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

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## Foreword

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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](http://www.iso.org/directives)).

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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*.

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# Commercial beverage coolers — Classification, requirements and test conditions

## 1 Scope

The scope of this Standard is to define the classification for commercial beverage coolers and to specify their requirements and test methods. This Standard is applicable to integral refrigeration systems.

This Standard 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*

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

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

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1 Types of commercial beverage cooler

#### 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 the next [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 greater than 1,5 m

### 3.1.3

#### **semi-vertical commercial refrigerated 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

### 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)

### 3.1.7

#### **combined commercial beverage cooler with glass door top**

beverage cooler consisting of a refrigerated bottom, open or with transparent/solid lid, and a transparent/solid door refrigerated top

### 3.1.8

#### **combined commercial beverage cooler with open top**

beverage cooler consisting of a refrigerated bottom, open or with transparent/solid lid, and an open refrigerated top

## 3.2 Parts of commercial beverage cooler

### 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

#### **ticket holder**

profile fitted along the commercial beverage cooler shelves which enables different types of labels for consumer information to be displayed

### 3.2.5

#### **kickplate**

vertical plate or plinth that covers the gap between the floor and base of the commercial beverage cooler



**3.2.6****nightcover**

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

EXAMPLE Example of cover is night curtain, night blind, night lid.

**3.2.7****canopy**

upper front part of a vertical/semi-vertical commercial beverage cooler

**3.2.8****front panel(s)**

group of aesthetic pieces of the commercial beverage cooler front, visible to the customer

**3.2.9****front**

side of the commercial beverage cooler facing the consumer

**3.2.10****front riser**

device for retaining the goods within the display surface

**3.2.11****base deck**

lowest display surface of a commercial beverage cooler

**3.2.12****shelf sham**

device to limit the loading of a display surface

**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 side of the commercial beverage cooler

**3.3.4****height**

vertical distance from the floor to the top of the commercial beverage cooler; if the commercial beverage cooler has an 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**

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 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 stand-by mode

EXAMPLE Lights, fans.

**3.4.4****stand-by 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 stand-by 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 stand-by 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****semi-automatic defrosting**

defrosting where an action is necessary by the user to initiate the removal of frost accumulation and normal operation is restored automatically

Note 1 to entry: It either includes automatic removal of defrost water or entails manual removal of defrost water.

**3.4.11****defrost water removal**

process through which defrost water is removed from a commercial beverage cooler

**3.4.12****automatic removal of defrost water**

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

**3.4.13****manual removal of defrost water**

removal of defrost water that requires an action by the user

**3.4.14****total energy consumption****TEC**

total energy consumption in kilowatt hours per 24 h

### 3.4.15

#### specific energy consumption

##### SEC

specific energy consumption for commercial beverage cooler expressed in kilowatt per 24 h per m<sup>3</sup> (TEC/Veq)

## 3.5 Definition related to test environment

### 3.5.1

#### M-cans

test cans 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

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## 4 Symbols

$t_{run}$	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
$t_{deft}$	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)
$\Delta t$	time between two consecutive measuring samples
$N_{max}$	number of measuring samples in 24 h
$n_{deft}$	number of defrosts during 24 h
TEC	total energy consumption in kilowatt hours per 24 h
SEC	specific energy consumption for commercial beverage cooler expressed in kilowatt per 24 h per m <sup>3</sup> (TEC/Veq)
$t_{rr}$	relative or percentage running time:

$$t_{rr} = \frac{t_{run}}{t_{run} + t_{stop}} = \frac{t_{run}}{24 - t_{defl}} \quad (1)$$

where

$$t_{run} + t_{stop} + t_{defl} = 24h \quad (2)$$

## 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, $\theta_{ah}$ , of warmest M-can colder than or equal to [°C]	Lowest temperature, $\theta_b$ , of coldest M-can warmer than or equal to [°C]	Average temperature equal to or less than [°C]
K <sub>1</sub>	+7,0	0,0	3,5
K <sub>2</sub>	+6,0	-1,0	2,5
K <sub>3</sub>	+1,0	-3,5	-1,0
K <sub>4</sub>	+9,0	1,0	+5,0
S	Special classification		

NOTE The M-can temperature classes are measured with an expanded measurement uncertainty of  $\pm 0,8$  °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

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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.

## 5.2.5 Electrical components

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