



**SLOVENSKI STANDARD**  
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**Hladilne vitrine in skrinje za sladoled - Razvrščanje, zahteve, zmogljivost in preskus porabe energije**

Refrigerated display scooping cabinets and pozzetto for gelato - Classification, requirements, performance and energy consumption testing

Verkaufskühlmöbel und Pozzetti für Speiseeis - Klassifizierung, Anforderungen, Leistung und Energieaufnahmeprüfung

Vitrines réfrigérées de vente de glace et pozzetto - Classification, exigences, performance et essai de consommation énergétique

**Ta slovenski standard je istoveten z: prEN 16838**

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## Refrigerated display scooping cabinets and pozzetto for gelato - Classification, requirements, performance and energy consumption testing

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 44.

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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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**prEN 16838:2018 (E)****European foreword**

This document (prEN 16838:2018) 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 16838:2016.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

In comparison with the previous edition, the following technical modifications have been made:

- addition of pozzetto in the whole standard;
- title modification in order to get it consistent with the content of the standard;
- update terminology;
- update existing figures and addition of new Figures;
- editorial improvement.

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## 1 Scope

This document specifies classification, requirements for the construction, performance and energy consumption testing of gelato scooping cabinets and pozzetto used to sale and/or display artisan and self made gelato. It specifies test conditions and methods for checking that the requirements have been satisfied, their marking and the list of their characteristics to be declared by the manufacturer.

## 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.

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)*

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

## 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

#### **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

#### **pozzetto**

cabinet cooled by a refrigerating system which enables to store and to scoop gelato contained in tubs, within prescribed temperature limits

### 3.3

#### **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

### 3.4

#### **display section**

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

**prEN 16838:2018 (E)****3.5****pozzetto section**

part of the pozzetto used to scoop the product

**3.6****covers**

sliding door or night curtain or swivel panes

**3.7****lid**

removable cover for pozzetto section

**3.8****gelato tub**

container intended to store gelato

**3.9****net volume**

volume containing gelato within the top edge of the tub

**3.10****top display area of gelato tub**

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

**3.11****front display area of gelato tub**

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

**3.12****lateral display area of gelato tub**

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

**3.13****total net storage volume****V<sub>s</sub>**

sum of net volume of each tubs contained in the storage section

**3.14****total net volume of pozzetto section****V<sub>p</sub>**

sum of net volume of each tubs contained in pozzetto section

**3.15****total display area****TDA**

sum of the top, front and lateral display areas 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 and remote pozzetto for compression-type refrigerating system |
| TEC                | total energy consumption in kilowatt hours per 24 h period   |
| TDA                | total display area, in square meters   |
| V <sub>p</sub>     | total net volume of pozzetto section, in litres  |
| V <sub>s</sub>     | total net volume of storage section, in litres   |
| TEC/TDA            | specific energy consumption (SEC-D) for gelato scooping cabinet expressed in kilowatt hours per 24 h per square meters   |
| TEC/V <sub>p</sub> | specific energy consumption (SEC-V <sub>p</sub> ) for pozzetto expressed in kilowatt hours per 24 h per litres   |
| $t_{\text{rr}}$    | relative or percentage running time:   |

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

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 12 corresponds to refrigerant outlet, and state in Figure 13 to refrigerant inlet, of gelato scooping cabinet and pozzetto |
| $\theta_7$     | refrigerant temperature at evaporator outlet, in degrees Celsius   |
| $\theta_8$     | refrigerant temperature at the gelato scooping cabinet and pozzetto outlet, in degrees Celsius   |
| $\theta_4$     | refrigerant temperature at the gelato scooping cabinet and pozzetto inlet, in degrees Celsius  |
| $\theta_5$     | refrigerant temperature at evaporator inlet, in degrees Celsius  |
| p <sub>8</sub> | refrigerant pressure at the gelato scooping cabinet and pozzetto outlet, in Pascals  |

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$\theta_{\text{mrun}}$  arithmetic average of evaporator-saturated temperature obtained from pressure  $p_g$  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  $p_g$  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

**5 Requirements****5.1 Construction****5.1.1 General****5.1.1.1 Strength and rigidity**

The Gelato scooping cabinet or pozzetto 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 or pozzetto 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 and pozzetto are in operation or at rest.

For gelato scooping cabinets and pozzetto 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 pozzetto and their 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.

For pozzetto fitted with lids, the refrigerating system shall suffer no damage if any lid in the pozzetto is left open while the pozzetto is operating in an ambient temperature corresponding to the climate class (see Table 4) for which the pozzetto 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.

#### **5.1.3.4 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.

### **5.1.5 Temperature display**

#### **5.1.5.1 General**

The gelato scooping cabinets and pozzetto shall incorporate a temperature display instrument showing the air temperature in the refrigerated equipment 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 and pozzetto.

**prEN 16838:2018 (E)****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**

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 and pozzetto 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 and pozzetto. 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 and pozzetto 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

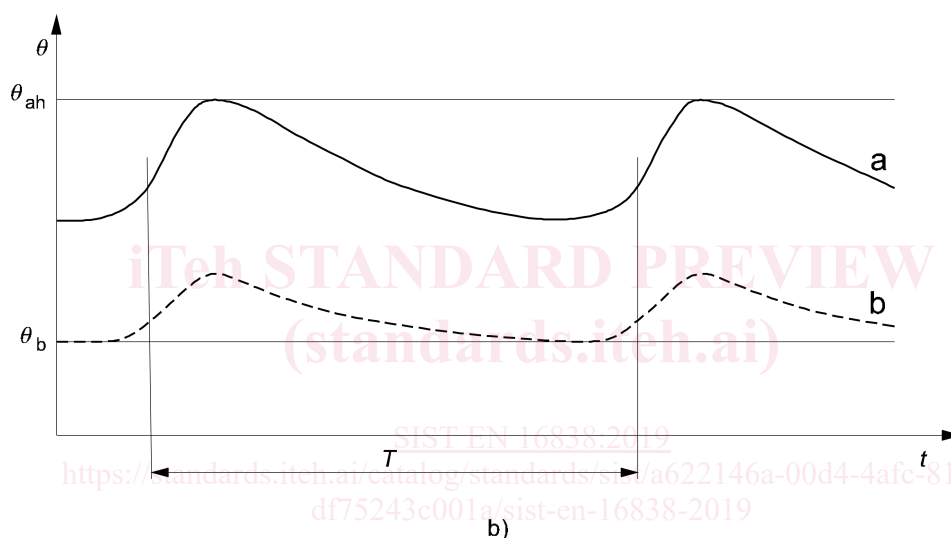
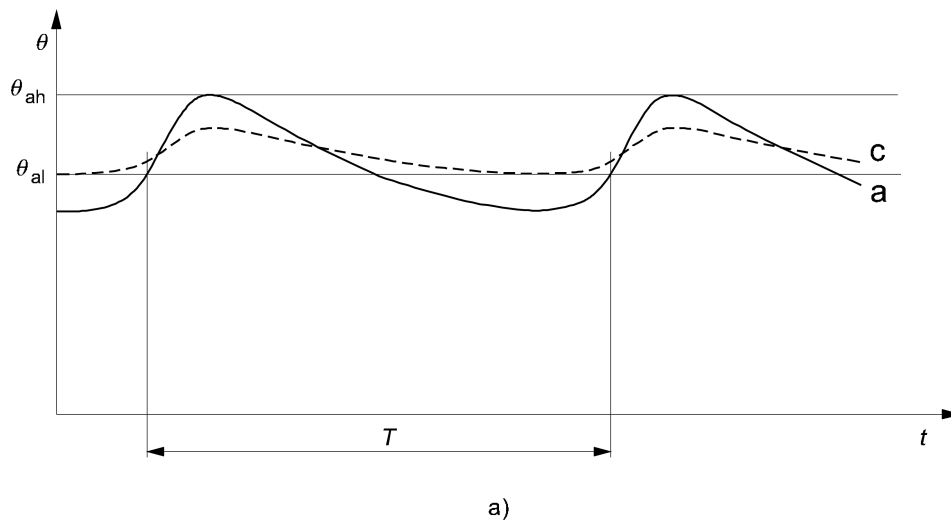
| Class | Highest temperature, $\theta_{ah}$ , of warmest M-test gelato tubs colder than or equal to <sup>a</sup> <sup>b</sup> | Lowest temperature, $\theta_{bl}$ , of coldest M-test gelato tubs warmer than or equal to <sup>b</sup> | Highest minimum temperature, $\theta_{al}$ , of all test tubs colder 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   |  |  |

<sup>a, b</sup> 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 and pozzetto, 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

The specific energy consumption is the rate between TEC and TDA for gelato scooping cabinet (SEC-D).

The specific energy consumption is the rate between TEC and Vp for pozzetto (SEC-Vp).

## 6 Test condition

### 6.1 General

When the characteristics of a gelato scooping cabinet and pozzetto are to be verified, all the tests and inspections shall be applied to one and the same gelato scooping cabinet and pozzetto. 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 and pozzetto 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><br>(see 6.2) |
| Temperature               | 5.2.2                           | 6.3.4           | <b>Inside test room</b><br>(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           |                                       |