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Ice-cream freezers - Classification, requirements and test conditions (ISO/DIS 22043:2024)

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Ice-cream freezers — Classification, requirements and test conditions

Congélateurs pour crèmes glacées — Classification, exigences et conditions d'essai

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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).

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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*, 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).

This second edition cancels and replaces the first edition (ISO 22043:2020) which has been technically revised.

The main changes are as follows:

— addition of Class C3 in Table 1 “Classification according to temperature” and in Table 9 “Temperature rise time conditions for C1 and C3”

— Improvement on Figures:

  — Correction of Figure 13 “Arithmetic mean temperature of M-package”

  — Table 13: addition of symbol θm for the average mean temperatures of all M-packages

— Addition of Annex ZA Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 2019/2024 OJEU L 315/313 aimed to be covered

— Addition of Annex ZB Relationship between this European Standard and the energy labelling requirements of Commission Delegated Regulation (EU) No 2019/2018 OJEU L 315/155 aimed to be covered

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.

Ice-cream freezers — Classification, requirements and test conditions

1 Scope

This document specifies the classification for horizontal closed ice-cream freezer with access of the product from the top via transparent or solid lid(s) and specifies their requirements and test methods.

The ice-cream freezers defined in this document work with static air cooling, with a skin evaporator (no evaporator fan and no fan in the refrigerated space) and are used specifically for the storage and display of pre-packed ice-cream.

This document is only applicable to integral type refrigeration systems. It is not applicable to remote and secondary system type cabinets. Ice-cream freezers defined in this document are intended to have a net volume ≤600 l. For transparent lid ice-cream freezers only, they are intended to have a net volume/ TDA ≥ 0,35 m.

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 817:2014, *Refrigerants — Designation and safety classification*

ISO 5149-2:2014, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

IEC 60335-1:2020, *Household and similar electrical appliances — Safety — Part 1: General requirements*

IEC 60335-2-89:2019, *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

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 General

3.1.1
ice-cream freezer
horizontal closed refrigerated cabinet intended to store and/or display and sell pre-packed ice cream where access by the consumer to the pre-packed ice cream is gained by opening a lid (solid or transparent) from the top

Note 1 to entry: See Annex A for the designation of the ice-cream freezer family.

3.2 Parts of ice-cream freezers

3.2.1
condensing unit
combination of one or more compressors, condensers and liquid receivers (when required) and the regularly furnished accessories

3.2.2
night cover
top cover permanently integrated into the *ice-cream freezer* (3.1.1) used to reduce the heat ingress (e.g. by infrared radiation or convection) during the period when there are no sales

3.3 Physical aspects and dimensions

3.3.1
depth
horizontal distance between the front and the rear of the *ice-cream freezer* (3.1.1)

3.3.2
width
horizontal distance between the two external sides of the *ice-cream freezer* (3.1.1)

3.3.3
height
vertical distance from the bottom to the top of the *ice-cream freezer* (3.1.1)

3.3.4
load limit
boundary surface consisting of a plane or several planes within which all *M-packages* (3.5.1) can be maintained within the limits for the declared M-package temperature class

3.3.5
load limit line
permanently marked boundary line denoting the edge of the *load limit* (3.3.4) surface

3.3.6
net volume
V_N
storage volume inside the appliance which can be used for storage of products

Note 1 to entry: The calculation method in 6.2.5 shall be applied.

3.3.7
gross volume
volume within the inside walls of the *ice-cream freezer* (3.1.1) or compartment, including internal fittings and the lid when closed

3.3.8
equivalent volume
V_{eq}
reference volume corrected for compartment temperature classification

Note 1 to entry: The calculation method in Annex B shall be applied.

3.3.9
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* (3.3.6)

Note 1 to entry: For the calculation method see Annex C.

3.3.10
footprint
surface occupied by the *ice-cream freezer* (3.1.1)

3.4 Performance characteristics

3.4.1
normal conditions of use
operating conditions which exist when the *ice-cream freezer* (3.1.1), 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 the purposes of, e.g. loading, unloading, cleaning, defrosting, the manipulation of accessible controls and of any removable accessories, according to the manufacturer's instructions are applicable within this definition. The effects of actions resulting from interventions by technical personnel for the purposes of maintenance or repair are outside this definition.

3.4.2
defrost
removal of frost, snow and ice from an *ice-cream freezer* (3.1.1)

3.4.3
total energy consumption
TEC
total amount of energy used by an *ice-cream freezer* (3.1.1)

3.4.4
specific energy consumption for ice-cream freezers
SEC
index of the efficiency of the *ice-cream freezer* (3.1.1), expressed as the ratio of TEC divided by *equivalent volume* (3.3.8) (TEC/Equivalent volume)

3.4.5
product temperature
one of the classifications document establishing the performance level of the *ice-cream freezer* (3.1.1)

Note 1 to entry: Defined in Table 1.

3.4.6
relative compressor running time
ratio of compressor running time to overall duration of a measurement cycle excluding defrost time

3.5 Test environment

3.5.1
M-package
test package 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-package temperature class
classification of *M-package* (3.5.1) temperature according to the temperatures of the warmest M-packages during the temperature test

3.5.4
ice-cream freezer classification
designation given by the combination of *climate class* (3.5.2) and *M-package temperature class* (3.5.3)

4 Symbols and abbreviated terms

t_{run} running time — time during which the compressor is running within the 24 h test period

t_{stop} stopping time — time during which the compressor is not running within the 24 h test period and excluding defrost time

Δt time between two consecutive measurement samples

N_{max} number of measuring samples in the 24 h test period

RH Relative humidity

SEC specific energy consumption for ice-cream freezers expressed in kilowatt hours per 24 h per m^3 (TEC/V_{eq});

TEC total energy consumption in kilowatt hours per 24 h period

T_{rr} relative or percentage running time:

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

where $t_{run} + t_{stop} = 24$ h

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)

V_{eq} equivalent volume

V_N net volume

5 Classification and requirements

5.1 Classification

The classification of the ice-cream freezers is done according to temperature. The performance of ice-cream freezers 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 Annex E.

Table 1 — Classification according to temperature

Class	Warmest M-package temperature colder or equal to in all tests except lid opening test °C	Warmest M-package maximum temperature rise allowed K
C1	–18,0	2,0
C2	–7,0	2,0
S	Special classification	2,0
C3	-14,0	2,0

5.2 Requirements

5.2.1 Construction

5.2.1.1 Strength and rigidity

The ice-cream freezer and its parts shall be constructed with adequate strength and rigidity for normal conditions of handling, transport and use. Attention shall be given to the following:

a) interior fittings shall be sufficiently strong for the duty required;

b) where sliding shelves, baskets or trays 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.

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 have sufficient free length and/or vibration eliminators to prevent failure due to fatigue. Where necessary, pipes and valves shall be adequately thermally insulated.

5.2.1.3 Lids

Lids shall be condensate-free at the climate class specified by the manufacturer.

When any lids provided to ensure an air seal to the refrigerated space are closed, there shall be no undue leakage of ambient air into the interior (see 6.2.1). The lids shall not open of their own accord.

The gasket shall be made from a material whose characteristics are compatible with the 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.

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 Corrosion resistance

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

5.2.2.3 Thermal insulation

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.

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

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.

5.2.3 Refrigerating system

5.2.3.1 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 ice cream freezer is in operation or at rest. The maximum ambient temperature during transit shall be taken into account. All refrigerant containing components shall be in accordance with ISO 5149-2:2014.

5.2.3.2 Condensation

There shall be suitable means to prevent water condensing on cold surfaces of the ice cream freezer and its parts and from harmfully affecting the operation of the refrigerating system or its controls.

5.2.3.3 System protection

For ice-cream freezers, the refrigerating system shall suffer no damage if any lid in the cooler is left open while the ice cream freezer is operating in an ambient temperature corresponding to the climate class (see Table 1) for which the cooler is intended. When the 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.

5.2.3.4 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 due to their toxicity, flammability, etc. Guidance on this point is available in ISO 5149-2:2014.

5.2.4 Electrical components

5.2.4.1 General

Electrical components shall be in accordance with IEC 60335-1:2020 and IEC 60335-2-89:2019.

5.2.4.2 Temperature display

The ice-cream freezer shall incorporate a temperature display instrument showing the air temperature in the refrigerated display ice-cream freezer, at the load line, to provide an indication of the operation and functioning of the refrigerating equipment and information on its operating state.

NOTE As a rule, measured air temperature is not identical with pre-packed ice-cream temperature in an ice-cream freezer.

5.2.4.3 Temperature-measuring instrument

Suitable temperature-measuring instruments shall be used, i.e. those that fulfill the following requirements:

— the unit symbol (°C) shall be inscribed or displayed on the temperature-measuring instrument;

— the range of measurement shall be at least from −40 °C to + 40 °C;