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**Hladilne vitrine za sladoled - Razvrščanje, zahteve in preskusni pogoji**

Refrigerated display scooping cabinets for gelato - Classification, requirements and test conditions

Verkaufskühlmöbel für Speiseeis - Klassifizierung, Anforderungen und Prüfbedingungen

Vitrines réfrigérées de vente de glace - Classification, exigences et conditions d'essai

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**Refrigerated display scooping cabinets for gelato -  
Classification, requirements and test conditions**

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exigences et conditions d'essai

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Anforderungen und Prüfbedingungen

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**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## European foreword

This document (EN 16838:2016) has been prepared by Technical Committee CEN/TC 44 “Commercial and Professional Refrigerating Appliances and Systems, Performance and Energy Consumption”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2017, and conflicting national standards shall be withdrawn at the latest by January 2017.

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## EN 16838:2016 (E)

## 1 Scope

This European Standard specifies requirements for the construction, characteristics and performance of refrigerated display scooping cabinets for gelato used to sale and display artisan and self made gelato, hereafter called “gelato scooping cabinets”. It specifies test conditions and methods for checking that the requirements have been satisfied, as well as classification of the cabinets, their marking and the list of their characteristics to be declared by the manufacturer.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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*

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

## 3 Terms and definitions

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

**3.1**  
**gelato scooping cabinets**  
cabinet cooled by a refrigerating system which enables, to store, to display and to scoop artisan and self made gelato contained in tubs, within prescribed temperature limits

Note 1 to entry: Artisan and self made gelato are hereafter called “gelato”.

**3.2**  
**storage section**

non-visible part of the gelato scooping cabinet used only to store the product, separated from the display volume and with a different access

**3.3**  
**display section**

visible part of the gelato scooping cabinet used only to display and to scoop the product

**3.4**  
**covers**  
sliding door or night curtain or swivel panes

**3.5**  
**gelato Tub**  
container intended to store gelato



**3.6****net volume**

volume containing gelato within the top edge of the tub

**3.7****top display area of GelatoTub**

area delimited by the external perimeter of a gelato tub open side

**3.8****front display area of GelatoTub**

area delimited by the external perimeter of a gelato tub front side

**3.9****total net volume**

net volume of the storage section

**3.10****total display area TDA**

sum of the top area and the front display area of each visible gelato tubs

**4 Symbols and abbreviations**

$t_{\text{run}}$	running time — time during which compressor is running (or solenoid valve is open), within 24 h, expressed in hours
$t_{\text{stop}}$	stopping time — time during which compressor is not running (or solenoid valve is closed) within 24 h and excluding defrost time, expressed in hours
$t_{\text{deft}}$	defrost time — time during which compressor is running and hot gas solenoid valve is open (or reverse cycle valve is open)
$q_m$	mass flow rate of liquid refrigerant in kilograms per second
$\Delta t$	time between two consecutive measuring samples, in hours
$N_{\text{max}}$	number of measuring samples in 24 h
$n_{\text{deft}}$	number of defrosts during 24 h
DEC	direct electrical energy consumption, in kilowatt hours per 24 h period
REC <sub>RC</sub>	refrigeration electrical energy consumption, in kilowatt hours per 24 h period, for remote gelato scooping cabinet for compression-type refrigerating system
TEC	total energy consumption in kilowatt hours per 24 h period
TDA	total display area, in square meters
TEC/TDA	Specific Energy Consumption (SEC) for Gelato scooping cabinet expressed in kilowatt hours per 24 h per square meters
$t_{\text{rr}}$	relative or percentage running time:

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

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where  $t_{\text{run}} + t_{\text{stop}} + t_{\text{deft}} = 24\text{h}$

$\Phi_n$	instant heat extraction rate in kilowatts
$h_8, h_4$	specific enthalpy in kilojoules per kilogram, where state in Figure 11 corresponds to refrigerant outlet, and state in Figure 12 to refrigerant inlet, of Gelato scooping cabinet
$\theta_7$	refrigerant temperature at evaporator outlet, in degrees Celsius
$\theta_8$	refrigerant temperature at the Gelato scooping cabinet outlet, in degrees Celsius
$\theta_4$	refrigerant temperature at the Gelato scooping cabinet inlet, in degrees Celsius
$\theta_5$	refrigerant temperature at evaporator inlet, in degrees Celsius
$p_8$	refrigerant pressure at the Gelato scooping cabinet outlet, in Pascals
$\theta_{\text{mrun}}$	arithmetic average of evaporator-saturated temperature obtained from pressure $p_8$ by referring to table of saturation properties for refrigerant in use — during $t_{\text{run}}$ , in degrees Celsius
$\theta_{\text{min}}$	arithmetic average of evaporator-saturated temperature obtained from pressure $p_8$ by referring to table of saturation properties for refrigerant in use — during the last 10 % of all running periods, in degrees Celsius
$T_{\text{mrun}}$	$= \theta_{\text{mrun}} + 273,15$ in Kelvin

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## 5 Requirements

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### 5.1 Construction

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#### 5.1.1 General

##### 5.1.1.1 Strength and rigidity

The Gelato scooping 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:

- 1) interior fittings, including shelves, baskets, rails, etc. and their supports, shall be sufficiently strong for the duty required;
- 2) where sliding shelves, baskets, trays or drawers are fitted they shall retain their shape and ease of movement when fully loaded;
- 3) 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.

##### 5.1.1.2 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.

### 5.1.1.3 Condensate drainage

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

Any condensate or defrost water receptacle, or group of receptacles, requiring to be emptied manually shall have a capacity equivalent to at least 48 h of normal operation in the appropriate climate class for which the Gelato scooping cabinet is intended.

### 5.1.1.4 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.

## 5.1.2 Materials

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.

## 5.1.3 Refrigerating system

### 5.1.3.1 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 Gelato scooping cabinet is in operation or at rest.

For Gelato scooping cabinets with integral condensing unit or 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.

### 5.1.3.2 Condensation

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

### 5.1.3.3 System protection

For Gelato scooping cabinets fitted with covers, the refrigerating system shall suffer no damage if any cover in the gelato scooping cabinet is left open while the gelato scooping cabinet is operating in an ambient temperature corresponding to the climate class (see Table 4) for which the gelato scooping cabinet is intended.

When the cover 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.

### 5.1.3.4 Refrigerant

When deciding on the refrigerant for the system, attention shall be given to the possible hazards associated with the use of certain refrigerants, due to their toxicity, flammability etc. Guidance on this point is available in ISO 5149-2.

## 5.1.4 Electrical components

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

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### 5.1.5 Temperature display

#### 5.1.5.1 General

The Gelato scooping cabinets shall incorporate a temperature display instrument showing the air temperature in the refrigerated display scooping cabinets to provide an indication of the operation and functioning of refrigerating equipment and information on its operating state.

NOTE As a rule, measured air temperature is not identical with gelato temperature in Gelato scooping cabinets.

#### 5.1.5.2 Temperature-measuring instrument

Suitable temperature-measuring instruments shall be used, i.e. those that fulfil 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 -25 °C to +15 °C;
- 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.

NOTE The  $t_{90}$  time is the 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).

#### 5.1.5.3 Temperature sensor location

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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.

NOTE 1 The temperature sensor of a thermometer is considered to be “readily accessible” if it is reachable directly for examination. It ought to be necessary to remove access panel(s) to carry out replacement.

NOTE 2 For Gelato scooping cabinets with natural convection cooling, 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.

The temperature sensor location is defined as part of the temperature test of the Gelato scooping cabinet. During the temperature test air temperatures at the declared sensor location shall be measured and these values noted in the test report.

NOTE 3 It is the responsibility of the supplier and end user to ensure that the temperature measurements complies with national regulation on temperature control of gelato.

### 5.2 Operating characteristics

#### 5.2.1 Absence of odour and taste

The absence of odour and taste is not compulsory. An optional test method is given in Annex A.

### 5.2.2 Classification according to temperature

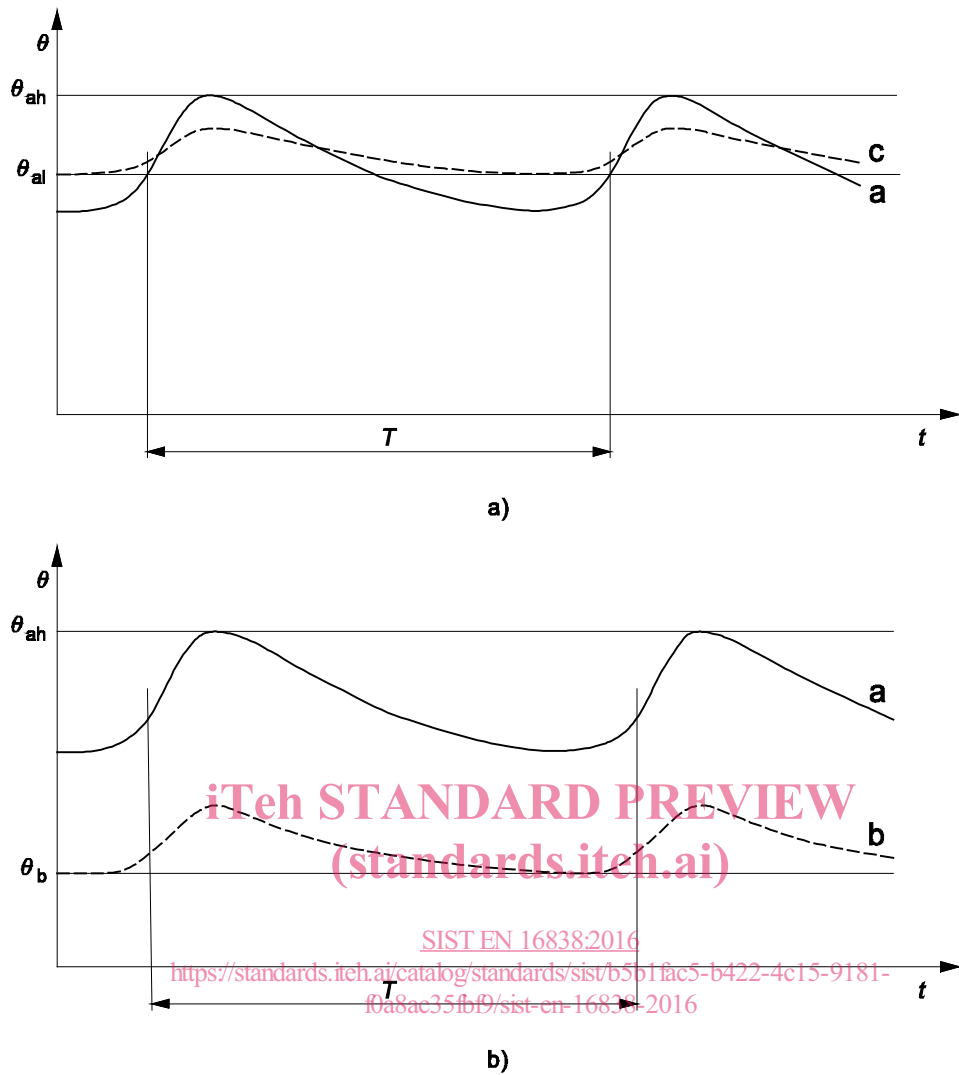
The performance of Gelato scooping cabinet shall comply with one of the classifications defined in Table 1. The performance shall be verified in accordance with the conditions and test methods specified in 6.3.3.

**Table 1 — Temperature classes**

Class	Highest temperature, $\theta_{ah}$ , of warmest M-Test gelato tubs colder than or equal to <sup>a b</sup>	Lowest temperature, $\theta_b$ , of coldest M-Test gelato tubs warmer than or equal to <sup>b</sup>	Highest minimum temperature, $\theta_{al}$ , of all Test tubs colder than or equal to <sup>a</sup>
	°C		
G1	-10	-14	
G2	-10	-16	
G3	-10	-18	
L1	-15		-18
L2	-12		-18
L3	-12		-15
S	Special classification		
a, b See Figure 1.			

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### Key

- a) temperature curves of the warmest and of the highest minimum value of M-test gelato tub
- b) temperature curves of the warmest and of the coldest M-test gelato tub
- a temperature curve a of warmest M-test gelato tub
- b temperature curve b of coldest M- test gelato tub
- c temperature curve with the highest minimum value of all M-gelato tubs
- $\theta$  temperature
- $\theta_{ah}$  highest temperature of warmest M-test gelato tubs
- $\theta_b$  lowest temperature of coldest M-test gelato tubs
- $\theta_{al}$  highest minimum temperature of all M-gelato tubs
- $t$  time
- $T$  test period

**Figure 1 — Relevant temperature curves of M-Test gelato tubs**

### 5.2.3 Defrosting

The accumulation of ice, frost or snow on surfaces within the refrigerated space, as well as the accumulation of drained defrost water, shall not occur, as it would impair the performance of Gelato scooping cabinets other than those which are intended to be defrosted manually. This shall be verified according to the conditions and test methods specified in 6.3.4.5.

The proposed defrosting procedures (automatic or manual) shall not affect the temperature requirements.

For Gelato scooping cabinets or sections of Gelato scooping cabinets with manual defrosting, the manufacturer shall supply all necessary instructions for the correct operation of the defrosting system.

### 5.2.4 Water vapour condensation

The performance of Gelato scooping cabinets 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 6.3.5.

### 5.2.5 Energy consumption

The direct electrical energy consumption (DEC) and, when the condensing unit is remote from the Gelato scooping cabinet, the refrigeration electrical energy consumption (REC) and total energy consumption (TEC) shall be measured and calculated according to the conditions and the test methods specified in 6.3.6 and 6.3.7.

### 5.2.6 Specific Energy Consumption

Specific Energy Consumption is the rate between TEC and TDA for Gelato scooping Cabinet.

## 6 Test condition

### 6.1 General

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

Table 2 lists the tests and inspections. Gelato scooping cabinets shall comply with the requirements specified in 6.1 using the appropriate test method.

**Table 2 — Test summary**

Tests and inspections	Requirement clause in this part	Test method	
Physical dimensions		6.2	<b>Outside test room</b> (see 6.2)
Temperature	5.2.2	6.3.4	<b>Inside test room</b> (see 6.3)
Defrosting	5.2.3	6.3.4	
Energy consumption	5.2.5	6.3.6 and 6.3.7	
Water vapour condensation	5.2.4	6.3.5	