



SLOVENSKI STANDARD

SIST EN 16901:2017

01-marec-2017

Zamrzovalniki za sladoled - Razvrstitev, zahteve in preskusni pogoji

Ice-cream freezers - Classification, requirements and test conditions

Speiseeis-Gefriermaschinen - Klassifikation, Anforderungen und Prüfbedingungen

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

Ta slovenski standard je istoveten z: **EN 16901:2016**

[SIST EN 16901:2017](https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017)

<https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017>

ICS:

97.040.30	Hladilni aparati za dom	Domestic refrigerating appliances
-----------	-------------------------	-----------------------------------

SIST EN 16901:2017

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 16901:2017](#)

<https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017>

EUROPEAN STANDARD

EN 16901

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 2016

ICS 97.040.30

English Version

Ice-cream freezers - Classification, requirements and test conditions

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

Speiseeis-Gefriermaschinen - Klassifikation, Anforderungen und Prüfbedingungen

This European Standard was approved by CEN on 9 October 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017>



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Contents

	Page
European foreword.....	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
3.1 General.....	6
3.2 Parts of ice-cream freezers.....	6
3.3 Physical aspects and dimensions	7
3.4 Definitions relating to performance characteristics.....	8
3.5 Definitions related to test environment.....	8
4 Symbols.....	9
5 Classification and requirements.....	9
5.1 Classification.....	9
Table 1 — Classification according to temperature	9
5.2 Requirements.....	10
5.2.1 Construction.....	10
5.2.2 Materials.....	10
5.2.3 Refrigerating system.....	11
5.2.4 Electrical components	11
5.2.5 Operating characteristics.....	12
6 Tests.....	13
6.1 General.....	13
Table 2 — Test summary	13
6.2 Tests outside test room.....	13
6.2.1 General.....	13
6.2.2 Seal test for lids.....	13
6.2.3 Test on durability of lid.....	14
Figure 1 — Durability of lid	14
6.2.4 Linear dimensions, areas and volumes.....	14
6.3 Tests inside test room	15
6.3.1 General.....	15
6.3.2 Test room conditions.....	15
Table 3 — Test room climate classes	16
6.3.3 Test packages and life-time.....	16
Table 4 — Dimensions and mass of test packages	17
Figure 2 — Thermal characteristics of test packages	18
Table 5 — Temperature and specific enthalpy of test packages.....	19
Table 6 — Temperature and increase in specific enthalpy of test packages.....	19
Figure 3 — M-Package	20
Table 7 — Temperature and specific enthalpy of filler packages	21
Table 8 — Temperature and increase in specific enthalpy of filler packages	21

Figure 4 — Thermal characteristics of filler packages.....	22
6.3.4 Instruments, measuring equipment and measuring expanded measurement uncertainty.....	22
6.3.5 Preparation of test ice cream freezer.....	22
Figure 5 — Ice cream location within the test room.....	23
Figure 6 — Condensing air with test room air flow, or across, but not opposed the test room air flow.....	24
Figure 7 — Air movement.....	25
Figure 8 — Climate measuring point for ice cream freezer.....	25
Figure 9 — Glass lid ice cream freezer with flat base deck with and without tubes laid at the base.....	27
Figure 10 — Glass lid ice cream freezer with stepped base deck with and without tubes laid at the base.....	28
Figure 11 — Tests on ice cream freezers with lights or without lights.....	29
6.3.6 Test on ice cream freezers.....	30
Figure 12 — Relevant temperature curve of M-packages.....	31
Figure 13 — Arithmetic mean temperature of M-packages.....	32
Figure 14 — Condensation code.....	33
Table 9 — Temperature rise time conditions for C1.....	34
7 Test report.....	34
7.1 Tests outside test room.....	34
Table 10 — Linear dimensions, areas and volumes.....	35
7.2 Tests inside test room.....	35
Table 11 — Conditions for tests inside test room.....	35
Table 12 — Ice cream freezer preparation for tests inside test room.....	35
Table 13 — Temperature test for tests inside test room.....	36
Table 14 — Water vapour condensation test.....	36
Table 15 — Electrical energy consumption test.....	36
Table 16 — Specific energy consumption.....	37
8 Marking.....	37
8.1 Load limit.....	37
Figure 15 — Load limit markings.....	37
Figure 16 — Dimensions of load limit line.....	37
Figure 17 — Different positions for the load limit.....	38
8.2 Marking plate.....	38
8.3 Information to be supplied by the manufacturer.....	38
Annex A (informative) Ice-cream freezer families.....	40
Table A.1 — Ice cream freezer families.....	40
Annex B (normative) Net volume calculation.....	41
Annex C (normative) Equivalent volume calculation.....	42

EN 16901:2016 (E)

Annex D (normative) TDA calculation	43
D.1 General	43
D.2 Calculation of TDA	43
Figure D.1 — Horizontal, open, wall-site and island cabinets	44
Figure D.2 — Horizontal, open, island cabinets	45
Annex E (informative) Test for absence of odour and taste	46
E.1 Preparation and testing	46
E.1.1 Ambient temperature	46
E.1.2 Cleaning	46
E.1.3 Thermostat setting	46
E.1.4 Samples	46
E.1.5 Test period	46
E.2 Examination of samples	47
E.2.1 Conditions	47
E.2.2 Evaluation	47
Annex F (normative) Performance and energy rating of ice cream freezers	48
F.1 Scope	48
F.2 Standard rating conditions for ice cream freezers	48
F.3 Specific energy consumption (SEC) for ice cream freezers	48
Annex ZA (informative) Relationship between this European Standard and the ecodesign requirements of Commission Draft Ecodesign Regulation DG ENER LOT12 aimed to be covered	49
Table ZA.1 — Correspondence between this European Standard and Commission Draft Ecodesign Regulation DG ENER LOT12 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for refrigerated commercial display cabinets and Commission’s standardization request ‘M/495’	49
Bibliography	50

European foreword

This document (EN 16901:2016) 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 June 2017, and conflicting national standards shall be withdrawn at the latest by June 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2009/125/EC.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

[SIST EN 16901:2017](https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017)

<https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017>

EN 16901:2016 (E)**1 Scope**

The scope of this European Standard is to define the classification for horizontal closed ice-cream freezer with access of the product from the top and to specify their requirements and test methods. These appliances are different to supermarket segment freezers, as they work with static air cooling, with a skin evaporator (no evaporator fan) and are used specifically for the storage and display of pre-packed ice-cream. This standard is only applicable to integral type refrigeration systems. This standard is not applicable to remote and secondary system type cabinets. Ice-cream freezers within this standard should have a net volume ≤ 600 l and only for transparent lid ice cream freezers they should have a net volume/TDA $\geq 0,35$ m.

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 (IEC 60335-2-89)*

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*

<https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017>

3 Terms and definitions

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

3.1 General**3.1.1****ice cream freezer**

horizontal closed refrigerated cabinets 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 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

3.3.2

width

horizontal distance between the two external sides of the ice cream freezer

3.3.3

height

vertical distance from the bottom to the top of the ice cream freezer

3.3.4

load limit

boundary surface consisting of a plane or several planes within which all M-packages can be maintained within the limits for the M- packages temperature class declared

3.3.5

load limit line

permanently marked boundary line denoting the edge of the load limit surface

3.3.6

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.

<https://standards.itech.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017>

3.3.7

gross volume

volume within the inside walls of the ice-cream freezer or compartment, excluding internal fittings and the lid when closed

3.3.8

equivalent volume

reference volume corrected for compartment temperature classification

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

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

3.3.10

shelf area

area defined by the external dimensions of the shelf or internal dimensions of the base of the cabinet or basket

3.3.11

footprint

surface occupied by the ice-cream freezer

EN 16901:2016 (E)**3.4 Definitions relating to performance characteristics****3.4.1****normal conditions of use**

operating conditions which exist when the ice cream freezer, 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 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.

3.4.2**defrost**

removal of frost, snow and ice from an ice-cream freezer

3.4.3**total energy consumption****TEC**

total amount of energy used by an ice cream freezer

3.4.4**specific energy consumption for ice cream freezers****SEC**

index of the efficiency of the ice cream freezer, expressed as the ratio of TEC divided by equivalent volume (TEC/Equivalent volume);

[SIST EN 16901:2017](https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017)

3.4.5**product temperature**

<https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d024f01f4/sist-en-16901-2017>

one of the classifications defined in Table 1 of this standard, establishing the performance level of the ice cream freezer

3.5 Definitions related to 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**

M-package temperature class classification of M-package temperature according to the temperatures of the warmest M-packages during the temperature test

3.5.4**ice cream freezers classification**

designation given by the combination of climate class and M-package temperature class

4 Symbols

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
TEC	total energy consumption in kilowatt hours per 24 h period
SEC	specific energy consumption for ice cream freezers expressed in kilowatt hours per 24 h per m ³ (TEC/ Equivalent volume);
t_{rr}	relative or percentage running time:

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

where

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

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)

5 Classification and requirements

5.1 Classification

SIST EN 16901:2017

<https://standards.iteh.ai/catalog/standards/sist/35fd26c1-78e6-4abe-9d6a-b59d02401f1/sist-en-16901-2017>

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 F.

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

EN 16901:2016 (E)**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 and 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 fittings 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.

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.

5.2.4 Electrical components

5.2.4.1 General

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

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.

EN 16901:2016 (E)**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;
- 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.

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

NOTE 2 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 3 For electronic controllers, it is possible to display a calculated temperature.

NOTE 4 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.

NOTE 5 It is the responsibility of the supplier and user to ensure that the location of the temperature sensor complies with national regulation on temperature control of foodstuffs.

5.2.5 Operating characteristics**5.2.5.1 Water vapour condensation**

The performance of 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 standard using the appropriate test method.

Table 2 — Test summary

Tests and inspections	Requirement clause	Test method	Test room
Seal test	5.2.1.3	6.2.1	Outside test room (see 6.2)
Absence of odour and taste (not compulsory)	—	Annex E	
Durability of lid	5.2.1.3	6.2.2	
Temperature	5.2.3.1	6.3.6.1	Inside test room (see 6.3)
Water vapour condensation	5.2.3.2	6.3.6.4	
Temperature rise time	5.2.3.3	6.3.6.5	
Energy consumption	5.2.5.2	6.3.6.6	

6.2 Tests outside test room

6.2.1 General

The tests which may be carried out outside the test room deal with the inspection of construction characteristics, physical dimensions and the absence of odour and taste.

6.2.2 Seal test for lids

The effectiveness of lids provided to ensure a seal shall be tested as follows (with the ice-cream freezer not running). Insert a strip of paper 50 mm wide, 0,08 mm thick and of a suitable length at any point of the seal. With the lid closed normally on it the strip of paper shall not slide freely.

NOTE 1 Attention is drawn to the fact that some ice cream freezers having lids are fitted with decompression valves which allow air to penetrate for a short period of time so that any drop in pressure created inside the ice cream freezer is compensated. No test is required for such valves.

NOTE 2 The most unfavourable points can be found by inspecting the contact of the seal with the ice cream freezer closed and lighted from the inside.