
**Commercial beverage coolers —
Classification, requirements and test
conditions**

*Meubles frigorifiques de vente pour boissons — Classification,
exigences et conditions d'essai*

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 86, *Refrigeration and air-conditioning*, Subcommittee SC 7, *Testing and rating of commercial refrigerated display cabinets*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 44, *Commercial and professional refrigerating appliances and systems, performance and energy consumption*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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.

Commercial beverage coolers — Classification, requirements and test conditions

1 Scope

This document specifies the classification for commercial beverage coolers and their requirements and test methods. This document is applicable to integral refrigeration systems.

This document is not applicable to remote and secondary system cabinets.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 817, *Refrigerants — Designation and safety classification*

ISO 5149-2, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

IEC 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements*

IEC 60335-2-89, *Household and similar electrical appliances — Safety — Part 2-89: Particular requirements for commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or motor-compressor*

3 Terms and definitions

[ISO 22044:2021](https://standards.iteh.ai/catalog/standards/sist/4a6dcd15-e6be-4a9d-87b4-d4c5b20a82b1/iso-22044-2021)

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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/>

3.1 Types of commercial beverage coolers

3.1.1

commercial beverage cooler

refrigerated cabinets to sell and/or display pre-packaged beverage products that are non-perishable, designed to chill products loaded at ambient temperature to the defined storage temperature class within a specified time and for which the customer is allowed direct access to the products

Note 1 to entry: In [Annex A](#) there is the designation of the commercial beverage cooler family.

Note 2 to entry: The customer is an organization or person that receives a product; customer can be internal or external to the organization.

EXAMPLE Consumer, client, end-user, retailer, beneficiary and purchaser.

3.1.2

vertical commercial beverage cooler

beverage cooler with overall height between 0,5 m and 2,2 m

3.1.3

semi-vertical commercial beverage cooler

vertical beverage cooler for which the overall height does not exceed 1,5 m and having either a vertical or inclined display opening

3.1.4

horizontal commercial beverage cooler

beverage cooler with horizontal display opening on its top and accessible from above

3.1.5

open commercial beverage cooler

horizontal/vertical/semi-vertical beverage cooler where there are not barriers for the access to the displayed products

Note 1 to entry: Do not consider night covers as a barrier for the access to the displayed products.

3.1.6

closed commercial beverage cooler

horizontal/vertical/semi-vertical beverage cooler where access to the displayed product is gained by opening a door or a lid (transparent or solid)

3.2 Parts of commercial beverage coolers

3.2.1

air discharge

opening from which the air curtain emerges

3.2.2

air return

opening at which the air curtain flows back to the evaporator or heat exchanger inside the commercial beverage cooler air ducts

3.2.3

shelf

surface excluding the base deck, on which the goods are displayed

3.2.4

night cover

cover permanently integrated into the commercial open beverage cooler used to reduce the heat ingress (e.g. by infrared radiation or convection)

EXAMPLE Covers can be a night curtain, night blind, night lid.

3.2.5

front

side of the commercial beverage cooler facing the consumer

3.2.6

base deck

lowest display surface of a commercial beverage cooler

3.3 Physical aspects and dimensions

3.3.1

refrigerated shelf area

refrigerated display area where the vertical clearance above any shelf or base deck is greater than or equal to 125 mm, measured perpendicularly above the plane of the shelf or base deck and within the bounds of any load limit

3.3.2**depth**

horizontal distance, including rear spacers for air circulation channel, between the front and the rear of the commercial beverage cooler

3.3.3**width**

horizontal distance between the two external sides of the commercial beverage cooler

3.3.4**height**

vertical distance from the floor to the top of the commercial beverage cooler

Note 1 to entry: If the commercial beverage cooler has adjustable feet, the height defined shall be the minimum and the maximum height necessary at installation of the cooler.

3.3.5**load limit**

boundary surface consisting of a plane or several planes within which all M-cans can be maintained within the limits for the M-cans temperature class declared

3.3.6**load limit line**

permanently marked boundary line denoting the edge of the load limit surface

3.3.7**net volume**

storage volume inside the appliance which can be used for storage of products

Note 1 to entry: For the calculation method see [Annex B](#).

3.3.8**gross volume**

volume within the inside walls of the commercial beverage cooler or compartment, including internal fittings, doors or lids, if any, with these being closed, and with the load limit being taken into account if the commercial beverage cooler has no door or lid

3.3.9**equivalent volume**

V_{eg}

reference volume corrected for compartment classification differences

3.3.10**total display area**

TDA

total visible foodstuffs area, including visible area through the glazing, defined by the sum of horizontal and vertical projected surface areas of the net volume

Note 1 to entry: For the calculation method see [Annex D](#).

3.3.11**footprint**

surface occupied by the commercial beverage cooler

3.4 Terms and definitions relating to performance characteristics**3.4.1****air curtain**

air flow going from the air discharge towards the air return, thereby limiting both heat and mass transfers between the commercial beverage cooler's gross volume and the surrounding environment

3.4.2

normal conditions of use

operating conditions which exist when the commercial beverage cooler, including all permanently located accessories, has been set up and situated in accordance with the recommendations of the manufacturer and is in service

Note 1 to entry: The effects of actions by non-technical personnel for purposes of loading, unloading, cleaning, defrosting, the manipulation of accessible controls and of any removable accessories etc., according to the manufacturer's instructions are within this definition. The effects of actions resulting from interventions by technical personnel for the purposes of maintenance or repair are outside this definition.

3.4.3

energy management device

EMD

electronic device that automatically controls the refrigeration system and/or other key components of the commercial beverage cooler during the standby mode

EXAMPLE Lights, fans.

3.4.4

standby mode

state in which commercial beverage cooler's lighting, refrigeration and/or other energy-using systems are automatically adjusted such that they consume less energy than they consume in an active mode

Note 1 to entry: In the case of commercial beverage coolers, equipped with an EMD and with night cover built in, or night lid built in, the EMD standby mode is activated manually when the night curtain or night lid is down.

Note 2 to entry: In the case of commercial beverage coolers, equipped only with night cover built-in, or night lid built-in for the energy consumption test refer to [6.3.8](#).

3.4.5

active mode

state in which the commercial beverage coolers are in the average temperature defined for the product class, also lighting and/or other energy-using systems are on

3.4.6

EMD product average temperature

temperature that allows the commercial beverage cooler, that has been in standby mode for 12 h, to recover the average product temperature defined for each product temperature class in a recovery time less than 4 h

3.4.7

half reload

capability of the beverage cooler to lower all product temperatures within a specified time after half of the products are removed and reloaded with product at ambient temperature

3.4.8

defrosting

removal of frost, snow and ice from a commercial beverage cooler

3.4.9

automatic defrosting

defrosting where no action is necessary by the user to initiate the removal of frost accumulation and to restore normal operation

Note 1 to entry: It includes automatic removal of defrost water.

3.4.10

automatic removal of defrost water

removal and/or evaporation of defrost water that does not require any action by the user

3.4.11**manual removal of defrost water**

removal of defrost water that requires an action by the user

3.4.12**specific energy consumption****SEC**

index of the efficiency of the *commercial beverage cooler* (3.1.1), expressed as the ratio of TEC divided by *equivalent volume* (3.3.9)

Note 1 to entry: SEC is expressed in kilowatt hours per 24 h per m³ [kWh/24 h·m³].

3.5 Terms and definitions related to test environment**3.5.1****M-can**

test can used to simulate the product during tests, fitted with a temperature measuring device

3.5.2**climate class**

classification of the test room climate according to the dry bulb temperature and relative humidity

3.5.3**M-cans temperature class**

classification of test temperature according to temperatures of warmest and coldest M-cans during the temperature test

3.5.4**commercial beverage cooler classification**

designation given by the combination of climate class and M-cans temperature class

4 Symbols and abbreviated terms

t_{run}	running time — time during which compressor is running in normal condition within 24 h
t_{stop}	stopping time — time during which compressor is not running (or solenoid valve is close) within 24 h
t_{defst}	defrost time — time during defrost during which compressor is not running (or solenoid valve is closed) or secondary refrigerant is generally not circulating, within 24 h, but not considered as stopping time
t_{pull}	pull down time – time to pull down the temperature of the beverages from the ambient temperature to the defined temperature class
t_{hr}	half reload time – time to recover the beverage cooler temperature after the half reload with product at ambient temperature
t_{90}	time in which 90 % of a sudden temperature change of 20 °C is indicated, the measurement medium being moderately agitated air (velocity 1 m/s)
Δt	time between two consecutive measuring samples
N_{max}	number of measuring samples in 24 h
n_{defst}	number of defrosts during 24 h
TEC	total energy consumption in kWh per 24 h

SEC	specific energy consumption for commercial beverage cooler expressed in kWh/24 h·m ³ (TEC/V _{eq})
t _{rr}	relative or percentage running time
θ	temperature
θ _m	average mean temperature
θ _{ah}	highest temperature of warmest M-cans
θ _b	lowest temperature of coldest M-cans
V _{eq}	equivalent volume

5 Classification and requirements

5.1 Classification according to temperature

The performance of commercial beverage cooler shall comply with one of the classifications defined in [Table 1](#). The performance shall be verified in accordance with the conditions and test methods specified in the following clauses.

Table 1 — Classification according to temperature

Class	Highest temperature, θ _{ah} , of warmest M-can colder than or equal to [°C]	Lowest temperature, θ _b , of coldest M-can warmer than or equal to [°C]	Average temperature equal to or less than [°C]
K ₁	+7,0	0,0	3,5
K ₂	+6,0	-1,0	2,5
K ₃	+1,0	-3,5	-1,0
K ₄	+9,0	1,0	+5,0
S	Special classification		

NOTE The M-can temperature classes are measured with an expanded measurement uncertainty of ±0,8 °C.

5.2 Construction

5.2.1 General

5.2.1.1 Strength and rigidity

The commercial beverage cooler 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:

- interior fittings, including shelves, baskets, rails, etc. and their supports, shall be sufficiently strong for the duty required;
- where sliding shelves, baskets, trays or drawers are fitted they shall retain their shape and ease of movement when fully loaded;
- 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.

5.2.1.2 Pipes and connections

Pipes and connections to moving or resiliently mounted parts shall be arranged so as not to foul or 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.

5.2.1.3 Condensate drainage

Where drains, drip trays or evaporation receptacles are fitted, they shall have ample capacity and shall be easily accessible and cleanable.

5.2.1.4 Joints and seams

All construction joints and seams within the net volume shall prevent the accumulation of potentially contaminating substances.

All construction joints and seams within the net volume shall permit the easy removal of any deposits of potentially contaminating substances.

5.2.2 Materials

5.2.2.1 General

The materials shall be durable and shall not favour the development of mould or emit odours.

Under normal conditions of use, materials in contact with foodstuffs shall be resistant to moisture and shall neither be toxic nor contaminate them.

5.2.2.2 Wear resistance

Internal and external finishes shall be resistant to wear 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.

5.2.2.3 Corrosion resistance

Metal parts, used in the construction of commercial beverage coolers, shall have resistance to corrosion appropriate to their location and function.

5.2.3 Thermal insulation

5.2.3.1 Efficiency

The thermal insulation shall be efficient and permanently fixed. In particular, the insulating material shall not be subject to shrinkage and shall not allow under normal working conditions an accumulation of moisture.

5.2.3.2 Vapour barrier

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

5.2.3.3 Containment of insulation material

Where the insulation space is vented to the inside, it shall be ensured that particles of the insulation material cannot escape into the foodstuff display compartment.

For fibrous insulation materials, it shall not be possible to insert a rigid probe of 1 mm diameter through any aperture which allows access to the insulating material, the probe being applied with negligible force.

5.2.4 Refrigerating system

5.2.4.1 Design and construction

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 are subjected when the commercial beverage cooler is in operation or at rest.

For commercial beverage coolers with components thereof which are charged with refrigerant prior to transportation, the maximum ambient temperature during transit shall be taken into account. All refrigerant containing components shall be in accordance with ISO 5149-2.

5.2.4.2 Condensation

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

5.2.4.3 System protection

For commercial beverage cooler fitted with doors or lids, the refrigerating system shall suffer no damage if any door or lid in the commercial beverage cooler is left open while the commercial beverage cooler is operating in an ambient temperature corresponding to the climate class (see [Table 1](#)) for which the commercial beverage cooler is intended.

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

5.2.4.4 Refrigerant

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-transfer media or secondary refrigerant, due to their toxicity, flammability etc. Guidance on this point is available in ISO 5149-2.

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5.2.5 Electrical components

Electrical components shall be in accordance with IEC 60335-2-89 and IEC 60335-1.

6 Tests

6.1 General

When the characteristics of a commercial beverage cooler are to be verified, all the tests and inspections shall be applied to one and the same commercial beverage cooler. These tests and inspections may also be made individually for the study of a particular characteristic.

[Table 2](#) lists the tests and inspections. Commercial beverage cooler shall comply with the requirements specified in this part of standard using the appropriate test method.

Table 2 — Test summary

Tests and inspections	Requirement clause in this document	Test method	Test room
Seal test	—	6.2.2	Outside test room (see 6.2)
Absence of odour and taste (not compulsory)	—	Annex E	
Durability of door and lid			
Temperature	5.1	6.3.11	Inside test room (see 6.3)
Water vapour condensation	5.2.4.2	6.3.12	
Energy consumption		6.3.13	
Half reload recovery		6.3.11.3	

6.2 Tests outside test room

6.2.1 General

The tests which may be carried out outside the test room deal with the inspection of construction characteristics, physical dimensions and the absence of odour and taste.

6.2.2 Seal test for doors and lids

The effectiveness of doors or lids provided to ensure a seal shall be tested as follows (with the commercial beverage cooler not running). See [Figure 1](#).

Insert a strip of paper 50 mm wide, 0,08 mm thick and of a suitable length at any point of the seal. With the door or lid closed normally on it the strip of paper shall not slide freely.

NOTE 1 Attention is drawn to the fact that some commercial beverage coolers having doors provided to ensure an air seal 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 commercial beverage cooler can be compensated. No test is required for such valves.

NOTE 2 The most unfavourable points can be found by inspecting the contact of the seal with the commercial beverage cooler closed and lighted from the inside.

6.2.3 Test on durability of door and lid

6.2.3.1 Test condition/preparation

The purpose of these tests, carried out using the following procedures, is to check the durability of the hinges and handles of doors. The ambient temperature shall be between +16 °C and +32 °C. The refrigerating appliance shall be switched off.

6.2.3.2 Opening sequence

The movement of the door shall be controlled from an angle of 0° to an angle of opening between 5° and 45°, followed by a free movement of the door, the controlled movement being approximately sinusoidal. The opening of the door shall take place in the first quarter of the period of the cycle.

6.2.3.3 Closing sequence

The number of cycles per minute shall be 10 to 25. External doors shall withstand 100 000 opening and closing operations without deterioration which could be prejudicial to the airtightness of the door.