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Introduction

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For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex **(e.g. 3.1)**	Paragraph/ Figure/Table/Note	**Type of comment**	**Commend (justification for change) by the MB**	**Proposed change by the MB**	**Secretariat observations on each comment submitted**
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

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DRAFT International Standard

ISO/DIS 22043

Ice-cream freezers — Classification, requirements and test conditions

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

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2025-03-03

This document is circulated as received from the committee secretariat.

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Full document details: 24/30482138 DC

Contents

Page

Foreword ..... **v**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**
3.1 General 1
3.2 Parts of ice-cream freezers 2
3.3 Physical aspects and dimensions 2
3.4 Performance characteristics 3
3.5 Test environment 3

4 Symbols and abbreviated terms **4**

5 Classification and requirements **4**
5.1 Classification 4
5.2 Requirements 5
5.2.1 Construction 5
5.2.2 Materials 5
5.2.3 Refrigerating system 6
5.2.4 Electrical components 6
5.2.5 Operating characteristics 7

6 Tests **7**
6.1 General 7
6.2 Tests outside test room 8
6.2.1 General 8
6.2.2 Seal test for lids 8
6.2.3 Test on durability of lid 8
6.2.4 Linear dimensions, areas and volumes 9
6.2.5 Net volume calculation 9
6.3 Tests inside test room 9
6.3.1 General 9
6.3.2 Test room conditions 10
6.3.3 Test packages and life-time 11
6.3.4 Instruments, measuring equipment and measuring expanded measurement uncertainty 15
6.3.5 Preparation of test ice-cream freezer 16
6.3.6 Test on ice-cream freezers 23

7 Test report **27**
7.1 General 27
7.2 Tests outside test room 27
7.3 Tests inside test room 28

8 Marking **29**
8.1 Load limit 29
8.2 Marking plate 31
8.3 Information to be supplied by the manufacturer 31

Annex A (informative) **Ice-cream freezer families** **33**

Annex B (normative) **Equivalent volume calculation** **34**

Annex C (normative) **TDA calculation** **35**

Annex D (informative) **Test for absence of odour and taste** **37**

Annex E (normative) **Performance and energy rating of ice-cream freezers** **39**

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Annex ZA (informative) **Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 2019/2024 OJEU L 315/313 aimed to be covered** **40**

Annex ZB (informative) **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** **41**

Bibliography **42**

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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

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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.

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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.

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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)

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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

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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.

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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;

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— the scale division or smallest numerical increment shall be less than or equal to 1 °C;

— the maximum errors shall be 2 K over the total measuring range;

— the time constant t_{90} of the sensor shall be equal to or less than 20 min.

When temperature-measuring instruments are employed in ice-cream freezers:

— one temperature-measuring instrument shall be employed for each ice-cream freezer with its own refrigerating circuit.

5.2.4.4 Temperature sensor location

The temperature sensor location shall be readily accessible to enable on-site testing for the correct indication of temperature and replacement of the temperature measuring instrument on-site in service.

The temperature sensor of a thermometer is considered to be "readily accessible" if it is reached directly for examination. It is necessary to remove the access panel(s) to carry out replacement.

NOTE 1 The positioning of the temperature sensor in a guide tube is also considered to be "readily accessible" if the sensor is introduced into and removed from the guide tube without a tool.

Wherever possible, the mounting method shall not supply heat to, or withdraw heat from the temperature sensor. The temperature sensor shall be protected against heat radiation from the external ambient.

NOTE 2 For electronic controllers, it is possible to display a calculated temperature.

NOTE 3 For recording and display of temperatures, one or two temperature sensors are used. The temperature sensor is the same as those used for controlling the refrigeration. An alarm is activated in case of error. This option is not in accordance with the requirements of EN 12830.

5.2.5 Operating characteristics

5.2.5.1 Water vapour condensation

The performance of the ice-cream freezer shall not be impaired by water vapour condensation. The amount of water vapour condensation shall be verified according to the conditions and test methods specified in 6.3.6.4.

5.2.5.2 Energy consumption

The energy consumption shall be stated by the manufacturer. The total energy consumption (TEC) shall be measured and calculated according to the conditions and the test methods specified in 6.3.6.6.3.

5.2.5.3 Specific energy consumption

The ice-cream freezer specific energy consumption (SEC) as ratio between TEC and equivalent volume (TEC/V_{eq}) shall be stated by the manufacturer. This value shall be used to compare the energy efficiency between different ice-cream freezers.

6 Tests

6.1 General

When the characteristics of an ice-cream freezer are to be verified, all the tests and inspections shall be applied to one and the same ice-cream freezer. These tests and inspections may also be made individually for the study of a particular characteristic.

Table 2 lists the tests and inspections that shall be carried out. Ice-cream freezers shall comply with the requirements specified in this part of the document using the appropriate test method.

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