IEC 60335-2-89

Edition 2.0 2010-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Household and similar electrical appliances – Safety –
Part 2-89: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor

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

IEC 60335-2-89:2010

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-89: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant unit or compressor

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee 61C: Safety of refrigeration appliances for household and commercial use, of technical committee 61: Safety of household and similar electrical appliances

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
61C/562/ISH	61C/571/RVISH

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

_____

SC 61C interpretation sheet on: Pressure relief devices used in transcritical refrigeration systems

Introduction

Requirements for refrigeration systems that use transcritical refrigerants such as CO_2 (R 744) were introduced into the standard in 2010; however at the time few manufacturers saw transcritical refrigerants as a future progression. It is only recently that commercial refrigerating appliances using such systems are being developed and as a result some clarification of the standard is required due to practicalities of technology being applied.

There is a requirement in 22.103 that appliances employing **a transcritical refrigeration system** shall include a **pressure relief device** in the high pressure side of the refrigeration system. The intent of this device is to prevent the pressure of the system exceeding the **design pressure** should a malfunction occur, such as a failure of the gas cooler fan motor.

A pressure test is carried out on the system with the **pressure relief device** rendered inoperative to ensure that the high side of the system and components can withstand at least 3 times the **design pressure** or as a minimum the high side pressure specified in IEC 60335-2-34, which in the case of R 744 (CO_2) is 420 bar (42 MPa).

The **pressure relief device** is defined in 3.111 as a “pressure sensing device intended to reduce pressure automatically when pressures within the refrigeration system exceed the setting pressure of the device”.

As per the text of 22.103 the operating pressure of the pressure relief device shall be no higher than the **design pressure** of the high pressure side. The component test parameters for several different types of **pressure relief device** such as mechanical, electrical and those of the burst disc type are listed in the addition of 24.1.4.

Questions

On the basis that the **pressure relief device** can maintain the **design pressure** by either venting refrigerant from the refrigeration system or by automatically shutting down the pressure generating element (the compressor),

1) How to apply the second paragraph of 22.103 where the pressure is controlled by automatically shutting down the pressure generating element (the compressor).

2) Subclause 24.101 specifies requirements to ensure that the discharge capacity of the pressure relief device is adequate and which can be verified by calculation or by a test. In the case of an electrical pressure relief device that automatically shuts down the compressor instead of externally venting refrigerant is this clause relevant?

Relevant text from IEC 60335-2-89:

The second paragraph of 22.103 states in regard to the mounting of the pressure relief device: "*The **pressure relief device** shall be mounted so that the refrigerant released from the system cannot cause any harm to the user of the appliance. The aperture shall be located so that it is unlikely to be obstructed in normal use.*"

Subclause 24.101 states:

24.101 The discharge capacity of the **pressure relief device** shall be such that it is able to release an adequate amount of refrigerant so that the pressure during the release of the refrigerant does not increase beyond the pressure setting of the **pressure relief device,** even if the compressor is operating.

Compliance is checked by validation of the manufacturer's calculations or by an appropriate test.

ANSWERS

1) The second paragraph of 22.103 is not relevant where the pressure is controlled by automatically shutting down the pressure generating element (the compressor) since the pressure is not controlled by releasing refrigerant from the system.

2) Subclause 24.101 is not relevant to a pressure relief device that senses pressure and shuts down the compressor automatically if the system high side pressure exceeds the high side design pressure since such a device does not have a discharge capacity.

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FOREWORD

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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 second edition cancels and replaces the first edition published in 2002 including its Amendment 1 (2005) and amendment 2 (2007). It constitutes a technical revision.

The principal changes in this edition as compared with the first edition of IEC 60335-2-89 are as follows (minor changes are not listed):

– aligns the text with IEC 60335-1, and its Amendments 1 and 2;
– introduces requirements for appliances using transcritical refrigerant systems (3.107, 3.108, 3.109, 3.110, 3.111, 7.1, 7.6, 7.12.1, 22.103, 24.1.4, 24.102)
– introduces an enhanced flexing test (23.3)

The text of this standard is based on the following documents:

FDIS	Report on voting
61C/208/FDIS	61C/211/RVD

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

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

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 fourth edition (2001) 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.

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.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication 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 following differences exist in the countries indicated below.

– 22.101: E12 and E17 lamp holders are checked as specified for E14 and B15 lamp holders. E26 lamp holder is checked as specified for E27 and B22 lamp holders (Japan).

– 22.109: For unsealed glass tube heaters, the temperature requirements are different (Japan).

The contents of the interpretation sheet of July 2014 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 publication 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 with an incorporated or remote refrigerant unit or compressor

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard specifies safety requirements for electrically operated commercial refrigerating appliances that have an incorporated compressor or that are supplied in two units for assembly as a single appliance in accordance with the manufacturer's 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.

As far as is practicable, this standard deals with the common hazards presented by these types of appliances.

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

NOTE 102 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;
– in many countries, additional requirements are specified by national authorities.

NOTE 103 This standard does not apply to

– domestic refrigerating appliances (IEC 60335-2-24)
– industrial refrigerating systems;
– motor-compressors (IEC 60335-2-34);
– commercial dispensing appliances and vending machines (IEC 60335-2-75);
– commercial ice-cream appliances;
– commercial ice makers;
– cold temperature rooms;
– multiple refrigerated chambers with a remote compressor.

NOTE 104 Appliances with a charge of more than 150 g of **flammable refrigerant** in each separate refrigerant circuit are not covered by this standard. For appliances with a charge greater than 150 g of **flammable refrigerant** in each refrigerant circuit and for the installation, ISO 5149 may be applied. Consequently, such appliances cannot be assessed for safety using this part 2.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

IEC 60079-4, *Electrical apparatus for explosive gas atmospheres – Part 4: Method of test for ignition temperature*

IEC 60079-4A, *Electrical apparatus for explosive gas atmospheres – Part 4: Method of test for ignition temperatures – First supplement*

IEC 60079-15:2005, *Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection "n" electrical apparatus*

IEC/TR 60079-20, *Electrical apparatus for explosive gas atmospheres – Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus*

IEC 60335-2-5, *Household and similar electrical appliances – Safety – Part 2-5: Particular requirements for dishwashers*

IEC 60335-2-34:2002, *Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors*
Amendment 1 (2004)
Amendment 2 (2008)[1)]

ISO 817, *Refrigerants – Designation system*

ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas*

ISO 4126-2:2003, *Safety devices for protection against excessive pressure – Bursting disc safety devices*

ISO 5149, *Mechanical refrigerating systems used for cooling and heating – Safety requirements*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 *Replacement:*

normal operation
operation of the appliance under the following conditions:

Refrigerating 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. Devices which 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 instruction.

For appliances with a separate **refrigerant unit,** the **refrigerant unit** is connected to the cabinet in accordance with the manufacturer's instructions.

1) There exists a consolidated edition 4.2 (2009) that includes Edition 4 and its Amendment 1 and Amendment 2.

3.101
refrigerated display and storage cabinet
enclosed cabinet which displays or stores beverages or chilled or frozen foodstuff placed therein and which is cooled by a **refrigerant unit**

3.102
ancillary heating element
heating device which performs an auxiliary function, such as a defrost heater, door heater or anti-condensation heater

3.103
skilled 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 his or herself or other persons

3.104
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

3.105
flammable refrigerant
refrigerant with a flammability classification of group 2 or 3 in accordance with ISO 5149

NOTE For refrigerant blends which have more than one flammability classification, the most unfavourable classification is taken for the purposes of this definition.

3.106
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. 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

3.107
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

3.108
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 A gas cooler is normally used in **transcritical refrigeration systems**.

3.109
design pressure
gauge pressure that has been assigned to the high pressure side of a **transcritical refrigeration system**

3.110
bursting disc
disc or foil which bursts at a predetermined pressure to reduce a pressure in a refrigeration system