IEC 60335-2-89

Edition 3.0 2019-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Appareils électrodomestiques et analogues – Sécurité –
Partie 2-89: Exigences particulières pour les appareils de réfrigération et fabriques de glace à usage commercial avec une unité de fluide frigorigène ou un motocompresseur incorporés ou à distance

IEC 60335-2-89:2019-06(en-fr)

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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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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This part of International Standard IEC 60335 has been prepared by subcommittee 61C: Household appliances for refrigeration, of IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition cancels and replaces the second edition published in 2010, Amendment 1:2012 and Amendment 2:2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

– the text has been aligned with Ed 5.2 of Part 1;

– some notes have been deleted or converted to normative text (4, 5.2, 7.6, 22.111, 22.111.1);

– some subclauses have been renumbered (22.103, 22.104, 22.105, 22.106, 22.107, 22.109, 22.110, 22.111, 22.112, 22.113, 22.114, 22.115);

– requirements for commercial ice-makers have been added (5.7, 5.101, 7.1, 11.8, 19.102);

– installation of appliances with a remote refrigerant unit or motor-compressor has been clarified (5.10, 11.2);

– installation instructions for appliances with a remote refrigerant unit employing R-744 refrigerant in a transcritical refrigeration system have been added (7.12.1);

– a pressure test for appliances employing R-744 refrigerant has been added (22.7);

– additional refrigerants have been added to Table 102 and it has been updated to reference only ISO 817 and ISO 5149-1 data;

– additional requirements for appliances with a refrigerant charge exceeding 150 g of flammable refrigerant within each refrigerating circuit have been added (7.1, 21.103, 22.108, 22.110, 22.116, 22.117, 22.118, 22.119, 22.120, 22.121, Annex CC);

– Annex AA has been modified to cover motors that are supplied at a voltage that is different from the rated voltage of the appliance;

– Annex BB has been updated to align with the latest edition of IEC 60079-15.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
61C/792/FDIS	61C/796A/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60335 series, under the general title: *Household and similar electrical appliances – Safety*, can be found on the IEC website.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor.

Where a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. Where this standard states "addition", "modification” or "replacement", the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type*;

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The contents of the corrigendum of September 2019 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

It has been assumed in the drafting of this International standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features which impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

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

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 specifies safety requirements for electrically operated commercial refrigerating appliances and **ice-makers** that have an incorporated motor-compressor or that are supplied in two units for assembly as a single appliance in accordance with the instructions (split system).

NOTE 101 Examples of appliances that are within the scope of this standard are

– **refrigerated display** and **storage cabinets**;
– refrigerated trolley cabinets;
– service counters and self-service counters;
– blast chillers and blast freezers;
– **commercial ice-makers**.

As far as is practicable, this standard deals with the common hazards presented by these types of appliances including those that use **flammable refrigerants** and appliances employing R-744 refrigerant**.**

This International Standard is not applicable to appliances with a mass of **flammable refrigerant** exceeding the limits specified in 22.110 or to appliances with that use refrigerants with a toxicity classification of B according to ISO 817.

It does not cover those features of construction and operation of refrigerating appliances that are dealt with in ISO standards.

NOTE 102 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or aboard ships or aircraft, additional requirements can be necessary;
– in many countries, additional requirements are specified by national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

NOTE 103 This standard does not apply to

– appliances using **flammable refrigerant** in **transcritical refrigeration systems;**
– domestic refrigerating appliances (IEC 60335-2-24);
– split systems having a **refrigerant charge** of **flammable refrigerant** exceeding 150 g in any **refrigerating circuit**;
– industrial refrigerating systems;
– motor-compressors (IEC 60335-2-34);
– commercial dispensing appliances and vending machines (IEC 60335-2-75);
– commercial ice-cream appliances;
– cold temperature rooms;
– multiple refrigerated chambers with a remote motor-compressor.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

IEC 60079-7:2015, *Explosive atmospheres – Part 7: Equipment protection by increased safety "e"*
IEC 60079-7:2015/AMD1:2017 [1],

IEC 60079-15:2017, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60079-29-1, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*

IEC 60335-2-34:2012, *Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors*
IEC 60335-2-34/AMD1:2015
IEC 60335-2-34/AMD2:2016[2]

IEC 60730-2-6, *Automatic electrical controls – Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements*

ISO 817:2014, *Refrigerants – Designation and safety classification*
ISO 817:2014/AMD1:2017

ISO 4126-2:2018, *Safety devices for protection against excessive pressure – Bursting disc safety devices*

ISO 5149-1:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Definitions, classification and selection criteria*
ISO 5149-1:2014/AMD1:2015

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

ISO 14903, *Refrigerating systems and heat pumps – Qualification of tightness of components and joints*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1 Definitions relating to physical characteristics

3.1.9 *Replacement:*
normal operation
operation of the appliance under the following conditions:

Appliances are operated at an ambient temperature in accordance with 5.7, empty, with doors or lids closed, or roller blinds closed or open, whichever is the more unfavourable. User adjustable temperature control devices are short-circuited or otherwise rendered inoperative.

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1 There exists a consolidated edition 5.1 (2017) that includes Edition 5 and its Amendment 1.

2 There exists a consolidated edition 5.2 (2016) that includes Edition 5 and its Amendment 1 and Amendment 2.

Devices that are switched, by dew-point controls or clocks, are switched on or off, whichever is the more unfavourable.

For appliances connected to a water supply, the water other than cooling water, is at a temperature of 15 °C ± 2 °C. The cooling water is at the maximum temperature specified in the instructions.

3.1.101
design pressure
gauge pressure that has been assigned to the high-pressure side of a **transcritical refrigeration system**

Note 1 to entry: The **design pressure** assigned should take into account pressures that could be expected during transportation of the **transcritical refrigeration system**.

3.1.102
refrigerant charge
mass of refrigerant within a **refrigerating circuit**

3.5 Definitions relating to types of appliances

3.5.101
refrigerated display and storage cabinet
cabinet which displays or stores beverages or chilled or frozen foodstuff placed therein and which is cooled by a **refrigerant unit**

3.5.102
ice-maker
appliance in which ice is made by freezing water by a device consuming electrical energy

Note 1 to entry: The appliance may be provided with a compartment for storing the ice.

3.6 Definitions relating to parts of an appliance

3.6.101
ancillary heating element
heating device which performs an auxiliary function, such as a defrost heater, door heater or anti-condensation heater

3.6.102
free space
space with a volume exceeding 60 l in which a child can be entrapped and which is accessible after opening any door, lid or drawer and removing any **detachable internal part**, including shelves, containers or removable drawers which are themselves only accessible after opening any door or lid

Note 1 to entry: In calculating the volume, a space with any single dimension not exceeding 150 mm or any two orthogonal dimensions each of which do not exceed 200 mm is ignored.

3.6.103
gas cooler
heat exchanger in which, after compression, the refrigerant is cooled down, by transferring heat to an external cooling medium, without changing state

Note 1 to entry: A **gas cooler** is normally used in **transcritical refrigeration systems**.

3.6.104
refrigerating circuit
combination of interconnected refrigerant-containing parts constituting one closed circuit in which the refrigerant is circulated for the purpose of extracting and delivering heat

3.6.105
refrigerant unit
factory assembled unit for performing part of the refrigeration cycle (compressing gas, condensation or gas cooling) comprising of one or more refrigerant compressors with motors, condensers or **gas coolers**, liquid receivers, interconnection pipe work and ancillary equipment, all mounted on a common base

3.6.106
transcritical refrigeration system
refrigeration system where the pressure in the high-pressure side is above the pressure where the vapour and liquid states of the refrigerant can coexist in thermodynamic equilibrium

3.6.107
hermetically sealed system
system in which all refrigerant containing parts are sealed by welding, brazing or a similar permanent connection

3.6.108
critical point
point in a **refrigerating circuit** were **flammable refrigerant** may leak

Note 1 to entry: The following are considered to be **critical points**:

– interconnecting joints between parts of the **refrigerating circuit**;
– pipes with a bend radius, measured along the centre line, of less than 2,5 times the external pipe diameter.

Note 2 to entry: The following are not considered to be **critical points**:

– pipes with a bend radius, measured along the centre line, equal to or greater than 2,5 times the external pipe diameter;
– welded telescopic joints of the motor-compressor;
– welding of the pipes through the motor-compressor housing;
– welding of hermetic glass to metal seals (fusite).

3.7 Definitions relating to safety components

3.7.101
bursting disc
disc or foil which bursts at a predetermined pressure to reduce a pressure in a refrigeration system

3.7.102
pressure relief device
pressure sensing device, intended to reduce pressure automatically when pressures within the refrigeration system exceed the setting pressure of the device during abnormal operation

3.8 Definitions relating to miscellaneous matters

3.8.101
flammable refrigerant
refrigerant with a flammability classification of Class 2L, Class 2 or Class 3 in accordance with ISO 817

Note 1 to entry: For refrigerant blends which have more than one flammability classification, the most unfavourable classification is taken for the purposes of this definition.

3.8.102
qualified person
person having the appropriate technical training and experience necessary to be aware of hazards to which he or she is exposed in performing a task and of measures necessary to minimize the danger to themselves or other persons

4 General requirement

This clause of Part 1 is applicable except as follows.

Addition:

NOTE 101 The use of **flammable refrigerants** involves some additional hazards that are not associated with appliances which use non-**flammable refrigerants**.

This standard addresses the hazard due to ignition of leaked **flammable refrigerant** by potential ignition sources associated with the appliance.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.2 *Addition:*

At least one additional specially prepared sample is required for the tests of 22.112.

Unless the motor-compressor complies with IEC 60335-2-34, at least one additional specially prepared sample is required for the tests of 22.109.

Unless the motor-compressor complies with IEC 60335-2-34, at least one additional specially prepared sample is required for the test of 19.1.

At least one additional sample of the fan motor, thermal motor protector combination may be required for the test of 19.1.

The tests of 22.7 and 22.108 may be performed on separate samples.

Due to the potentially hazardous nature of the tests of 22.111, 22.112, 22.113, 22.114 and 22.116, special precautions may need to be taken when performing the tests.

5.3 *Addition:*

*Before starting the tests, the appliance shall be operated at **rated voltage** for at least 24 h, then switched off and left to stand for at least 12 h.*

5.7 *Addition:*

*For **ice-makers**, the tests in accordance with Clauses 10, 11 and 13 are performed at an ambient temperature of 32 °C ± 2 °C*

For other appliances, tests in accordance with Clauses 10, 11 and 13 are performed at an ambient temperature of

– *32 °C ± 2 °C on appliances of test room climatic class 0, 1, 2, 3, 4, 6 or 8;*
– *43 °C ± 2 °C on appliances of test room climatic class 5 or 7.*

Before starting the tests specified in 10, 11 and 13, the appliance, with the doors or lids open, is brought to the ambient specified temperature ± 2 K.

Other tests are performed at an ambient temperature of 20 °C ± 5 °C.

Appliances classified for several climatic classes are tested at the ambient temperature relevant to the highest test room climatic class.

NOTE 101 Steady conditions are considered to be established when three successive readings of the temperature, taken at approximately 60 min intervals, at the same point of any operating cycle, do not differ by more than 1 K.

5.10 *Addition:*

*For appliances with a remote **refrigerant unit**, the **refrigerant unit** is connected to the cabinet in accordance with the instructions provided with the appliance before testing.*

For the tests of 22.111, 22.112 and 22.113, the appliance is empty with doors or lids closed, or roller blinds closed or open, whichever is the more unfavourable, and is installed as follows.

*Appliances, other than **built-in appliances**, are placed in a test enclosure, the walls of which enclose the appliance as closely as possible to all its sides and top surface, unless the manufacturer indicates in the instructions that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test. If the appliance has a remote **refrigerant unit** or motor-compressor, then only the **refrigerated display and storage cabinet** is installed in the test enclosure, the remote **refrigerant unit** or motor-compressor is placed on the floor of the test corner away from walls.*

*For appliances incorporating remote **refrigerant units** or remote motor-compressors, the refrigerant line between the **refrigerant unit** or motor-compressor and the **refrigerated display and storage cabinet** shall have a length of 5 m to 7,5 m. The refrigerant line shall be installed with thermal insulation applied in accordance with the instructions. If the appliance employs R-744 refrigerant in a **transcritical refrigeration system**, a **pressure relief device** shall be installed on the high-pressure side between the motor-compressor and the **gas cooler** unless it is pre-fitted to the motor-compressor.*

5.101 *Appliances that use **flammable refrigerants** and that, according to the instructions, may be used with other electrical appliances inside a food/ice storage compartment are tested with such recommended appliances incorporated and in operation as they would be in normal use.*

NOTE An example of such electrical appliances are deodorizers.

***Ice-makers** that use **flammable refrigerants** and that, according to the instructions, may be used in conjunction with accessories such as ice-bins are tested with such recommended accessories installed and in operation as they would be in normal use.*

6 Classification

This clause of Part 1 is applicable except as follows.

6.101 Refrigerated display and storage cabinets shall be classified for at least one of the following test room climatic classes:

– test room climate class 0;
– test room climate class 1;
– test room climate class 2;
– test room climate class 3;
– test room climate class 4;
– test room climate class 5;
– test room climate class 6;