessible for cleaning.

Unless otherwise stated by the manufacturer, any condensate receptacle, or group of receptacles, required to be emptied manually shall have a capacity equivalent to at least 40 h of normal operation in the appropriate climate class for which the cabinet is intended.

4.1.7 Door fasteners and hinges under normal conditions of use shall be smooth and positive in action and designed to function properly without undue wear.

When any doors or lids, provided to ensure tightness of the refrigerated space, are closed there shall be no undue leakage of ambient air into the interior and the doors or lids shall not open of their own accord.

The gasket shall be made from a material whose characteristics are compatible with operating conditions (especially temperatures).

If the fastening device is mechanical, a stop or other means shall be provided to prevent the gasket from being excessively deformed.

The tightness of doors or lids provided to ensure tightness shall be tested by inserting a strip of paper 50 mm wide, 0,08 mm thick¹⁾ and of suitable length at any point of the seal, and the door or lid closed normally on it.

NOTE — The most unfavourable points may be found by inspecting the area around the seal with the cabinet closed and lighted from the inside.

As a result of this test, the strip of paper should not slide freely.

NOTE — Attention is drawn to the fact that some cabinets having doors provided to ensure tightness are fitted with decompression valves which allow air to penetrate for a short period of time so that any drop in pressure created inside the cabinet may be compensated. No test is required for such valves.

4.1.8 All construction joints and seams within the net volume shall be designed to prevent as far as possible the accumulation of potentially contaminating substances.

All construction joints and seams within the net volume shall be designed so that it is easy to remove any deposits of potentially contaminating substances.

4.2 Materials

4.2.1 The materials shall not deteriorate or cause the development of mould or give off odours.

Under normal conditions of use, materials in contact with food products shall be resistant to moisture and shall not be toxic or contaminate food.

1) For verification of the thickness of the paper used, see ISO 534.

4.2.2 Internal and external finishes shall be durable and capable of being cleaned effectively and hygienically. Finishes shall not crack, chip, flake, rub off or soften under normal conditions of use or during cleaning.

4.2.3 Metal parts, used in the construction of cabinets, shall have resistance to corrosion appropriate to their location and function.

4.3 Thermal insulation

4.3.1 When determining materials and their thickness to be used for insulation, consideration should be given to the following characteristics :

- a) resistance to heat transfer;
- b) resistance to penetration of water and water vapour;
- c) behaviour of the insulation in the presence of water in the form of liquid or ice;
- d) emissivity of the surface as regards radiation;
- e) freedom from toxicity by contact of the cladding;
- f) freedom from odour;
- g) the need to avoid water vapour condensation on the warm side;
- h) retention of essential properties (for example form, thermal conductivity, etc.).

4.3.2 Suitable means shall be used to prevent the deterioration of thermal insulation by the ingress of moisture.

4.3.3 Where the insulation space is vented to the inside, steps shall be taken to ensure that particles of the insulation material cannot escape into the food display and storage space. For fibrous insulation materials, any aperture which allows access to the insulating material shall be so designed that it is not possible to insert a probe of 1 mm diameter through it, the probe being applied with negligible force.

4.4 Refrigerating system

4.4.1 There shall be suitable means to prevent water condensed on cold surfaces of the cabinet and its parts from harmfully affecting the operation of the refrigerating system or its controls.

4.4.2 For cabinets fitted with doors or lids, the refrigerating system shall be so designed that it will suffer no damage if any door or lid in the cabinet is left open accidentally while the cabinet is operating in an ambient temperature corresponding to the climate class (see ISO 1992/2) for which the cabinet is intended.

When the door or lid is kept open under normal operating conditions (for example during product loadings), or is left open accidentally, any automatic motor overload protective device may come into operation.

4.4.3 When deciding on the refrigerant for the system, attention shall be given to the possible hazards associated with the use of certain refrigerants and heat-transferring liquids, due to their toxicity, flammability, etc. Guidance on this point is available in ISO/R 1662.

4.4.4 The design and construction of all parts of the refrigerating system subject to internal pressure shall take into account the maximum working pressure to which they will be subjected when the cabinet is in operation or at rest. (See 6.2.2.)

In the case of complete commercial refrigerated cabinets or components thereof which are charged with refrigerant prior to transportation, the maximum ambient temperature during transit shall be taken into account.

4.5 Electrical components

Electrical components shall be in accordance with relevant IEC Publications (in course of preparation).

NOTE — Reference should be made to appropriate national standards pending completion of the IEC Publications.

5 REQUIRED CHARACTERISTICS AND THEIR LIMITS

5.1 Physical dimensions

5.1.1 The manufacturer shall state the following nominal data as defined in ISO 1992/1 :

- a) overall height, depth and length of cabinet;
- b) refrigerated shelf area;
- c) display opening;
- d) net volume.

These measurements shall be made with the cabinet not in operation but situated in ambient conditions corresponding to the climate class (see ISO 1992/2) for which the cabinet is intended.

5.1.2 The tolerances on the physical dimensions shall be as follows :

- a) The difference between the linear dimensions stated by the manufacturer and dimensions measured according to ISO 1992/1, shall not be greater than :

For dimensions > 1 m : $\pm 0,3$ % of that stated by the manufacturer

For dimensions ≤ 1 m : ± 3 mm

- b) The values for items b), c) and d) indicated in 5.1.1, determined according to ISO 1992/1, shall not be less than 97% of those stated by the manufacturer.

5.2 Temperature requirements

The performance of cabinets shall comply with the requirements laid down in ISO 5160/2 relevant to the class

of cabinet under consideration at the declared test room climate class or classes as verified according to the conditions and methods of test specified in ISO 1992/2 and ISO 1992/3.

5.3 Defrosting

5.3.1 The formation of frost is an obstacle to heat transmission. The accumulation of ice or frost on surfaces within the refrigerated space (excluding the surfaces of the test packages) as well as the accumulation of drained water shall not impair the performance of cabinets. This shall be verified according to the conditions and methods of test specified in ISO 1992/4.

5.3.2 Defrosting generally results in an increase in temperature of foods. The foods are affected in various ways by the amount and frequency of the temperature fluctuations. It is therefore necessary to choose the most appropriate defrosting procedure for the foods stored and in relation to the cabinets concerned so that the temperature requirements (see 5.2) are always complied with.

5.3.3 In addition, for cabinets or parts of cabinets, other than those which are intended to be defrosted manually, the defrosting arrangements shall be considered satisfactory if, at the end of the test (see ISO 1992/4), there is no evidence of accumulation of ice or frost on surfaces within the refrigerated space (excluding the surfaces of the test packages), or of accumulation of water resulting from defrosting.

5.3.4 For cabinets or parts of cabinets with manual defrosting, the requirements specified in 5.3.1 and 5.3.2 apply. No standard test allows verification of these requirements; accordingly, the manufacturer shall supply in the instructions all necessary information for the correct operation of the defrosting so as to allow for satisfaction of the above mentioned requirements.

5.4 Water vapour condensation

5.4.1 The performance of cabinets shall not be impaired by water vapour condensation as verified according to the conditions and methods of test specified in ISO 1992/5.

5.4.2 The cabinet shall be considered satisfactory if the report of the test (see ISO 1992/5) shows that during the test period there is no evidence of condensed water vapour having been in direct contact with, or having dripped on to, any test packages and, depending on the method used to detect water vapour condensation, the following results have been obtained :

- a) where the visual method was used, water vapour condensation was not visible on the outer surface of the cabinet to the eye of a trained observer; or
- b) where the temperature of the outer surface of the cabinet was measured with a quick-acting, temperature-sensitive probe, the exterior surface temperature was at

no point less than the values indicated in table 1 for the various test room climate classes specified in ISO 1992/2.

TABLE 1 – Minimum exterior surface temperature of the cabinet

| Test room climate class | Cabinet minimum exterior surface temperature °C |
|-------------------------|-------------------------------------------------|
| 1 | 12 |
| 2 | 15 |
| 3 | 17 |
| 4 | 20 |
| 5 | 24 |

5.5 Odour of materials

(See ISO 4120.)

5.6 Accidental mechanical contact

Under normal conditions of use it shall not be possible to touch moving parts which may constitute an accidental mechanical hazard.

This shall be verified in accordance with ISO 1992/8, which shall be the test for compliance.

If panels within the storage space, for example those which cover the air ducts and the fans, are able to be removed without the use of tools, they shall be fitted with a warning notice indicating that the electric supply to the cabinet shall be switched off before they are removed.

The warning notice shall be written in one more of the official languages of the country in which the cabinet is used, before installation.

6 METHODS OF TEST AND INSPECTION

6.1 Type tests

6.1.1 When the characteristics of a cabinet are to be verified, all the tests and inspections shall in principle be applied to one and the same cabinet. These tests and inspections can also be made individually for the study of a particular characteristic.

6.1.2 The selection, preparation and installation of a cabinet for type testing shall be carried out in accordance with ISO 1992/2 where necessary.

6.1.3 Table 2 lists the type tests and inspections. Cabinets shall comply with the requirements specified in this International Standard using the appropriate test method.

TABLE 2 – Type tests and inspections

| Type tests and inspections | Requirement clause in this International Standard | Test methods |
|------------------------------------|---------------------------------------------------|---------------------------|
| Dimensions, areas and volumes | 5.1 | ISO 1992/1 and ISO 1992/2 |
| Temperature test | 5.2 | ISO 1992/2 and ISO 1992/3 |
| Defrosting test | 5.3 | ISO 1992/2 and ISO 1992/4 |
| Water vapour condensation test | 5.4 | ISO 1992/2 and ISO 1992/5 |
| Electrical energy consumption test | 7.3c) | ISO 1992/2 and ISO 1992/6 |
| Odour of material test | 5.5 | [Under consideration] |
| Accidental mechanical contact test | 5.6 | ISO 1992/2 and ISO 1992/8 |

6.2 Routine production tests

6.2.1 All cabinets in routine production shall be subjected to tests and inspections sufficient to show that each cabinet is similar to the one submitted to type tests and that the complete assembly and all its components are functioning properly.

6.2.2 All refrigerant-carrying components shall be in accordance with ISO/R 1662, part 4, clause 44. Certification shall be provided to ensure that this requirement is fulfilled.

7 MARKING AND INFORMATION

7.1 Load limit

7.1.1 Every cabinet shall be clearly and permanently marked with a load line or lines, on the inside, in the form shown in the figure, to denote the load limit as defined in 3.1 (as sub-clause 2.1 of ISO 1992/1). Where it is not possible to exceed the load limit, no marking is required.

7.1.2 The line shown in the figure shall be continuous, or repeated at intervals to ensure that it cannot be overlooked. Individual markings shall be at least 50 mm long and shall contain at least one triangle.

7.1.3 Where a line cannot be marked because of cabinet design, an outline sketch showing the load limit shall be fixed in a visible position.

7.2 Marking plate¹⁾

Each cabinet shall have the following information marked in a permanent and legible manner in locations where it is readily accessible :

- a) the manufacturer's mark or the trade mark (not necessarily the same name as that of the condensing system);
- b) type, model and serial number of the cabinet, integral condensing system(s), etc., or sufficient information to provide adequate identification for replacement of parts or necessary servicing;
- c) all indications relating to the power source for which the cabinet is designed;
- d) for cabinets having integral condensing systems, the international number of refrigerant(s) (see ISO 817) used and its (their) mass;
- e) for cabinets having remote condensing units, marking in accordance with the requirements of ISO/R 1662.

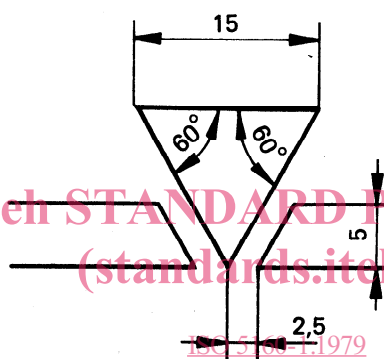
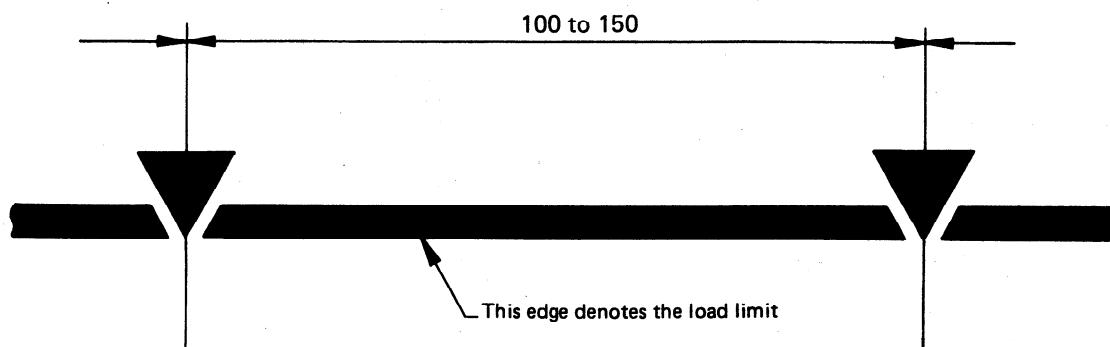
7.3 Information to be supplied by the manufacturer

The following information shall be provided by the manufacturer with each cabinet, but not necessarily as a permanent marking :

- a) overall dimensions (see 5.1.1a));
- b) instructions for installation, use, maintenance, cleaning, and, when necessary, branching and connection;
- c) for each declared class of cabinet and for each declared test room climate class :
 - the display opening;
 - the net volume;
 - where applicable, the refrigerated shelf area;
 - if the condensing system is not fitted by the cabinet manufacturer, the information referred to in ISO 1992/2, sub-clause 3.5;
 - the energy consumption, expressed in kilowatt-hours per 24 h, measured in accordance with the test described in ISO 1992/6;
 - maximum load permitted on the trays and shelves and in the baskets for the various methods of arranging them in the cabinet.

1) See also ISO/R 1662, part 5, sub-clause 53.9.

Dimensions in millimetres



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FIGURE — Marking of load limit