IEC 60335-2-24

Edition 8.0 2020-09
COMMENTED VERSION

INTERNATIONAL STANDARD

colour inside

Household and similar electrical appliances – Safety –
Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

IEC 60335-2-24:2020-09 CMV(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

FOREWORD

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This commented version (CMV) of the official standard IEC 60335-2-24:2020 edition 8.0 allows the user to identify the changes made to the previous edition IEC 60335-2-24:2010+AMD1:2012+AMD2:2017 CSV edition 7.2. Futhermore, comments from IEC SC 61C experts are provided to explain the reasons of the most relevant changes.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

This part of IEC 60335 has been prepared by subcommittee 61C: Safety of refrigeration appliances for household and commercial use, of IEC Technical Committee 61: Safety of household and similar electrical appliances.

This eighth edition cancels and replaces the seventh edition published in 2010, Amendment 1:2012 and Amendment 2:2017. This edition constitutes a technical revision.

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

– aligns the text with IEC 60335-1, Ed 5.2;
– some notes have been converted to normative text or deleted (4, 5.2, 5.7, 7.1, 7.6, 7.10, 7.12, 19.1, 19.101, 19.102, 20.101, 20.102, 20.103, 20.104, 21, 22.7, 22.33, 22.101, 22.102, 22.103, 22.107, 22.108, 22.109, 30.1);
– normative references and associated text have been updated (2, 22.108, 22.109, Table 102, Annex CC);
– definition of free space has been clarified (3.6.104);
– measurement of the input current of refrigerating appliances using inverter driven motor-compressors is included (10.2);
– compatibility tests for winding insulation of motor-compressors used with different types of refrigerants and oils have been introduced (22.9);
– requirements for inadvertent contact points between uncoated aluminium pipes and copper pipes have been updated (22.111);
– testing of accessible glass panels has been clarified (22.116);
– in refrigerating appliances, requirements for material encasing and in contact with thermal insulation have been introduced and consequential text has been deleted (22.117, 30.2, 30.2.101, Annex EE);
– requirements for motor running capacitors have been updated (24.5, 24.8);
– the locked rotor test for fan motors has been clarified (Annex AA).

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

FDIS	Report on voting
61C/861/FDIS	61C/863/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 refrigerating appliances, ice-cream appliances and ice-makers.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When 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 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).

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

– 22.117: Only the first two dashed items in the first paragraph of the requirement are allowed (Australia and New Zealand).

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 that 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 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of the following appliances, their **rated voltage** being not more than 250 V for single-phase appliances, 480 V for other appliances and 24 V DC for appliances when battery operated:

– **refrigerating appliances** for household and similar use;
– **ice-makers** incorporating a motor-compressor and **ice-makers** intended to be incorporated in frozen food storage compartments;
– **refrigerating appliances** and **ice-makers** for use in camping, touring caravans and boats for leisure purposes.

These appliances may be operated from the mains, from a separate battery or operated either from the mains or from a separate battery.

This standard also deals with the safety of **ice-cream appliances** intended for household use, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

It also deals with **compression-type appliances** for household and similar use, which use **flammable refrigerants**.

This standard does not cover features of the construction and operation of those **refrigerating appliances** which are dealt with in other IEC standards.

Refrigerating appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as

– **refrigerating appliances** used in staff kitchen areas in shops, offices and other working environments,
– **refrigerating appliances** used in farm houses and by clients in hotels, motels and other residential type environments,
– **refrigerating appliances** used in bed and breakfast type environments, and
– **refrigerating appliances** used in catering and similar non-retail applications

are within the scope of this standard.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account

– persons (including children) whose
  - physical, sensory or mental capabilities or
  - lack of experience and knowledge

  prevents them from using the appliance safely without supervision or instruction;
– children playing with the appliance.

NOTE 1 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements ~~may~~ 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 2~~ This standard does not apply to

– appliances intended to be used in the open air;
– appliances designed exclusively for industrial purposes;
– appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
– appliances incorporating a battery intended as a power supply for the refrigerating function;
– appliances assembled on site by the installer;
– appliances with remote motor-compressors;
– motor-compressors (IEC 60335-2-34);
– commercial dispensing appliances and vending appliances (IEC 60335-2-75);
– commercial ~~refrigerators and freezers used for the display of food products, including beverages, for retail sale~~ refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or motor-compressor (IEC 60335-2-89);
– ~~commercial ice-cream appliances~~ professional ice-cream makers (IEC 60335-2-118).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60068-2-11:~~1981~~, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60079-1:2014, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

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

IEC 60079-15:~~2010~~2017, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

~~IEC 60079-20-1, *Explosive atmospheres – Part 20-1: Material characteristics for gas and vapour classification – Test methods and data*~~

[1] There exists a consolidated edition 5.1:2017 that includes edition 5 and its Amendment 1.

IEC 60252-1:2010, *AC motor capacitors – Part 1: General – Performance, testing and rating – Safety requirements – Guidance for installation and operation*
IEC 60252-1:2010/AMD1:2013

~~IEC60335-2-5:2002, *Household and similar electrical appliances – Safety – Part 2-5: Particular requirements for dishwashers*~~

IEC 60335-2-34:~~2002~~2012, *Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors*
IEC 60335-2-34:2012/AMD1:2015
IEC 60335-2-34:2012/AMD2:2016[2]

IEC 60598-1:2014, *Luminaires – Part 1: General requirements and tests*
IEC 60598-1:2014/AMD1:2017[3]

IEC 60695-11-3:2012, *Fire hazard testing – Part 11-3: Test flames – 500 W flames – Apparatus and confirmational test methods*

IEC 60695-11-20:2015, *Fire hazard testing – Part 11-20: Test flames – 500 W flame test method*

IEC 60730-2-6:2015, *Automatic electrical controls – Particular requirements for automatic electrical pressure sensing controls including mechanical requirements*
IEC 60730-2-6:2015/AMD1:2019[4]

IEC 60851-4:2016, *Winding wires – Test methods – Part 4: Chemical properties*

ISO 209:2007, *Aluminium and aluminium alloys – Chemical composition*

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

ISO 4126-2:~~2003~~2018, *Safety devices for protection against excessive pressure – Part 2: 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:~~2011~~2019, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

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

3 There exists a consolidated edition 8.1:2017 that includes edition 8 and its Amendment 1

4 There exists a consolidated edition 3.1:2019 that includes edition 3 and its Amendment 1

3.1 Definitions relating to physical characteristics

3.1.9 *Replacement:*
normal operation
operation of the appliance under the following conditions from 3.1.9.101 to 3.1.9.104.

3.1.9.101
normal operation of a refrigerating appliance
operation at an ambient temperature in accordance with 5.7, empty, with the doors and lids closed. User-adjustable temperature control devices which control the operation of the motor-compressor in **compression-type appliances** are short-circuited or otherwise rendered inoperative

3.1.9.102
normal operation of an ice-maker
operation at an ambient temperature in accordance with 5.7, with the supply water at a temperature of 15 °C ± 2 °C

3.1.9.103
normal operation of an incorporated ice-maker
operation at the normal temperature of the frozen food storage compartment, with the supply water at a temperature of 15 °C ± 2 °C

3.1.9.104
normal operation of an ice-cream appliance
operation of the appliance using the maximum quantity of the mixture of ingredients indicated in the instructions; the mixture used being that which gives the most unfavourable results, the mixture being at an initial temperature of 23 °C ± 2 °C

3.5 Definitions relating to types of appliances

3.5.101
refrigerating appliance
enclosed thermally insulated appliance of suitable volume for household use, cooled by an incorporated device and having one or more compartments intended for the preservation of foodstuffs including cooling of beverages

3.5.102
compression-type appliance
appliance in which refrigeration is effected by the vaporization at low pressure in a heat exchanger (**evaporator**) of a liquid refrigerant, the vapour thus formed being restored to the original state by mechanical compression at a higher pressure and subsequent cooling in another heat exchanger (**condenser**)

3.5.103
ice-maker
appliance in which ice is made by freezing water by a device consuming electrical energy and having a compartment for storing the ice

3.5.104
incorporated ice-maker
ice-maker specially designed to be incorporated into a frozen food storage compartment and without independent means for freezing water

3.5.105
absorption-type appliance
appliance in which refrigeration is effected by the evaporation in a heat exchanger (**evaporator**) of a liquid refrigerant, in the liquid state, the resulting vapour being then absorbed by an absorbent medium from which it is subsequently expelled at a higher partial vapour pressure by heating and liquefied by cooling in another heat exchanger (**condenser**)

3.5.106
ice-cream appliance
compression-type appliance which is used to make ice-cream

3.6 Definitions relating to parts of an appliance

3.6.101
heating system
heating element with associated components such as timers, switches, **thermostats** and other controls

3.6.102
condenser
heat exchanger in which, after compression, vaporized refrigerant is liquefied by losing heat to an external cooling medium

3.6.103
evaporator
heat exchanger in which, after pressure reduction, the liquid refrigerant is vaporized by absorbing heat from the medium to be refrigerated

3.6.104
free space
space with a volume exceeding 60 l where 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~~ 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.

Note 1 to entry: Evaluation of the ignored volume can be checked by applying a 150 mm ± 0,5 mm diameter sphere or a square with 200 ± 0,5 mm side without appreciable force. The volume can be ignored if the sphere or square cannot fit inside. **1**

3.6.105
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

3.6.106
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**.

3.7 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

3.8 Definitions relating to miscellaneous matters

3.8.101
design pressure
DP
gauge pressure that has been assigned to the high-pressure side of a **transcritical refrigeration system**

3.8.102
flammable refrigerant
refrigerant with a flammability classification of A2L, A2 or A3 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.

4 General requirement

This clause of Part 1 is applicable except as follows.

Addition:

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

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

The hazard due to ignition of leaked **flammable refrigerant** by an external potential ignition source associated with the environment in which the appliance is installed is compensated by the low probability of ignition.

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 22.107.

~~NOTE 101~~ *Unless the motor-compressor conforms to IEC 60335-2-34, at least one additional specially prepared sample ~~may be~~ is required for the test of 19.1.*

~~NOTE 102~~ *At least one additional sample of the fan motor ~~and its~~, thermal motor protector combination may be required for the test of 19.1.*

~~NOTE 103~~ *The test of 22.7 may be performed on separate samples.*

~~NOTE 104~~ *Due to the potentially hazardous nature of the tests of 22.107, 22.108 and 22.109, special precautions may need to be taken when performing the tests.*

5.3 *Addition:*

Before starting the tests,

– ***ice-cream appliances*** *are operated empty at* ***rated voltage*** *for 1 h, or for the maximum setting of an incorporated timer, whichever is shorter;*

– *other* ***compression-type appliances*** *shall be operated at* ***rated voltage*** *for at least 24 h, then switched off and left to stand for at least 12 h.*

The test of 11.102 is carried out immediately after the tests of Clause 13.

The test of 15.105 is carried out immediately after the test of 11.102.

The tests of 15.101.1, 15.101.2, 15.103 and 15.104 are carried out immediately after the test of 15.2.

5.4 *Replacement*:

Tests are carried out using each source of energy (electricity, gas or other fuel) in turn. Gas appliances are supplied at the appropriate rated pressure.

Tests are additionally carried out with all combinations of energy sources supplied simultaneously unless this is prevented by interlocking devices.

5.7 *Addition:*

For ***ice-cream appliances*****,** *tests specified in Clauses 10, 11 and 13 are carried out at an ambient temperature of 23 °C ± 2 °C.*

For other appliances, tests specified in Clauses 10, 11, 13 and Subclause 19.103 are carried out at an ambient temperature of

– *32 °C ± 1 °C on appliances of extended temperate (SN) and temperate (N) classes;*

– *38 °C ± 1 °C on appliances of subtropical (ST) class;*

– *43 °C ± 1 °C on appliances of tropical (T) class.*

Before starting these tests, the appliance with the doors or lids open is brought to within 2 K of the ambient temperature specified.

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

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

~~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.*

5.8.1 *Addition:*

Appliances which can be battery operated are tested at the more unfavourable polarity when the supply terminals or terminations for the connection of the battery have no indication for polarity.

5.9 *Addition:*

*Appliances incorporating an **ice-maker** are tested with the **ice-maker** operating to give the most unfavourable results.*

5.10 *Addition*:

For the tests of 22.107, 22.108 and 22.109, the appliance is empty and installed as outlined below:

***Built-in appliances** are installed in accordance with the instructions for installation.*

Other appliances are placed in a test enclosure, the walls enclosing the appliance as near to all its sides and the top of the appliance as possible, unless the manufacturer indicates in the instructions for installation that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test.

NOTE 101 Commonly available fixing hardware, such as screws and bolts, need not be delivered with a fixed appliance.

5.101 *Appliances which are constructed so that an **ice-maker** may be incorporated are tested with the intended **ice-maker**.*

5.102 ***Compression-type appliances** with **heating systems** and Peltier-type appliances are tested as **combined appliances**.*

5.103 ***Compression-type appliances** which use **flammable refrigerants** and which, according to the instructions, may be used with other electrical appliances inside a food storage compartment are tested with such recommended appliances incorporated and being operated as in normal use.*

NOTE Examples of such electrical appliances are ice-cream makers and deodorizers.

6 Classification

This clause of Part 1 is applicable except as follows.

6.101 Appliances, other than **ice-cream appliances**, shall be of one or more of the following climatic classes:

– appliances of extended temperate class (SN);
– appliances of temperate class (N);
– appliances of subtropical class (ST);
– appliances of tropical class (T).

Compliance is checked by inspection.

NOTE The climatic classes are specified in IEC 62552-1:2015.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

Appliances shall also be marked with

– the power input, in watts, of **heating systems**, if greater than 100 W;
– the defrosting input, in watts, if greater than the input corresponding to the **rated power input**;
– **rated power input** in watts or **rated current** in amperes, except that **compression-type appliances**, other than **ice-cream appliances**, shall be marked with the **rated current** in amperes;
– the letters SN, N, ST or T indicating the climatic class of the appliance;
– the maximum rated wattage of lamps, in watts (not applicable if the lamps can only be replaced by the manufacturer or its service agent, together with a part of the appliance);
– the total mass of the refrigerant;

~~NOTE 101 For **absorption-type appliances** using ammonia, the total mass of the refrigerant is considered to be the mass of ammonia used.~~

– for a single component refrigerant, at least one of the following:
  - the chemical name;
  - the chemical formula;
  - the refrigerant number;
– for a blended refrigerant, at least one of the following:
  - the chemical name and nominal proportion of each of the components;
  - the chemical formula and nominal proportion of each of the components;
  - the refrigerant number and nominal proportion of each of the components;
  - the refrigerant number of the refrigerant blend;
– the chemical name or refrigerant number of the principal component of the insulation blowing gas.

Refrigerant numbers are given in ISO 817.

For **compression-type appliances**, the defrosting power input in watts shall be marked separately if the current corresponding to the defrosting power input is greater than the **rated current** of the appliance.

Appliances which can be mains and battery operated shall be marked with the battery voltage.

Appliances which can be battery operated shall be marked with the type of battery, distinguishing between rechargeable and non-rechargeable batteries, if necessary, unless the type is irrelevant for the operation of the appliance.

The means provided for connection of any additional electrical supply shall be marked with the voltage and nature of the supply.

Appliances having provision for an **incorporated ice-maker** shall be marked with the maximum power input for an **incorporated ice-maker**, if greater than 100 W.

Ice-makers without automatic water level control shall be marked with the maximum permissible water level.

Appliances shall be marked with details of the source of supply other than electrical, if any.

For **compression-type refrigerating systems**, the appliance shall also be marked with the mass of the refrigerant for each separate refrigerant circuit.

Compression-type appliances which use **flammable refrigerants** shall be marked with the symbol ISO 7010 W021 (2019-07).

Appliances employing R-744 in a **transcritical refrigeration system** shall be marked with the substance of the following:

WARNING: System contains refrigerant under high pressure. Do not tamper with the system. It must be serviced by qualified persons only.

Appliances employing R-744 in a **transcritical refrigeration system** shall be marked with symbol ISO 7000- 1701 (2004-01).

7.6 *Addition:*

	[symbol IEC 60417-5005 (2002-10)]	Plus; Positive polarity
	[symbol IEC 60417-5006 (2002-10)]	Minus; Negative polarity
	[symbol ISO 7010 W021 (2019-07)]	Warning; Risk of fire / Flammable materials
	[symbol ISO 7000-1701 (2004-01)]	Pressure

~~NOTE The rules for warning signs in ISO 3864-1 apply to the colour and shape of the symbol ISO 7010 W021.~~

~~**7.10** *Addition:*~~

~~NOTE 101 As an alternative, temperature values in degrees Celsius may be indicated on a control scale.~~

7.12 *Addition:*

The instructions for **refrigerating appliances** and **ice-makers** for camping or similar use shall include the substance of the following:

– suitable for camping use;

– the appliance may be connected to more than one source of energy

~~NOTE 101~~ (not applicable to appliances which are intended to be supplied by electricity only);

– the appliance shall not be exposed to rain

~~NOTE 102~~ (not applicable to appliances with a degree of protection against harmful ingress of water of at least IPX4).

The instructions for **ice-makers** not intended to be connected to the water supply shall state the substance of the following warning:

WARNING: fill with potable water only.

For **compression-type appliances** which use **flammable refrigerants**, the instructions shall include information pertaining to the installation, handling, servicing and disposal of the appliance.

The instructions for **compression-type appliances** that use **flammable refrigerants** shall additionally include the substance of the warnings listed below:

– WARNING: Keep ventilation openings, in the appliance enclosure or in the built-in structure, clear of obstruction.

– WARNING: Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.

– WARNING: Do not damage the refrigerant circuit.

NOTE 103 This warning is only applicable for appliances with refrigerating circuits which are accessible by the user.

– WARNING: Do not use electrical appliances inside the food storage compartments of the appliance, unless they are of the type recommended by the manufacturer.

For appliances which use flammable insulation blowing gases, the instructions shall include information regarding disposal of the appliance.

The instructions for **ice-cream appliances** shall include the ingredients and maximum quantity of mixtures that can be used in the appliance.

The instructions shall state the substance of the following:

Do not store explosive substances such as aerosol cans with a flammable propellant in this appliance.

If symbol ISO 7000-1701 (2004-01) is used, its meaning shall be explained.

The instructions shall include the substance of the following:

This appliance is intended to be used in household and similar applications such as

– staff kitchen areas in shops, offices and other working environments;
– farm houses and by clients in hotels, motels and other residential type environments;
– bed and breakfast type environments;
– catering and similar non-retail applications.

NOTE 104 If the manufacturer wants to limit the use of the appliance to less than the above, this has to be clearly stated in the instructions.

If symbol ISO 7010 W021 (2019-07) is used, its meaning shall be explained.

The instructions for **refrigerating appliances** and **ice-makers** shall include the substance of the following:

WARNING: When positioning the appliance, ensure the supply cord is not trapped or damaged.

WARNING: Do not locate multiple portable socket-outlets or portable power supplies at the rear of the appliance.

7.12.1 *Addition:*

Instructions shall include the method for replacing illuminating lamps, if the lamps can be replaced by the user.

For appliances designed for incorporating **ice-makers**, the instructions shall include the types of **ice-makers** which can be incorporated.

The instructions shall include information on the installation of **incorporated ice-makers** which are available as optional accessories and intended to be installed by the user. If it is intended that **incorporated ice-makers** are to be installed only by the manufacturer or its service agent, this shall be stated.

The instructions for **ice-makers** intended to be connected to the water supply shall state the substance of the following warning:

WARNING: Connect to potable water supply only.

The instructions for **fixed appliances** shall include the substance of the following warning:

WARNING: To avoid a hazard due to instability of the appliance, it must be fixed in accordance with the instructions.

In appliances employing R-744 in a **transcritical refrigeration system**, the instructions shall include the substance of the following:

WARNING: The refrigeration system is under high pressure. Do not tamper with it. Contact qualified service personal before disposal.

7.12.4 *Modification:*

This subclause is also applicable to **fixed appliances**.

7.14 *Addition:*

The height of the triangle in the symbol ISO 7010 W021 (2019-07) shall be at least 15 mm.

The height of the letters used for the marking of the type of flammable insulation blowing gas shall be at least 40 mm.

7.15 *Addition:*

The marking of the maximum rated wattage of illuminating lamps that can be replaced by the user shall be easily discernible while the lamp is being replaced.

For **compression-type appliances**, the marking of the type of **flammable refrigerant** and of the flammable insulation blowing gas, as well as the symbol ISO 7010 W021 (2019-07), shall be visible when gaining access to the motor-compressors.

For other appliances, the marking of the type of flammable insulation blowing gas shall be on the external enclosure.

7.101 For appliances which can be battery operated, the supply terminals or terminations for connections to the battery shall be clearly indicated by symbols.

The positive terminal shall be indicated by symbol IEC 60417-5005 (2002-10) and the negative terminal by symbol IEC 60417-5006 (2002-10).

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.1 *Modification:*

Replace the second paragraph of the test specification by the following:

*Lamps are not removed, provided that the appliance can be isolated from the supply by means of a plug or an all-pole switch. However, during the insertion or removal of lamps, protection against contact with **live parts** of the lamp cap shall be ensured.*

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.1 *Modification:*

Replace the third dashed item of the first paragraph of the test specification by the following:

– *the appliance being operated under **normal operation** except that user adjustable temperature controls are set to give the lowest temperature.*

Addition:

The power input is considered to be stabilized when steady conditions are established or when any incorporated timer operates, whichever occurs first.

*A representative period is one between the making and the breaking of the temperature control, or between the highest and lowest values of power input measured, excluding starting power input but including the power input of the **incorporated ice-maker**, if any.*

NOTE 101 The power input of a defrosting system which is separately marked on the appliance is not taken into consideration during the test.

10.2 *Modification:*

Replace the third dashed item of the first paragraph of the test specification by the following:

– *the appliance being operated under **normal operation** except that user adjustable temperature controls are set to give the lowest temperature.*

Addition:

*For **refrigerating appliances** using inverter driven motor-compressors, the appliance shall be operated for a period of 6 h or the maximum setting of an incorporated timer, whichever is shorter. Defrost cycles are excluded, if any. 2 Other appliances are operated for a period of 1 h or the maximum setting of an incorporated timer, whichever is shorter. Excluding starting*

current, the maximum value of the current averaged over any 5 min period is obtained. The interval between current measurements shall not exceed 30 s.

NOTE 101 Starting current is considered to be excluded if the first current measurement is made approximately 1 min after starting.

10.101 The power input of the defrosting system shall not deviate from the defrosting power input marked on the appliance by more than the deviation shown in Table 1.

*Compliance is checked by operating the appliance at **rated voltage** and measuring the power input of the defrosting system after the power input has stabilized.*

10.102 The power input of any **heating system** shall not deviate from the power input of these systems marked on the appliance by more than the deviation shown in Table 1.

*Compliance is checked by operating the appliance at **rated voltage** and measuring the power input of the **heating system** after the power input has stabilized.*

11 Heating

This clause of Part 1 is applicable except as follows.

11.1 *Modification:*

Compliance is checked by determining the temperature rise of the various parts under the conditions specified in 11.2 to 11.7.

If the winding temperatures of motor-compressors exceed the values given in Table 101, compliance is checked by the test of 11.101.

The winding temperatures of motor-compressors conforming to IEC 60335-2-34 (including its Annex AA) are not measured.

11.2 *Replacement:*

***Built-in appliances** are installed in accordance with the instructions for installation.*

***Ice-cream appliances** are placed as near to the walls of the test corner as possible, unless the manufacturer indicates in the instructions for use that a free distance shall be observed from the walls, in which case this distance is observed during the test. If means of ventilation are supplied by the manufacturer, they are mounted as intended.*

Other appliances are placed in a test enclosure. The walls enclose the appliance as near to all its sides and above as possible, unless the manufacturer indicates in the instructions for installation that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test.

*Dull black painted plywood approximately 20 mm thick is used for the test corner, supports and installation of **built-in appliances** and for the test enclosure for other appliances.*

11.7 *Replacement:*

The appliance is operated until steady conditions are established.

11.8 *Modification:*

Replace the text above Table 3 by the following:

*During the test, **protective devices** other than self-resetting thermal motor-protectors for motor-compressors shall not operate. When steady conditions are established, self-resetting thermal motor-protectors for motor-compressors shall not operate.*

During the test, sealing compound, if any, shall not flow out.

During the test, temperature rises are monitored continuously.

For appliances of extended temperate (SN) or temperate (N) class, the temperature rises shall not exceed the values given in Table 3.

For appliances of subtropical (ST) or tropical (T) class, the temperature rises shall not exceed the values given in Table 3 reduced by 7 K.

Addition:

For motor-compressors not conforming to IEC 60335-2-34 (including its Annex AA), the temperatures of

– *housings of motor-compressors, and*
– *windings of motor-compressors*

shall not exceed the values given in Table 101.

For motor-compressors conforming to IEC 60335-2-34 (including its Annex AA), the temperatures of their

– *housings of motor-compressors,*
– *windings of motor-compressors, and*
– *other parts such as its protection system and control system, and all other components that have been tested together with the motor-compressor during the tests of IEC 60335-2-34 and its Annex AA*

are not measured.

*The entry in Table 3 relating to the temperature rise of the external enclosure of **motor-operated appliances** is applicable to all appliances covered by this standard. However, it is not applicable to those parts of the external enclosure of the appliance that are,*

– *for **built-in appliances**, not **accessible parts** after installation in accordance with the instructions for installation;*
– *for other appliances, on that part of the appliance that according to the instructions for installation is intended to be placed against a wall with a free distance not exceeding 75 mm.*

Table 101 – Maximum temperatures for motor-compressors

Part of the motor-compressor	***Temperature*** ***°C***
Windings with	
– synthetic insulation	*140*
– cellulose insulation or the like	*130*
Housing	*150*

The temperature of ballast windings and their associated wiring shall not exceed the values specified in 12.4 of IEC 60598-1:2014/AMD1:2017 when measured under the conditions stated.

11.101 *If the temperatures of the windings of motor-compressors other than those complying with IEC 60335-2-34 including its Annex AA are higher than the temperature limits given in Table 101, the test is carried out again, the **thermostat** or similar control device being set at the lowest temperature, and the short circuit of the user-adjustable temperature control device removed.*

The winding temperatures are measured at the end of a running cycle.

The temperatures shall be not higher than the temperature limits given in Table 101.

11.102 Any defrosting system shall not give rise to excessive temperatures.

Compliance is checked by the following test.

*The appliance is supplied at the most unfavourable voltage between 0,94 and 1,06 times the **rated voltage**:*

- *in the case of appliances where defrosting is manually controlled, until the **evaporator** is coated with a layer of frost;*
- *in the case of appliances where defrosting is automatically or semi-automatically controlled, until the **evaporator** is coated with a layer of frost; however, this layer shall be not thicker than that which occurs in normal use during the intervals between the successive automatic defrosting operations or, for the semi-automatic defrosting, during the intervals between the defrosting operations recommended by the manufacturer, if any.*

NOTE 1 One method of accumulation of frost for **refrigerating appliances** is given in Annex BB.

With the defrosting system operating:

- *for **absorption-type appliances** and for **compression-type appliances** in which the defrosting system can be energized with the rest of the appliance unenergized, the supply voltage is as specified in 11.4;*
- *for other **compression-type appliances**, the supply voltage is as specified in 11.6.*

NOTE 2 The defrosting system is regarded as being able to be energized separately if this can be done without the use of a **tool**.

If the defrosting time is controlled by an adjustable device, the device is set to the time recommended by the manufacturer. If a control device is used which stops the defrosting at a given temperature or pressure, the defrosting period is automatically terminated when the control operates.

For manually controlled defrosting, the test is continued until steady conditions are established; otherwise the test is continued until the defrosting period is automatically terminated by a control device.

The temperatures of combustible materials and of electrical components liable to be affected by the defrosting operation are measured with thermocouples.

The temperatures and temperature rises shall not exceed the values given in 11.8.

NOTE 3 During the recovery period after defrosting, the thermal overload protector of the motor compressor ~~may~~ can operate.

11.103 Heating systems, other than defrosting systems, incorporated in an appliance shall not give rise to excessive temperatures.

Compliance is checked by the following test.

***Heating systems** other than defrosting systems are energized as follows:*

– *for **absorption-type appliances** and for **compression-type appliances** in which the **heating system** can be energized with the rest of the appliance unenergized, the supply voltage is as specified in 11.4;*
– *for other **compression-type appliances**, the supply voltage is as specified in 11.6.*

NOTE The defrosting system is regarded as being able to be energized separately, if this can be done without the use of a **tool**.

The test is continued until steady conditions are established.

*Temperature rises are measured by means of thermocouples fixed on the outside surface of the insulation of the **heating systems**.*

Temperature rises shall not exceed the values given in 11.8.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable except as follows.

13.1 *Addition:*

The test of 13.2 does not apply to battery circuits.

13.2 *Modification:*

*Instead of the values specified for **class 0I appliances** and the various types of **class I appliances**, the following values apply:*

– *for **class 0I appliances***	*0,75 mA;*
– *for **class I refrigerating appliances***	*the values specified for the various types of stationary **class I appliances**;*
– *for other **class I appliances***	*1,5 mA.*

13.3 *Addition*:

*The test voltage specified in Table 4 for **reinforced insulation** is applied between separate circuits for battery operation and mains supply operation.*

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.2 *Addition:*

Lamp covers are not removed.

15.101 Appliances subject to spillage of liquid from containers onto the inside walls of the cabinet or compartment shall be constructed so that such spillage does not affect their electrical insulation.

Compliance is checked by the relevant tests of 15.101.1 and 15.101.2 using the spillage solution specified in 15.2.

15.101.1 *The apparatus shown in Figure 101 is filled with the spillage solution to the level of the lip, and the displacement block is supported just above the solution by means of any suitable release mechanism and bridge support.*

*All shelves and containers which can be removed without the use of a **tool** are removed and the appliance is disconnected from the supply. Lamp covers are not removed.*

The apparatus is supported with its base horizontal and so positioned and at such a height that when the release mechanism is operated, the solution is discharged over the back and side interior walls of the cabinet or compartment including any electrical components mounted thereon, in the most unfavourable manner. The test is made only once with the apparatus in any one position, but the test may be repeated as many times as necessary in different positions, provided that there is no residual solution on parts wetted by a previous test.

*Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of the solution on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

Furthermore, if the inspection shows that the solution is in contact with the defrost heating element or its insulation, then the complete heating element shall withstand the test of 22.102.

15.101.2 *A rectangular container having dimensions of 200 mm x 110 mm and a height of 50 mm is filled with 0,5 l of the spillage solution.*

*The container is positioned, with its longest side parallel to the wall to be tested, on the highest shelf on which it will fit, the shelf shall have a clearance to the ceiling of the compartment of at least 130 mm. All other shelves and containers which can be removed without the use of a **tool** are removed. Lamp covers are not removed.*

The appliance is disconnected from the supply and the solution in the vessel is discharged over the back and side interior walls of the cabinet or compartment including any electrical components mounted thereon, in the most unfavourable manner within a period of 2 s. The test is made only once with the container in any one position, but the test may be repeated as many times as necessary in different positions, provided that there is no residual solution on parts wetted by a previous test.

*Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of the solution on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

Furthermore, if the inspection shows that the solution is in contact with the defrost heating element or its insulation, then the complete heating element shall withstand the test of 22.102.

15.102 Appliances subject to spillage of liquid onto the top of the cabinet shall be constructed so that such spillage does not affect their electrical insulation.

Compliance is checked by the relevant tests of 15.103 and 15.104. The spillage solution specified in 15.2 is used for the test of 15.103.

15.103 *Appliances, other than **built-in appliances**, **ice-makers** and **ice-cream appliances** are tilted at an angle of up to 2° in relation to the position of normal use in the direction which is likely to be the most unfavourable for this test. One half-litre of the spillage solution is poured uniformly over the top of the appliance in approximately 60 s at the most unfavourable place from a height of approximately 50 mm with the controls in the on position and the appliance disconnected from the supply.*

*Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of the solution on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

15.104 *For **ice-makers** which are directly connected to the water supply, the container, or that part of the appliance which serves as the container, is filled with water as in normal use. The inlet valve is then held open and the filling is continued for 1 min after the first evidence of overflow.*

Where no spillage occurs due to operation of a device that prevents such spillage, the inlet valve is held open for a further 5 min following the operation of this device.

*Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

15.105 Operation of a defrosting system shall not affect the electrical insulation of defrost heating elements.

Compliance is checked by the following test.

*Immediately after the test of 11.102, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.*

Furthermore, if the inspection shows that water is in contact with the defrost heating element or its insulation, then the apparatus shall withstand the test of 22.102.

16 Leakage current and electric strength

This clause of Part 1 is applicable except as follows.

16.1 *Addition:*

The test of 16.2 does not apply to battery circuits.

16.2 *Modification:*

*Instead of the values specified for **class 0I appliances** and the various types of **class I appliances**, the following values apply:*

– *for **class 0I appliances***	*0,75 mA;*
– *for **class I refrigerating appliances***	*the values specified for the various types of stationary **class I appliances**;*
– *for other **class I appliances***	*1,5 mA.*

16.3 *Addition:*

The test voltage specified in Table 7 for reinforced insulation is applied between separate circuits for battery operation and mains supply operation.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 *Addition:*

*Subclauses 19.2 and 19.3 do not apply to **heating systems**.*

In addition, fan motors and their thermal motor-protectors, if any, are subjected to the test specified in Annex AA.

~~NOTE 101~~ *For any given type of fan motor and thermal motor-protection combination, this test is performed only once.*

Motor compressors not conforming to IEC 60335-2-34 are subjected to the tests specified in 19.101 and 19.102 of IEC 60335-2-34 and shall also conform to 19.104 of that standard.

~~NOTE 102~~ *For any given type of motor-compressor, this test is performed only once.*

*Fan motors of **ice-cream appliances** are not subject to the locked-rotor test of Annex AA.*

19.7 *Addition:*

*Fan motors of **ice-cream appliances** are tested for 5 min.*

19.8 *Addition:*

This test is not applicable to three-phase motor-compressors complying with IEC 60335-2-34.

19.9 Not applicable.

19.13 *Addition:*

The temperature of the housing of motor-compressors other than those which comply with IEC 60335-2-34 is determined at the end of the test period and shall not exceed 150 °C.

19.101 Heating systems shall be so dimensioned and located that there is no risk of fire even in the case of abnormal operation.

Compliance is checked by inspection and the following test.

Doors and lids of the appliance are closed and the refrigerating system is switched off.

*Any **heating system** intended to be switched on and off by the user is switched on.*

***Heating systems** are continuously energized at a voltage equal to 1,1 times their **working voltage**, until steady conditions are established. If there is more than one **heating system**, they are operated each in turn, unless failure of a single component will cause two or more to operate together, in which case they are tested in combination.*

NOTE It ~~may~~ can be necessary to short-circuit one or more components which operate during **normal operation** in order to ensure that the **heating systems** are continuously energized.

~~NOTE~~ ***Self-resetting thermal cut-outs** are short-circuited unless they comply with 24.1.~~2~~4, the number of cycles of operation being 100 000.*

*The refrigerating system is not switched off if this prevents the **heating system** from operating.*

During and after the test, the appliance shall comply with 19.13.

19.102 Ice-makers and **ice-cream appliances** shall be constructed so that they shall not cause any risk of fire, mechanical hazard or electric shock even in the case of abnormal operation.

*Compliance is checked by applying any defect which may be expected in normal use, while the **ice-maker**, **incorporated ice-maker** or **ice-cream appliance** is operated under **normal operation** at **rated voltage**. Only one fault condition is reproduced at a time and the tests are made consecutively.*

The tests are made with the tap closed or opened, whichever gives the more unfavourable result.

Components complying with the relevant IEC standard are not open-circuited or short-circuited, provided the appropriate standard covers the conditions which occur in the appliance.

Water level switches complying with IEC 61058-1 are not short-circuited during these tests.

*During the tests, the temperatures of the windings of the **ice-maker**, **incorporated ice-maker**, **ice-cream appliance** or of the appliance incorporating the **ice-maker** shall not exceed the values given in Table 8.*

During and after the tests, the appliance shall comply with 19.13.

NOTE 1 Examples of fault conditions are:

– timer stopping in any position;

– disconnection and reconnection of one or more phases of the supply during any part of the programme;

– open-circuiting or short-circuiting of components, thermal controls are not short-circuited;

– failure of a magnetic valve;

– operation with an empty container.

NOTE 2 In general, tests are limited to those cases which ~~may~~ can be expected to give the most unfavourable results.

~~NOTE 3 The tests are made with the tap closed or opened, whichever gives the more unfavourable result.~~

~~NOTE 4 For the purpose of these tests, thermal controls are not short-circuited.~~

~~NOTE 5 Components complying with the relevant IEC standard are not open-circuited or short-circuited, provided the appropriate standard covers the conditions which occur in the appliance.~~

~~NOTE 6 Water level switches complying with IEC 61058-1 are not short-circuited during these tests.~~

NOTE ~~7~~ 3 The test during which the automatic filling device is held open has already been made during the test of 15.104.

19.103 Appliances intended for camping and similar use shall be constructed so that the risk of fire, mechanical hazard or electric shock is obviated as far as is practicable in the event of the appliance being operated whilst inclined.

Compliance is checked by the following test.

The appliance is placed on a support inclined by 5° in the most unfavourable position and is operated under ***normal operation*** *at* ***rated voltage*** *until steady conditions are established.*

During the test, ***non-self-resetting thermal cut-outs*** *which are accessible only with the aid of a* ***tool*** *or which require the replacement of a part shall not operate and no ignitable gas shall accumulate in the appliance.*

During and after the test, the appliance shall comply with 19.13.

19.104 Illuminating equipment shall not cause a hazard under abnormal operating conditions.

Compliance is checked by the following test, for which the appliance is empty, the refrigerating system is switched off or rendered inoperative, with the lamp circuit remaining operable, and doors or lids are in the most unfavourable open position or closed, whichever is the more onerous.

The complete illuminating equipment including its protective cover, fitted with a lamp as recommended by the manufacturer, is operated for 12 h at 1,06 times the ***rated voltage****.*

If an incandescent lamp does not attain the maximum rated wattage at ***rated voltage****, the voltage is varied until the maximum rated wattage is reached and is then increased to 1,06 times this voltage.*

Illuminating equipment having discharge lamps is operated under the fault conditions specified in items a), d) and e) of 12.5.1 of IEC 60598-1:2014/AMD1:2017, the appliance being supplied at ***rated voltage*** *until temperature stabilization of the measured parts*

During and after the test, the appliance shall comply with 19.13.

The temperatures of ballast windings and their associated wiring shall not exceed the values specified in 12.5 of IEC 60598-1:2014/AMD1:2017 when measured under the conditions specified.

19.105 Appliances intended for battery operation and having the polarity marked on or adjacent to the terminals or terminations shall be constructed so that the risk of fire, mechanical hazard or electric shock is obviated in the event of an inverted polarity connection.

Compliance is checked by operating the appliance under the conditions specified in Clause 11 but with a fully charged 70 Ah battery connected with reversed polarity.

During and after the test, the appliance shall comply with 19.13.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 *Modification:*

Instead of the requirement, the following applies:

Ice-cream appliances shall have adequate stability.

20.101 **Refrigerating appliances** and **ice-makers** shall have adequate stability. If stability of the appliance is provided by an open door, the door shall be designed to provide support.

This requirement does not apply to **built-in appliances**.

*Compliance is checked by inspection and by the tests of 20.102, 20.103 and 20.104, which are carried out after the empty appliance has been disconnected from the supply, placed on a horizontal support and levelled in accordance with the instructions for installation, with castors and rollers, if any, oriented or adjusted to the most unfavourable position. **Fixed appliances** having a height exceeding 1,3 m are installed in accordance with the instructions for installation.*

~~NOTE~~ ***Fixed appliances*** *with a height not exceeding 1,3 m are tested as free-standing appliances.*

During these tests, the appliance shall not tilt by more than 2° from the horizontal position and, after the tests, compliance with Clauses 8, 16 and 29 shall not be impaired.

20.102 *Appliances provided with doors shall be subjected to the following test.*

Unless otherwise specified in this standard, all door shelves, other than those which are specifically designed for storing eggs, shall be loaded using cylindrical weights having a diameter of 80 mm and a mass of 0,5 kg.

~~NOTE 1~~ *If egg racks can be removed, the relevant shelf is not considered to be specifically designed for storing eggs.*

As many weights as possible are placed horizontally on the door shelves starting as far as possible from the hinge and touching each other along the shelf, even if extended beyond the edge of the shelf, except for a space less than 80 mm wide at the end of the shelf.

Three of these weights are placed in each position on those shelves where the free height above the shelf is 340 mm or higher, two weights in each position on those shelves where the free height above the shelf is between 170 mm and 340 mm and one weight in each position where the free height above the shelf is less than 170 mm. Shelves that can be adjusted to different positions by the user are placed in the position which will give the most unfavourable results.

~~NOTE 2~~ *If the shelf is too narrow to accommodate the weights lying flat, the weights may overhang the shelf or be tipped up.*

Liquid containers located on the door are filled with a quantity of water to their full mark or, in the absence of a full mark, are completely filled.

For appliances with only one door, this is opened through an angle of approximately 90° and a weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of the door.

For appliances with more than one door, any two doors, in the most unfavourable combination, are opened through an angle of approximately 90°. The shelves of closed doors are not loaded. A weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of one of the open doors, chosen so as to give the most onerous test conditions.

The test is repeated with the door or doors opened through an angle of approximately 180° or to the limit of the door stop, whichever results in the smaller angle of opening.

Where appliances are provided with reversible doors, the test with the doors open to 180° or to the limit of the door stop, is repeated with the doors hinged on the other side in accordance with the instructions, if this will give a more unfavourable result.

20.103 *Appliances provided with sliding drawers inside food storage compartments are subjected to the following test.*

Each drawer is loaded with a uniformly distributed load/unit storage volume of the drawer of 0,5 kg/l.

~~NOTE~~ *Unit storage volume is the geometric volume of the drawer taking into account the free height of the space above the drawer.*

In appliances provided with up to three sliding drawers within food storage compartments, one of the drawers, selected to give the most unfavourable result, is pulled to the most onerous out position or to its stops, if fitted, with the appropriate door opened through an angle of approximately 90°.

In appliances provided with more than three sliding drawers within food storage compartments, two non-adjacent drawers, selected to give the most unfavourable result, are pulled to their most onerous out position or to their stops, if fitted, with any doors necessary to gain access to the drawers opened through an angle of approximately 90°.

The door shelves on opened doors are loaded in accordance with 20.102

20.104 *Appliances provided with sliding drawers accessible without opening a door are subjected to the following test.*

Each sliding drawer accessible without opening a door is loaded with a uniformly distributed load/unit storage volume of the compartments of 0,5 kg/l.

~~NOTE~~ *Unit storage volume is the geometric volume of the drawer taking into account the free height of the space above the drawer.*

One drawer, selected to give the most unfavourable result is pulled to its most onerous out position or to its stops, if fitted, and a weight of 23 kg is gently applied to or suspended from the centre of the drawer.

If the appliance also is provided with a door or doors, unless otherwise specified, the door shelves are loaded as specified in 20.102.

For appliances with only one door, this is opened through an angle of approximately 90° and a weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of the door.

For appliances with more than one door, any two doors, in the most unfavourable combination, are opened through an angle of approximately 90°. The shelves of closed doors are not loaded. A weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of one of the open doors, chosen so as to give the most onerous test conditions.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 *Modification:*

~~NOTE 101~~ *Covers of lamps within the appliance are considered likely to be damaged in normal use. Lamps are not tested.*

Addition:

*For **accessible glass panels**, the impact energy is 1,00 J ± 0,05 J.*

21.101 Appliances for camping or similar use shall withstand the effects of dropping and vibration.

Compliance is checked by the following test.

The appliance is placed on a horizontal wooden panel which is dropped 50 times from a height of 50 mm onto a solid base of wood.

The appliance is then fastened in its normal position of use to a vibration-generator by means of straps around the enclosure. The type of vibration is sinusoidal, the direction is vertical and the severity is as follows:

– *duration*	*30 min;*
– *amplitude*	*0,35 mm;*
– *sweep frequency range*	*10 Hz, 55 Hz, 10 Hz;*
– *sweep rate*	*approximately one octave per minute.*

After the test, the appliance shall show no damage affecting safety; in particular, no connections or parts the loosening of which may impair safety shall have loosened.

21.102 Lamps shall be protected against mechanical shocks.

Compliance is checked by applying a 75 mm ± 0,5 mm diameter sphere without appreciable force in an attempt to touch the lamp with the lamp cover in place.

The sphere shall not touch the lamp.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

Thermostats, with the exception of their thermosensitive parts, shall not be in contact with the **evaporator** unless they are adequately protected against condensation on cold surfaces and against the effect of water formed during the defrosting process.

NOTE 101 Attention is drawn to the fact that fluids ~~may~~ can flow along parts such as stems and tubes of thermostats.

22.7 *Replacement:*

Compression-type appliances, including protective enclosures of a protected cooling system, using **flammable refrigerants** shall withstand

– a gauge pressure of 3,5 times the saturated vapour pressure of the refrigerant at 70 °C for parts exposed to the high-side pressure during normal operation;
– a gauge pressure of 5 times the saturated vapour pressure of the refrigerant at 20 °C for parts exposed only to low-side pressure during normal operation.

NOTE Specific constructional requirements of appliances with a protected cooling system are given in 22.107.

~~NOTE 102 All pressures are gauge pressures.~~

Compliance is checked by the following test:

The appropriate part of the appliance under test is subjected to a pressure that is gradually increased hydraulically until the required test pressure is reached. This pressure is maintained for 1 min. The part under test shall show no leakage.

~~NOTE 103~~ *The test is not carried out on motor-compressors complying with IEC 60335-2-34.*

22.9 *Addition:* **3**

For the types of refrigerant and types of oil for which the motor-compressor is intended to be used, compliance of winding wire insulation shall be checked by the tests detailed in Annex BB of IEC 60335-2-34:2012/AMD1:2015 or for motor-compressors that do not use oil by test 16 in IEC 60851-4 for resistance to refrigerants. For test 16 in IEC 60851-4, the percentage of extractable matter shall not exceed 0,5 %. The breakdown voltage shall be at least 75 % of the minimum specified value.

For the types of refrigerant and types of oil for which the motor-compressor is intended to be used, compliance of tie cords and insulation materials other than winding wire insulation shall be checked by the tests detailed in Annex CC of IEC 60335-2-34:2012/AMD1:2015.

The tests are not performed on motor-compressors complying with IEC 60335-2-34.

22.17 *Modification:*

The requirement is not applicable to **refrigerating appliances** and **ice-makers**.

22.33 *Addition:*

Heating conductors having only one layer of insulation shall not be in direct contact with water or ice during normal use.

~~NOTE 101 Frozen water is regarded as a conducting liquid.~~

22.101 Lampholders shall be fixed so that they do not work loose in normal use

~~NOTE~~ , including during replacement of lamps.

Compliance is checked by inspection and, if necessary, by subjecting the lampholders to a torque of 0,15 Nm for E14 and B15 lampholders, and 0,25 Nm for E27 and B22 lampholders. The lampholders shall then withstand a push force and then a pull force of 10 N ± 1 N, each applied for 1 min in the direction of the axis of the lampholder.

After the tests, lampholders shall not have worked loose.

Lampholders for a fluorescent lamp shall comply with the test of 4.4.4 i) in IEC 60598-1:2014/AMD1:2017.

22.102 Insulated wire heaters and their joints located in, and in integral contact with, thermal insulation shall be protected against entry of water.

The requirement is not applicable to insulated wire heater connections to electrical terminals.

Compliance is checked by immersing three samples of the complete heating element in water containing approximately 1 % NaCl and having a temperature of 20 °C ± 5 °C for a period of 24 h.

A voltage of 1 250 V is then applied for 15 min between the live part(s) of the heating element and the water.

During the test, no breakdown shall occur.

~~NOTE Connections to electrical terminals are not considered as joints.~~

22.103 Appliances employing a **transcritical refrigeration system** shall in the high pressure side of the refrigeration system include a **pressure relief device** on the compressor or between the compressor and the **gas cooler**. There shall be no shut off devices or other components except piping between the compressor and the **pressure relief device**, which could introduce a pressure drop.

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.

The **pressure relief device** shall have no provisions for setting by the end user.

The operating pressure of the **pressure relief device** shall be no higher than the **design pressure** of the high pressure side.

The **design pressure** of the high pressure side shall be not less than the minimum high side test pressure required in Table 101 of IEC 60335-2-34:2012/AMD2:2016 divided by 3.

The refrigeration system, including all components, shall withstand the pressures expected in normal and abnormal use and during standstill.

Pressure testing has to be done on the complete refrigeration system, however it can be done separately for the low pressure side and for the high pressure side.

Compliance is checked by inspection and by the following test.

*The **pressure relief device** is made inoperable and the test pressure is raised gradually*

- *for the high pressure side, until a pressure not less than the minimum high side test pressure required in Table 101 of IEC 60335-2-34:2012/AMD2:2016 is reached, however not less than 3 times the **design pressure**;*
- *for the low pressure side, until a pressure not less than the minimum low side test pressure required in Table 102 of IEC 60335-2-34:2012/AMD2:2016 is reached.*

For a refrigeration system with an intermediate pressure between high pressure side and low pressure side, all parts subjected to the intermediate pressure are considered to be on the low pressure side.

The pressure is maintained for one minute and the parts under test shall show no leakage.

~~NOTE~~ *The test is not carried out on motor-compressors complying with IEC 60335-2-34.*

22.104 Appliances with two or more temperature control devices which control the same motor-compressor shall not cause undue operation of the thermal motor-protector of the motor-compressor.

Compliance is checked by the following test.

*The appliance is operated at **rated voltage** under **normal operation** except that user adjustable temperature control devices are set to give cyclic operation.*

When steady conditions are established, and immediately after a breaking of the first control device, the second control device is activated. The thermal motor-protector of the motor-compressor shall not operate.

In the case of appliances where more than two control devices may act on a motor-compressor, the test is carried out separately with each combination of control devices.

22.105 For mains-operated appliances which can also be battery operated, the battery circuit shall be insulated from **live parts** by **double insulation** or **reinforced insulation**.

Moreover, it shall not be possible to touch **live parts** when making the connections to the battery. This applies even if covers, or other parts which have to be removed to make the connections, are **non-detachable parts**.

*Compliance is checked by inspection and by the tests specified for **double insulation** or **reinforced insulation**.*

22.106 The mass of refrigerant in **compression-type appliances** which use **flammable refrigerant** in their cooling system shall not exceed 150 g in each separate refrigerant circuit.

Compliance is checked by inspection.

22.107 Compression-type appliances with a protected cooling system and which use **flammable refrigerants** shall be constructed to avoid any fire or explosion hazard, in the event of leakage of the refrigerant from the cooling system.

~~NOTE 1~~ Separate components such as **thermostats** which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage from the component itself.

~~NOTE 2~~ Appliances with a protected cooling system are those

– without any part of the cooling system inside a food storage compartment;
– where any part of the cooling system which is located inside a food storage compartment is constructed so that the refrigerant is contained within an enclosure with at least two layers of metallic materials separating the refrigerant from the food storage compartment. Each layer shall have a thickness of at least 0,1 mm. The enclosure has no joints other than the bonded seams of the evaporator where the bonded seam has a width of at least 6 mm;
– where any part of the cooling system which is located inside a food storage compartment has the refrigerant contained in an enclosure which itself is contained within a separate protective enclosure. If leakage from the containing enclosure occurs, the leaked refrigerant is contained within the protective enclosure and the appliance will not function as in normal use. The protective enclosure shall also withstand the test of 22.7. No critical point in the protective enclosure shall be located within the food storage compartment.

~~NOTE 3~~ Separate compartments with a common air circuit are considered to be a single compartment.

Compliance is checked by inspection and by the tests of 22.107.1, 22.107.2 and if necessary, 22.107.3.

NOTE An appliance with a protected cooling system which, when tested, is found not to comply with the requirements specified for a protected cooling system, ~~may~~ can be considered as having an unprotected cooling system if it is tested in accordance with 22.108 and found to comply with the requirements for an unprotected cooling system.

22.107.1 *A leakage is simulated at the most critical point of the cooling system. For refrigerant circuits that do not meet the corrosion requirements of 22.107.3, a leak is also simulated at any point of the cooling circuit that is nearest to an entry of a pipe or cable into a food storage compartment.*

~~NOTE 1~~ *Critical points are only interconnecting joints between parts of the refrigerant circuit including the gasket of a semi-hermetic motor compressor. Aluminium to copper joints are also critical points unless they are protected against corrosion by a coating or sleeving that excludes oxygen. Welded telescopic joints of the motor-compressor housing, the welding of the pipes through the motor-compressor housing and the welding of the hermetic glass to metal seals (fusite) are not considered to be pipework joints.*

NOTE 1 To find the most critical point of the cooling system, it ~~may~~ can be necessary to carry out more than one test.

The method for simulating a leakage is to inject the refrigerant vapour through a capillary tube at the critical point. The capillary tube shall have a diameter of 0,7 mm ± 0,05 mm and a length between 2 m and 3 m.

NOTE 2 Care ~~should~~ can be taken that the installation of the capillary tube does not unduly influence the results of the test and that the foam does not enter the capillary tube during foaming. The capillary tube ~~may need to~~ can be positioned before the appliance is foamed.

*During this test, the appliance is tested with doors and lids closed, and is switched off or operated under **normal operation** at **rated voltage**, whichever gives the more unfavourable result.*

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

The quantity of refrigerant of the type indicated by the manufacturer to be injected is equal to 80 % of the nominal charge of the refrigerant ± 1,5 g or the maximum which can be injected in one hour, whichever is the smaller.

The quantity injected is taken from the vapour side of a gas bottle which shall contain enough liquid refrigerant to ensure that at the end of the test there is still liquid refrigerant left in the bottle.

If a blend can fractionate, the test is carried out using the fraction that has the smallest value of the lower ~~explosive~~ flammability limit.

The gas bottle is kept at a temperature of

a) 32 °C ± 1 °C for leakage simulation on low-side pressure circuits;

b) 70 °C ± 1 °C for leakage simulation on high-side pressure circuits.

NOTE 3 The quantity of gas injected ~~should~~ can preferably be measured by weighing the bottle.

The concentration of leaked refrigerant is measured at least every 30 s from the beginning of the test and for at least 24 h after injection of the gas has stopped, inside and outside the food storage compartment, as close as possible to electrical components which, during ***normal operation****, or abnormal operation, produce sparks or arcs.*

The concentration is not measured close to

– ***non-self-resetting protective devices*** *necessary for compliance with Clause 19 even if they produce arcs or sparks during operation;*
– ***intentionally weak parts*** *that become permanently open-circuited during the tests of Clause 19 even if they produce arcs or sparks during operation;*
– *electrical apparatus that has been tested and found to comply with at least the requirements in Annex CC.*

NOTE 4 The instrument used for monitoring gas concentration, such as those which use infrared sensing techniques, ~~should~~ can have a fast response, typically 2 s to 3 s and should not unduly influence the result of the test.

NOTE 5 If gas chromatography is to be used, the gas sampling in confined areas ~~should~~ can occur at a rate not exceeding 2 ml every 30 s.

NOTE 6 Other instruments are not precluded from being used provided that they do not unduly influence the results.

The measured value shall not exceed 75 % of the lower ~~explosive~~ flammability limit of the refrigerant specified in Table 102 and shall not exceed 50 % of the lower ~~explosive~~ flammability limit of the refrigerant specified in Table 102 for a period exceeding 5 min.

NOTE 7 For appliances with a protected cooling system, there are no additional requirements applicable to electrical components located inside food storage compartments.

22.107.2 *All accessible surfaces of protected cooling system components, including accessible surfaces in intimate contact with protected cooling systems, are scratched using the tool whose tip is shown in Figure 102.*

The tool is applied using the following parameters:

– *force at right angles to the surface to be tested……35 N ± 3 N;*
– *force parallel to the surface to be tested……not exceeding 250 N.*

The tool is drawn across the surface to be tested at a rate of approximately 1 mm/s.

The surface to be tested is scratched at three different positions in a direction at right angles to the axis of the channel and at three different positions on the channel in a direction parallel to it. In the latter case, the length of the scratch shall be approximately 50 mm.

The scratches shall not cross each other.

The appropriate part of the appliance shall withstand the test of 22.7, the test pressure being reduced by 50 %.

22.107.3 *If aluminium having a purity of less than 99,5 % according to ISO 209 is used in a protected cooling system that is embedded in thermal insulation, a sample of the cooling system is subjected to the salt mist test of IEC 60068-2-11 for a test duration of 48 h.*

After the test there shall be no sign of blistering, pitting or other active corrosion of the aluminium or its coating, if any.

NOTE Aluminium with an ISO designation of Al 99,5 or an international registration record of 1050 A has a purity of 99,5 %.

22.108 For **compression-type appliances** with unprotected cooling systems and which use **flammable refrigerants**, any electrical component, other than luminaires, located inside the food storage compartment, that during **normal operation** or abnormal operation produces arcs or sparks ~~and luminaires~~, shall be tested and found at least to comply with the requirements of IEC 60079-15 or the requirements for level protection "dc" of IEC 60079-1, as modified by Annex CC **4**, for group IIA gases or the refrigerant used.

This requirement does not apply to

– **non-self-resetting protective devices** necessary for compliance with Clause 19, ~~even if they produce arcs or sparks during operation;~~ nor to

– **intentionally weak parts** that become permanently open-circuited during the tests of Clause 19,

even if they produce arcs or sparks during operation.

Refrigerant leakage into food storage compartments shall not result in an explosive atmosphere outside the food storage compartments in areas where luminaires and electrical components that produce arcs and sparks during **normal operation** or abnormal operation ~~or luminaires~~ are mounted, when doors or lids remain closed or when opening or closing doors or lids, unless these electrical components, other than luminaires, have been tested and found at least to comply with the requirements of IEC 60079-15 or the requirements for level protection "dc" of IEC 60079-1, as modified by Annex CC **4**, for group IIA gases or the refrigerant used.

This requirement does not apply to

– **non-self-resetting protective devices** necessary for compliance with Clause 19, ~~even if they produce arcs or sparks during operation;~~ nor to

– **intentionally weak parts** that become permanently open-circuited during the tests of Clause 19

~~NOTE 1~~ even if they produce arcs or sparks during operation.

Separate components such as **thermostats** which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage from the component itself.

~~NOTE 2~~ Appliances with an unprotected cooling system are those where at least one part of the cooling system is placed inside a food storage compartment or those which do not comply with 22.107.

~~NOTE 3~~ Other types of protection for electrical apparatus used in potentially explosive atmospheres covered by IEC 60079 (all parts) are also acceptable.

NOTE 1 Changing of a lamp is not considered a potential explosion hazard, because the door or lid is open during this operation.

For luminaires, compliance is checked by inspection and by the appropriate tests in 5.3 of IEC 60079-~~15~~7:2015 ~~and by the following test~~. For other luminaires, the vibration test for "rough service luminaires" according 4.20 of IEC 60598-1:2014/AMD1:2017 *shall be carried out.*

For electrical components other than luminaires, compliance is checked by inspection and by the appropriate tests of IEC 60079-1, IEC 60079-15 and by the following test.

NOTE 2 The tests called up by Annex CC ~~may~~ can be carried out using the stoichiometric concentration of the refrigerant used. However, apparatus which ~~has~~ have been independently tested and found to comply with Annex CC using the gas specified for group IIA need not be tested.

~~NOTE 6~~ *Irrespective of the requirement given in Clause 5.4 of IEC 60079-15, surface temperature limits are specified in 22.110.*

The test is performed in a draught-free location with the appliance switched off or operated under conditions of ***normal operation*** *at* ***rated voltage****, whichever gives the more unfavourable result.*

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

The test is carried out twice and is repeated a third time if one of the first tests gives more than 40 % of the lower ~~explosive~~ flammability limit.

Through an appropriate orifice, 80 % of the nominal refrigerant charge ±1,5 g, in the vapour state is injected into a food storage compartment in a time not exceeding 10 min. The orifice is then closed. The injection shall be as close as possible to the centre of the back wall of the compartment at a distance from the top of the compartment approximately equal to one-third of the height of the compartment. Thirty minutes after the injection is completed, the door or lid is opened at a uniform rate in a time between 2 s and 4 s, to an angle of 90° or to the maximum possible, whichever is less.

For appliances having more than one door or lid, the most unfavourable sequence or combination for opening the lids or doors is used.

For appliances fitted with fan motors, the test is done with the most unfavourable combination of motor operation.

The concentration of leaked refrigerant is measured at least every 30 s from the beginning of the test, at positions as close as possible to electrical components. However, it is not measured at the positions of

- ***non-self-resetting protective devices*** *necessary for compliance with Clause 19, ~~even if they produce arcs or sparks during operation~~ nor to;*
- ***intentionally weak parts*** *that become permanently open-circuited during the tests of Clause 19,*

even if they produce arcs or sparks during operation.

The concentration values are recorded for a period of 15 min after a sustained decrease is observed.

The measured value shall not exceed 75 % of the lower ~~explosive~~ flammability limit of the refrigerant as specified in Table 102, and shall not exceed 50 % of the lower ~~explosive~~ flammability limit of the refrigerant as specified in Table 102 for a period exceeding 5 min.

The above test is repeated, except that the door or lid is subjected to an open/close sequence at a uniform rate in a time of between 2 s and 4 s, the door or lid being opened to an angle of 90° or to the maximum possible, whichever is less, and closed during the sequence.

22.109 Compression-type appliances which use **flammable refrigerants** shall be constructed so that leaked refrigerant will not stagnate and thus cause a fire or explosion hazard in areas outside the food storage compartments where components producing arcs or sparks or luminaires are mounted.

The requirement does not apply to areas where

– **non-self-resetting protective devices** necessary for compliance with Clause 19, or
– **intentionally weak parts** that become permanently open-circuited during the tests of Clause 19

are mounted, even if they produce arcs or sparks during operation.

~~NOTE 1~~ Separate components such as **thermostats** which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage of the component itself.

*Compliance is checked by the following test unless ~~luminaires and~~ components that produce arcs and sparks during **normal operation** or abnormal operation and which are mounted in the areas under consideration, have been tested and found at least to comply with the requirements ~~in~~ of IEC 60079-15 or the requirements for level of protection "dc" of IEC 60079-1, as modified by Annex CC* **4**, *for group IIA gases or the refrigerant used.*

For luminaires, compliance is checked by inspection and by the appropriate tests in 5.3 of IEC 60079-7:2015. For other luminaires the vibration test for "rough service luminaires" according 4.20 of IEC 60598-1:2014/AMD1:2017 *shall be carried out.*

~~NOTE 2~~ Irrespective of the requirement given in Clause 5~~.4~~ of IEC 60079-15, surface temperature limits are specified in 22.110.

~~NOTE 3~~ Other types of protection for electrical apparatus used in potentially explosive atmospheres covered by IEC 60079 (all parts) are also acceptable.

*The test is performed in a draught-free location with the appliance switched off or operated under **normal operation** at **rated voltage**, whichever gives the more unfavourable result.*

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

A quantity equal to 50 % of the refrigerant charge ±1,5 g is injected into the considered area using a capillary tube having a diameter of 0,7 mm ± 0,05 mm.

Injection is to be at constant rate over a period of 1 h and is to be at the point of closest approach of

– *pipework joints in external parts of the cooling circuit, or*

– *the gasket of semi-hermetic motor-compressors*

to the electrical component under consideration; any direct injection shall be avoided.

~~NOTE 4~~ *Welding telescopic joints of the motor-compressor housing, the welding of the pipes through the motor-compressor housing and the welding of the hermetic glass to metal seals (fusite) are not considered to be pipework joints.*

If the electrical component under consideration is situated within a separate enclosure and if the refrigerant can stagnate within that enclosure, then the direction of refrigerant injection shall be from the pipework joint under consideration towards any opening (such as ventilation slots or cable entry ducts) in the separate enclosure.

The concentration of leaked refrigerant as close as possible to the electrical component is measured at least every 30 s from the beginning of the test until 15 min after a sustained decrease is observed.

The measured value shall not exceed 75 % of the lower ~~explosive~~ flammability limit of the refrigerant as specified in Table 102, and shall not exceed 50 % of the lower ~~explosive~~ flammability limit of the refrigerant as specified in Table 102 for a period exceeding 5 min.

22.110 Temperatures on surfaces that may be exposed to leakage of **flammable refrigerants** shall not exceed the auto-ignition temperature of the refrigerant, as specified in Table 102, reduced by 100 K.

Compliance is checked by measuring the appropriate surface temperatures during the tests specified in Clauses 11 and 19.

Temperatures of

– ***non-self-resetting protective devices*** *that operate during the tests specified in Clause 19, or of*

– ***intentionally weak parts*** *that become permanently open-circuited during the tests specified in Clause 19*

are not measured during those tests specified in Clause 19 that cause these devices to operate.

Table 102 – Refrigerant flammability parameters 5

Refrigerant number	Refrigerant name	Refrigerant formula	Refrigerant auto-ignition temperature [a,~~c~~] °C	Refrigerant lower ~~explosive~~ flammability limit [b,~~c,d,e~~] % V/V
R-50	Methane	CH_4	~~600~~ 645	~~4,4~~ 5,0
R-290	Propane	$CH_3CH_2CH_3$	~~450~~ 470	~~1,7~~ 2,1
R-600	~~n-~~Butane	$CH_3CH_2CH_2CH_3$	~~372~~ 365	~~1,4~~ 1,6
R-600a	Isobutane	$CH(CH_3)_2$~~CH~~CH_3	460	~~1,3~~ 1,8

[a] Auto-ignition values for other **flammable refrigerants** can be obtained from ~~IEC 60079-20-1 and~~ ISO 5149-1.

[b] LFL values for other **flammable refrigerants** can be obtained from ~~IEC 60079-20-1 and~~ ISO 817.

~~[c] IEC 60079-20-1 is the reference standard. ISO 5149-1 and ISO 817 may be used if the required data is not contained in IEC 60079-20-1.~~

~~[d] Concentration of refrigerant in dry air.~~

~~[e] In some standards, the term "flammability limit" is used for "explosive limit".~~

22.111 In **compression-type appliances** which use **flammable refrigerant** in their cooling system, all possible inadvertent contact points between uncoated aluminium pipes and copper pipes or similar dissimilar metals shall be prevented from galvanic coupling by positive means such as the use of insulated sleeving or spacers. This requirement is not applicable to the aluminium fins of heat exchangers and other aluminium parts that are in contact with outer surface of copper pipes. **6**

Compliance is checked by inspection.

22.112 The doors and lids of compartments in appliances with a **free space** shall be capable of being opened from the inside.

Compliance is checked by the following test.

The empty appliance is disconnected from the supply, placed on a horizontal support and levelled in accordance with the instructions for installation, with castors and rollers, if any, oriented, adjusted or blocked so as to prevent the appliance from moving. Locks, if any, on doors or lids are left unlocked.

Doors and lids are closed for a period of 15 min.

A force is then applied to a point, equivalent to an accessible inside point, of each appropriate door or lid of the appliance, at the midpoint of the edge farthest from the hinge axis in the direction perpendicular to the plane of the lid or door.

The force shall be applied at a rate not exceeding 15 N/s and the lid or door shall open before the force exceeds 70 N.

NOTE 1 The force ~~may~~ can be applied by means of a spring balance with the aid of a suction pad if necessary, to the point on the outer surface of the door or lid which corresponds to the accessible inside point.

NOTE 2 If the handle of the door or lid is at the mid-point of the edge farthest from the hinge axis, the force ~~may~~ can be applied by means of a spring balance, to the handle. In this case, the value of the force required to open the door or lid from the inside ~~may~~ can be determined by the proportional calculation relating to the distances of the handle and the accessible inside point from the hinge axis.

22.113 Drawers which are only accessible after opening a door or lid shall not contain a **free space**.

Compliance is checked by inspection and measurement.

22.114 Drawers which are accessible without opening a door or lid and which contain a **free space** shall

– have an opening in their rear wall that has a height of at least 250 mm and a width of at least two-thirds of the inner width of the drawer;
– be capable of being opened from the inside.

Compliance is checked by inspection, measurement and by the following test which is carried out with a weight of 23 kg placed inside the drawer.

The empty appliance is disconnected from the supply, placed on a horizontal support and levelled in accordance with the instructions for installation, with castors and rollers, if any, oriented, adjusted or blocked so as to prevent the appliance from moving. Locks, if any, on drawers are left unlocked.

Drawers shall be maintained closed for a period of 15 min.

A force is then applied to the drawer of the appliance at the geometrical centre of the front plane of the drawer equivalent to an accessible inside point, in the direction perpendicular to the front plane of the drawer.

The force shall be applied at a rate not exceeding 15 N/s and the drawer shall open before the force exceeds 70 N.

22.115 In appliances intended for household use and which contain compartments with a **free space**, any door or drawer giving access to these compartments shall not be fitted with a self-latching lock.

Key-operated locks shall require two independent movements to actuate the lock or be of a type that automatically ejects the key when unlocked.

NOTE Push and turn is considered to be an example of two independent movements.

Compliance is checked by inspection and test.

22.116 Accessible glass panels with an area having any two orthogonal dimensions exceeding 75 mm shall be made from

– glass that breaks into small pieces when it fractures; or

– glass that is not released or dropped from its normal position when broken;

– glass that has enhanced mechanical strength. **6**

~~This requirement does not apply to **accessible glass panels** with an area having any two orthogonal dimensions exceeding 75 mm inside the appliance made from glass that has enhanced mechanical strength.~~

Compliance is checked by tests a), b) or c) as applicable.

a) For glass that breaks into small pieces when it fractures, compliance is checked by the following test, which is performed on two samples.

Frames or other parts attached to the glass panel to be tested are removed and the glass is placed on a rigid horizontal flat surface.

NOTE 1 The edges of the sample to be tested are contained within a frame of adhesive tape in such a manner that the broken pieces remain in place after breakage but without hindering expansion of the sample.

The sample under test is broken by means of a test punch having a head with a mass of 75 g ± 5 g and a conical tungsten carbide tip with an angle of 60° ± 2°. The punch shall be positioned approximately 13 mm in from the longest edge of the glass at the midpoint of that edge. The punch is then hit by a hammer so that the glass breaks.

A transparent mask of 50 mm × 50 mm is placed on the fractured glass except within a peripheral margin of 25 mm from the edge of the sample.

The assessment shall be undertaken on at least two areas of the sample, and the areas chosen shall contain the largest particles.

The number of crack free particles within the mask are counted and for each assessment shall not be less than 40. The particle count shall be made within 5 minutes of the fracture. Each particle wholly contained within the area of the mask shall be counted as one particle and each particle that is partially within the mask shall be counted as a half particle.

NOTE 2 In the case of curved glass, plane pieces of the same material can be used for the test.

b) For glass that is not released or dropped from its normal position when broken, compliance is checked by breaking the glass when mounted in its normal position in the appliance by means of a test punch having a head with a mass of 75 g ± 5 g and a conical tungsten carbide tip with an angle of 60° ± 2°. The punch shall be positioned approximately 13 mm in from the longest edge of the glass at the midpoint of that edge. The punch is then hit by a hammer so that the glass breaks.

At the conclusion of this test, the glass shall not be broken or cracked in such a manner that pieces are released or dropped from their normal position. Glass that is released within the immediate vicinity of the punch tip as a result of the punch impacting the sample under test is ignored.

c) *For glass with enhanced mechanical strength, compliance is checked by the pendulum hammer test Eha of IEC 60068-2-75.*

For the test, the glass panels are supported according to their method of incorporation in the appliance.

The test is performed with three blows applied at the most critical point on two samples; the impact energy of each blow shall be 5 J.

At the conclusion of the tests, the glass shall not be broken or cracked.

22.117 **7** In **refrigerating appliances**, thermal insulation shall be encased in and be in contact with

– metallic material having a thickness not less than 0,20 mm and having a melting point temperature of not less than 1 000 °C; or
– a polymeric material classified as 5VA according to IEC 60695-11-20 provided that the test sample used for the classification was no thicker than the relevant part of the appliance; or
– a single layer non-polymeric material that has been tested in accordance with Annex EE; or
– a material with multiple layers, at least one of which is non-polymeric, that has been tested in accordance with Annex EE.

A hole or the combined area of holes within 150 mm of each other shall not exceed 25 cm^2. The total combined area of the holes shall not exceed 125 cm^2. Holes up to 3 mm^2 and material that join overlapping metal parts are ignored. The area of holes that have metallic objects such as pipes protruding from them are calculated omitting the area taken up from the metallic material.

These requirements are also applicable to material encasing thermal insulation between the compressor compartment and food storage compartments.

These requirements are not applicable to:

– parts in food storage compartments such as compartment liner, partition of the cabinet;
– parts providing access to the food storage compartment such as doors, drawers and lids;
– parts within 150 mm from the top surface of the appliance, the top surface being a horizontal plane from the highest point of the appliance, unless the inlet opening for the **supply cord** is within 150 mm of the exempt area;
– parts within 50 mm of food storage compartment seals;
– **portable appliances** with no motor-compressor.

Compliance is checked by inspection, measurement and the appropriate tests.

23 Internal wiring

This clause of Part 1 is applicable except as follows.

23.3 *Modification:*

Instead of the test being carried out while the appliance is in operation, it is carried out with the appliance disconnected from the supply.

The number of flexings for conductors flexed during normal use is increased to 100 000.

*The number of flexings for conductors flexed during normal use of an **incorporated ice maker** is increased to 50 000.*

Addition:

NOTE 101 The requirement concerning open-coil springs does not apply to external conductors.

24 Components

This clause of Part 1 is applicable except as follows.

24.1 *Addition:*

Motor-compressors are not required to be separately tested in accordance with IEC 60335-2-34 nor are they required to meet the requirements of IEC 60335-2-34 if they meet the requirements of this standard.

24.1.3 *Addition:*

The number of operations for other switches shall be as follows:

– *quick freeze switches*	*300*
– *manual and semi-automatic defrost switches*	*300*
– *door switches*	*50 000*
– *on/off switches*	*300*

24.1.4 *Addition:*

– ***self-resetting thermal cut-outs** which may influence the test results of 19.101 and which are not short-circuited during the test of 19.101*	*100 000*
– ***thermostats** which control the motor-compressor*	*100 000*
– *motor-compressor starting relays*	*100 000*
– *automatic thermal motor-protectors for motor-compressors of the hermetic and semi-hermetic type*	*minimum 2 000, but not less than the number of operations during the 15-day locked rotor test, whichever is the greater*
– *manual reset thermal motor-protectors for motor-compressors of the hermetic and semi-hermetic type*	*50*
– *other automatic thermal motor-protectors except for fan motors*	*2 000*
– *other manual reset thermal motor protectors*	*30*
– *for **pressure relief devices** of the **bursting disc** type, three separate samples of the appropriate parts of the refrigeration system are tested and the **bursting disc** shall operate in the same way for each sample tested*	*1*
– *electrical **pressure relief devices***	*30 000*
• *for automatic operation:*	*300*
• *for manual reset*	

Electrical pressure relief devices *shall comply with IEC 60730-2-6 and*

– *shall be of type 2.B and type 2.N;*
– *shall have a trip free mechanism of type 2.E;*
– *the deviation and drift shall not exceed + 0 %.*

For ***mechanical pressure relief devices*** *not falling under the scope of IEC 60730, the operating pressure ~~must~~ shall be no more than the setting of the device plus 10 %.*

Pressure relief devices *of the* ***bursting disc*** *type that are not certified to ISO 4126-2 shall be tested as part of the appliance to 14.3.4 of ISO 4126-2:2018. They shall be marked with*

– *name, trademark or identification mark of the manufacturer or responsible vendor;*
– *model name or type reference.*

24.3 *Addition:*

Voltage selection switches used in appliances for camping or similar use shall have a contact separation in all poles that provide full disconnection from the supply under overvoltage category III conditions.

24.5 ~~*Addition*~~ *Replacement:*

Capacitors in auxiliary windings of motors shall be marked with their voltage rating and their rated capacitance and shall be used in accordance with these markings. **8**

Compliance is checked by inspection and by the appropriate tests.

For motor running capacitors, the voltage across the capacitor shall not exceed

– *95 % of its voltage rating for capacitors of class of operation: class A;*
– *80 % of its voltage rating for capacitors of class of operation: class B;*

when the appliance is supplied at 1,1 times ***rated voltage*** *under* ***normal operation****.*

For starting capacitors, the voltage across the capacitors shall not exceed 1,3 times the voltage rating of the capacitor when the appliance is operating at 1,1 times ***rated voltage****.*

24.7 ~~*Modification*~~ *Addition:*

For coupling nuts used with hose-sets marked 25 °C max., the 96 h ageing test is carried out at a temperature of

– *32 °C ± 1 °C on hose-sets supplied with appliances of extended temperate (SN) and temperate (N) classes;*
– *38 °C ± 1 °C on hose-sets supplied with appliances of subtropical (ST) class;*
– *43 °C ± 1 °C on hose-sets supplied with appliances of tropical (T) class.*

24.8 *Replacement:*

Motor running capacitors shall ~~not cause a hazard in the event of a capacitor failure~~ comply with IEC 60252-1 under the following conditions. **8**

~~The requirement is considered to be met by one or more of the following conditions:~~

~~– the capacitors are of class of safety protection S2 or S3 according to IEC 60252-1;~~

~~– the capacitors are housed within a metallic or ceramic enclosure that will prevent the emission of flame or molten material resulting from failure of the capacitor.~~

~~NOTE The enclosure can have an entry or exit hole for the wiring connecting the capacitor to the motor.~~

– class of safety protection: S2;

– class of operation: class A or class B;

– damp heat test severity;

  • test duration 21 days;

  • temperature 40 °C ± 2 °C at a relative humidity of 93 % ± 3 %.

Compliance is checked by inspection and the appropriate tests, including the tests in 5.16.3 and 5.16.5 of IEC 60252-1:2010/AMD1:2013 for class of safety protection S2 capacitors. After the destruction tests of 5.16 in IEC 60252-1:2010/AMD1:2013, evaluation of failure is checked according to the 5.16.7 in IEC 60252-1:2010/AMD1:2013.

24.101 Lampholders shall be of the insulated type.

Compliance is checked by inspection.

24.102 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.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

Addition:

This clause of Part 1 is not applicable to those parts related to motor-compressors with facilities for connecting a **supply cord**, complying with the appropriate requirements of IEC 60335-2-34.

25.2 *Modification:*

Replace the requirement by the following.

Mains-operated appliances shall not be provided with more than one means of connection to the supply unless

– the appliance consists of two or more completely independent units built together in one enclosure,

– the relevant circuits are adequately insulated from each other.

Appliances which can be both mains and battery operated shall be provided with a separate means for the connection of the mains and of the battery.

25.7 *Modification:*

Light polyvinyl chloride sheathed cord (code designation 60227 IEC 52) and heat-resistant light polyvinyl chloride sheathed cord (code designation 60227 IEC 56) are allowed regardless of the mass of the appliance.

Addition:

This subclause does not apply to flexible leads or cords used to connect an appliance to a SELV power supply.

25.13 *Addition:*

This subclause does not apply to flexible leads or cords used to connect an appliance to a SELV power supply.

25.23 *Addition:*

For appliances which can be battery operated, if the battery is placed in a separate box, the flexible lead or flexible cord used to connect the box to the appliance is considered to be an **interconnection cord**.

25.101 Appliances which can be battery operated shall have suitable means for connection of the battery.

Appliances shall be provided with terminals or flexible leads, or a flexible cord which, for connection to the battery terminals, may be fitted with clamps or other devices suitable for use with the type of battery marked on the appliance.

Compliance is checked by inspection.

26 Terminals for external conductors

This clause of Part 1 is applicable except as follows.

Addition:

This clause of Part 1 is not applicable to those parts of motor-compressors with facilities for connecting a **supply cord** and complying with the appropriate requirements of IEC 60335-2-34.

26.11 *Addition:*

Terminal devices in an appliance for the connection of the flexible leads or cord with **type X attachment** connecting an external battery or battery box shall be so located or shielded that there is no risk of accidental connection between battery supply terminals.

27 Provision for earthing

This clause of Part 1 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor complies with IEC 60335-2-34.

28 Screws and connections

This clause of Part 1 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor complies with IEC 60335-2-34.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor conforms to IEC 60335-2-34. For motor-compressors not conforming to IEC 60335-2-34, the additions and modifications specified in IEC 60335-2-34 are applicable.

29.2 *Addition:*

Unless insulation is enclosed or located so that it is unlikely to be exposed to pollution by condensation due to normal use of the appliance, insulation in **refrigeration appliances** and **ice-makers** is in pollution degree 3 and shall have a CTI value of not less than 250. This requirement is not applicable for **functional insulation** if the **working voltage** does not exceed 50 V.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.1 *Addition:*

~~NOTE 101~~ **Accessible parts** of non-metallic material within the food storage compartment are regarded as external parts.

The ball pressure test is not applied to parts related to the motor-compressor if the motor-compressor complies with IEC 60335-2-34.

~~NOTE 102~~ *The temperature rises attained during the test of 19.101 are not taken into account.*

Modification:

*For **accessible parts** of non-metallic material within the storage compartment, the temperature of 75 °C ± 2 °C is replaced by 65 °C ± 2 °C.*

30.2 *Addition:*

These tests are not applied to parts related to the motor-compressor if the motor-compressor complies with IEC 60335-2-34 with no ignition.

~~*For accessible thermal insulation and non-metallic material on the external rear surfaces of an appliance having an area exceeding 75 cm^2 that is in direct contact with the thermal insulation, compliance is checked by the test of 30.2.101.*~~

30.2.2 Not applicable.

~~**30.2.101** *Accessible thermal insulation and non-metallic material on the external rear surfaces of an appliance that is in direct contact with thermal insulation*~~

~~– *is subject to the needle-flame test (NFT) of Annex E; or*~~

~~– *shall comprise material classified as V-0 or V-1 according to IEC 60695-11-10 provided that the test sample used for the classification was no thicker than the relevant part of the appliance.*~~

~~*Non-metallic material*~~

~~– *that is within 150 mm from the top surface of the appliance;*~~

~~– *that is on the left side or right side of the motor-compressor compartment;*~~

~~– *that has an area not exceeding 75 cm^2 that is in direct contact with the thermal insulation*~~

~~*is not tested.*~~

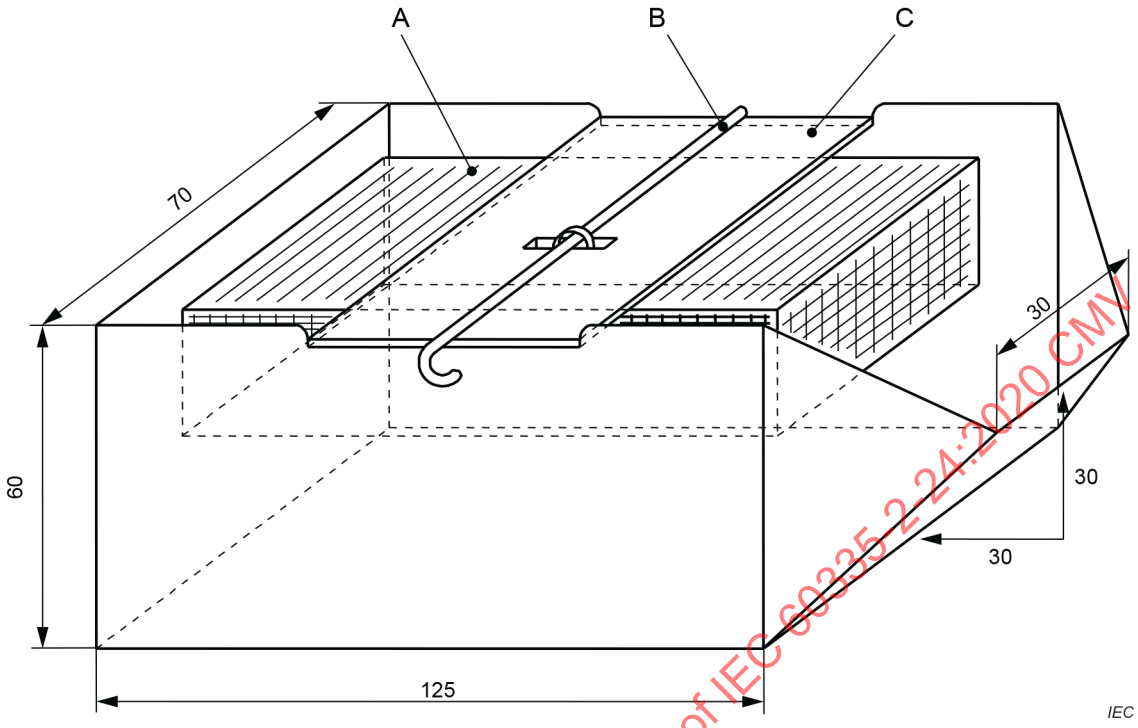
31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is not applicable.

Dimensions in millimetres



This displacement block has a volume of 140 ml ± 5 ml and a mass of 200 g ± 10 g.

Its dimensions are approximately 112 mm × 50 mm × 25 mm.

The dimensions of the vessel are inside dimensions and the tolerance is ± 2 mm.

Key

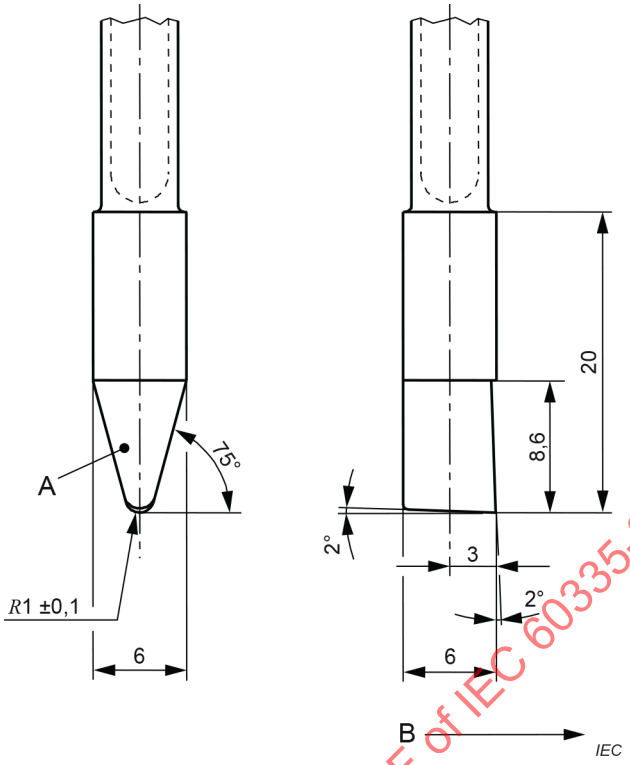
A displacement block

B release pin

C removable bridge support

Figure 101 – Apparatus for spillage test

Dimensions in millimetres



Key

A hard-soldered carbide tip K10

B direction of movement

Figure 102 – Scratching tool tip details

Annexes

The annexes of Part 1 are applicable except as follows.

Annex C
(normative)

Ageing test on motors

Addition:

This annex does not apply to motor-compressors.

Annex D
(normative)

Thermal motor protectors

Addition:

This annex does not apply to motor-compressors or **condenser** fan motors.

Annex P
(informative)

Guidance for the application of this standard to appliances used in ~~warm damp equable~~ tropical climates

This annex of Part 1 is applicable except as follows.

5 General conditions for the tests

5.7 *Modification:*

The ambient temperature of the tests of Clause 10, 11 and 13 is 43 °C ± 1°C as specified for appliances of tropical (T) class in Subclause 5.7.

11 Heating

11.8 *Modification:*

The values of Table 3 are reduced by 18 K.

Annex AA
(normative)

Locked-rotor test of fan motors

The winding of a fan motor shall not reach excessive temperatures if the motor locks or fails to start.

Compliance is checked by the following test.

The fan and its motor are mounted on wood or similar material. The motor´s rotor is locked. Fan blades and motor brackets are not removed.

The motors are supplied at their supply voltage when the appliance is supplied at ***rated voltage*** *or at the upper limit of the* ***rated voltage range****.* 6 *The supply circuit is given in Figure AA.1.*

The assembly is to operate under these conditions for 15 days (360 h) unless the ***protective device****, if any, permanently opens the circuit prior to the expiration of that time. In this case, the test is discontinued.*

If the temperature of the motor windings stays lower than 90 °C, the test is discontinued when steady conditions are established.

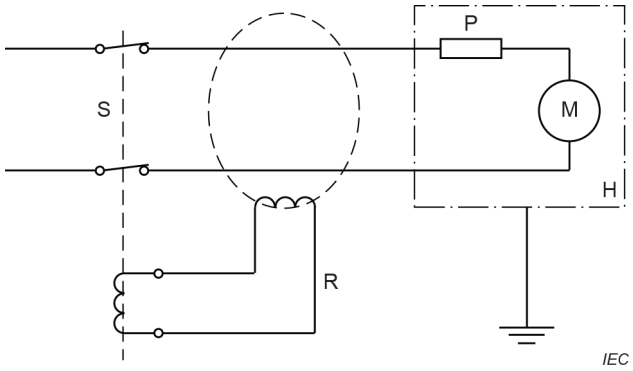
Temperatures are measured under conditions specified in 11.3.

During the test, the winding temperatures shall not exceed the values given in Table 8.

After a period of 72 h from the beginning of the test, the motor shall withstand the electric strength test of 16.3.

For other than DC motors, 6 *a residual current device with a rated residual current of 30 mA is connected so as to disconnect the supply in the event of an excessive earth leakage current.*

At the end of the test the leakage current is measured between the windings and the body at a voltage equal to twice the ***rated voltage****. Its value shall not exceed 2 mA.*



Key

S supply source

H housing

R residual current device ($I_{\Delta n}$ = 30 mA)

P thermal motor-protector (external or internal), if fitted

M motor

~~NOTE 1~~ The circuit is modified for three-phase fan motors. For DC Motors, the RCD is not necessary.

~~NOTE 2~~ Care has to be taken to complete the earthing system to permit the correct operation of the residual current device (RCCB/RCBO).

Figure AA.1 – Supply circuit for locked-rotor test of a single-phase fan motor

Annex BB
(informative)

Method for accumulation of frost

The accumulation of frost may be produced by the use of a device having a controllable heat source directed on a measured amount of water for the purpose of evaporating this water over a predetermined period with a minimum of extraneous heat loss to the cabinet of the ***refrigerating appliance****.*

A convenient form of the apparatus would comprise a block enclosure of thermally insulating material having a vertical hole at its centre containing a lamp mounted on a bottom plug directly below an evaporating dish with a high thermal conductivity base and low thermal conductivity walls (see Figure BB.1 and Figure BB.2).

The device described above should be mounted at the geometric centre of the cabinet of the ***refrigerating appliance*** *and the electrical connection brought conveniently to the outside so that the voltage applied may be varied and the power input measured with the door of the* ***refrigerating appliance*** *in the closed position.*

Water is then introduced into the evaporating dish at the required rate through a length of small bore tube passing into the cabinet. A continuous flow is not necessary but the water should be injected at appropriate intervals.

Provision should be made (for example in the control of the supply of electrical energy to the device) to ensure that the evaporation of water under normal conditions of use is capable of being maintained at a rate equal to 2 g of water per litre of gross cabinet volume per week.

The electrical energy to the device should not be excessive, but shall be sufficient to ensure the complete evaporation of the water.

The amount of frost to be accumulated prior to the start of the defrosting test should be based on this rate and on the time interval between two successive defrosts in accordance with the instructions.

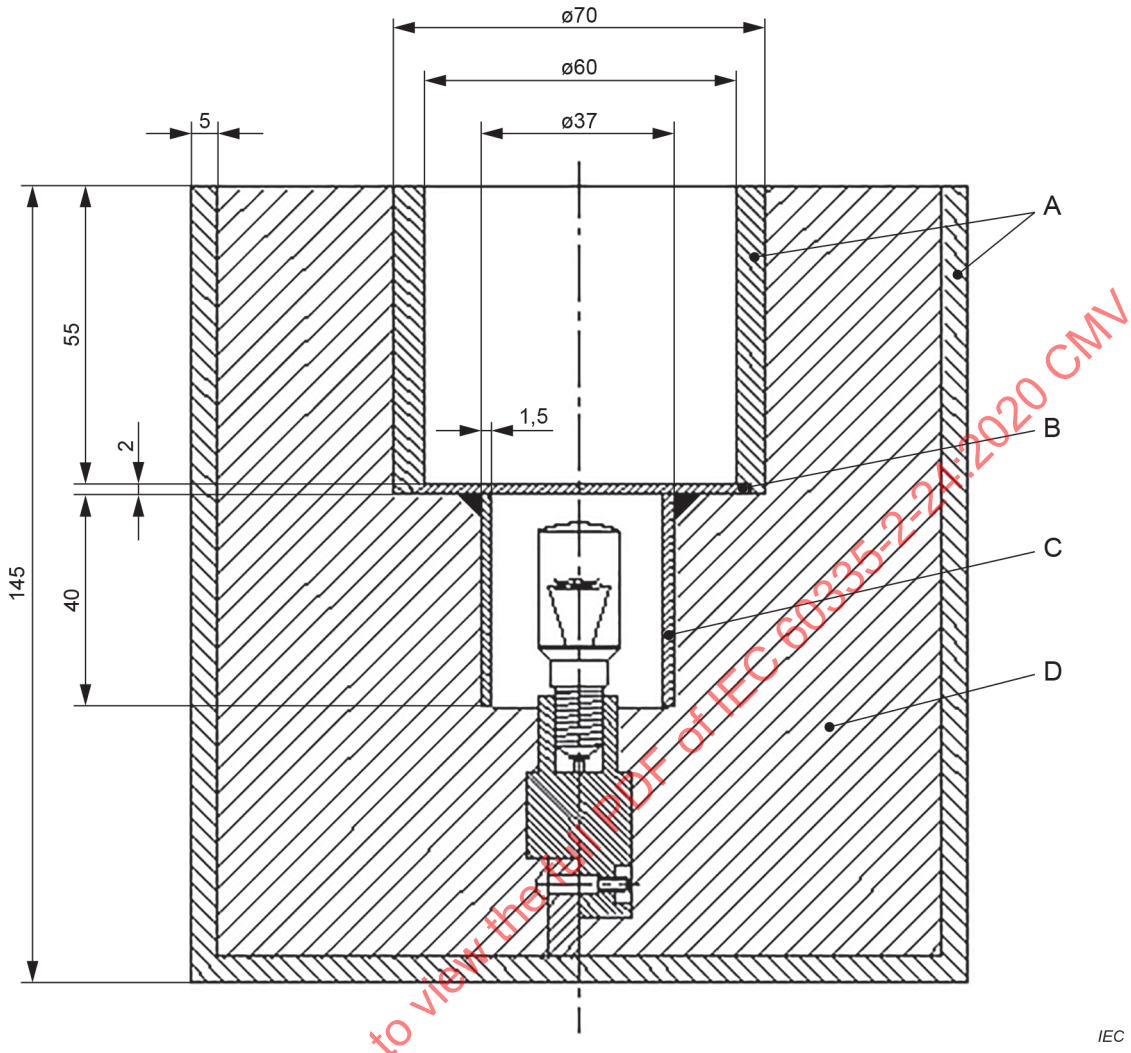
NOTE For example, if the instructions recommend defrosting twice weekly, then a **refrigerating appliance** with a cabinet gross volume of 140 l will require:

$$2\ g \times 140 / 2 = 140\ g \text{ of water}$$

The above rate may be exceeded in certain circumstances.

The apparatus described has a maximum evaporation rate of approximately 2 g/h when operating with an input of 4 W and with the water to be evaporated entering at cabinet temperature.

Dimensions in millimetres



Key

A insulating material

B copper plate

C copper tube

D thermal insulating foam

Figure BB.1 – Diagram of apparatus for water evaporation and for accumulation of frost

Figure BB.2 – Apparatus for water evaporation and for accumulation of frost

Annex CC
(normative)

Non-sparking "n" electrical apparatus and test conditions for "dc" devices 4

Where reference is made to IEC 60079-15, the following clauses are applicable as modified below.

~~**11 Supplementary requirements for non-sparking luminaires**~~

~~All of the subclauses of Clause 11 are applicable, except 11.2.4.1, 11.2.4.5, 11.2.5, 11.2.6, 11.2.7, 11.3.4, 11.3.5, 11.3.6 and 11.4.~~

~~**16 General supplementary requirements for apparatus producing arcs, sparks or hot surfaces**~~

~~Clause 16 is applicable.~~

~~**17 Supplementary requirements for enclosed-break devices and non-incendive components producing arcs, sparks or hot surfaces**~~

~~Clause 17 is applicable.~~

~~**18 Supplementary requirements for hermetically sealed devices producing arcs, sparks or hot surfaces**~~

~~Clause 18 is applicable.~~

~~**19 Supplementary requirements for sealed devices producing arcs, sparks or hot surfaces**~~

~~All of the subclauses of Clause 19 are applicable, except 19.1 and 19.6, which are replaced by the following.~~

~~19.1 **Non-metallic materials**~~

~~Seals are tested using 22.5. However, if the device is tested in the appliance, then 22.5.1 and 22.5.2 are not applicable. After the tests of Clause 19 in IEC 60335-2-24, by inspection, no damage that could impair the type of protection shall be evident.~~

~~**19.6 Type tests**~~

~~The type tests described in 22.5 shall be performed where relevant.~~

~~**20 Supplementary requirements for restricted-breathing enclosures protecting apparatus producing arcs, sparks or hot surfaces**~~

~~Clause 20 is applicable.~~

7 Requirements for non-incendive components

Clause 7 is applicable.

8 Requirements for hermetically sealed devices

Clause 8 is applicable.

9 Requirements for sealed devices

All of the subclauses of Clause 9 are applicable, except 9.1, which is replaced by the following.

9.1 Non-metallic materials

Seals are tested using 11.2.

10 Requirements for restricted-breathing enclosures

Clause 10 is applicable.

Where reference is made to IEC 60079-1, the following clause is applicable as modified below.

15.5.3.1 General

Group IIA: (55 ± 0,5) % hydrogen/air at atmospheric pressure; or

Group IIA: (6,5 ± 0,5) % ethylene/air at atmospheric pressure.

Annex DD
(informative)

Sound manufacturing practice for compression-type appliances which use flammable refrigerant

For **compression-type appliances** which use **flammable refrigerant** in their cooling system, the following recommendations are made concerning the manufacturing process.

All cooling circuits which are embedded in thermal insulation should be subject to a leak test prior to being embedded.

Prior to foaming there should be an inspection to ensure that there is no damage to the parts that are protected against corrosion or to the means provided for the prevention of galvanic coupling between copper and unprotected aluminium pipes.

Annex EE 7
(normative)

Test for material encasing and in contact with thermal insulation

When testing a material to this annex as required by 22.117, the test is carried out in accordance with the following.

The test shall be carried out using a laboratory burner in accordance with IEC 60695-11-3, Method A.

Two sets of three test specimens shall be taken from the refrigerator finished assembly including the outer encasing material, thermal insulation, and inner encasing material. The test specimen shall measure 150 mm ± 5 mm long by 150 mm ± 5 mm wide.

One set of three test specimens shall be conditioned for a minimum of 48 h in a conditioning chamber maintained at 23 °C ± 2 °C and 50 % ± 10 % relative humidity. Once removed from the conditioning chamber, the test specimens shall be subjected to the flame application test within 30 min.

One set of three test specimens shall be conditioned in an air-circulating oven for 168 h ± 2 h at 70 °C ± 2 °C with the oven providing not less than five air changes per hour. The specimens are then cooled in a desiccator chamber, maintained at 23 °C ± 2 °C at a relative humidity not exceeding 20 %, for at least 4 h. Once removed from the desiccator chamber, the test specimens shall be subjected to the flame application test within 30 min.

For the test, the specimen shall be held by a support stand. The support stand shall have clamps or the equivalent and shall be adjustable for the positioning of the test specimen. The test specimen is supported approximately in the horizontal plane as shown in Figure EE.1. The test specimen shall be oriented with the outer encasing material of the thermal insulation at the bottom of the sample.

The test specimen shall be 300 mm ± 10 mm above a horizontal cotton pad. The cotton pad shall be made of absorbent cotton designated "100 % cotton" or "pure cotton". The cotton pad shall be approximately 150 mm × 150 mm and have a maximum thickness of 6 mm and a maximum mass of 0,72 g. The cotton pad shall be located below the approximate centre of the test specimen.

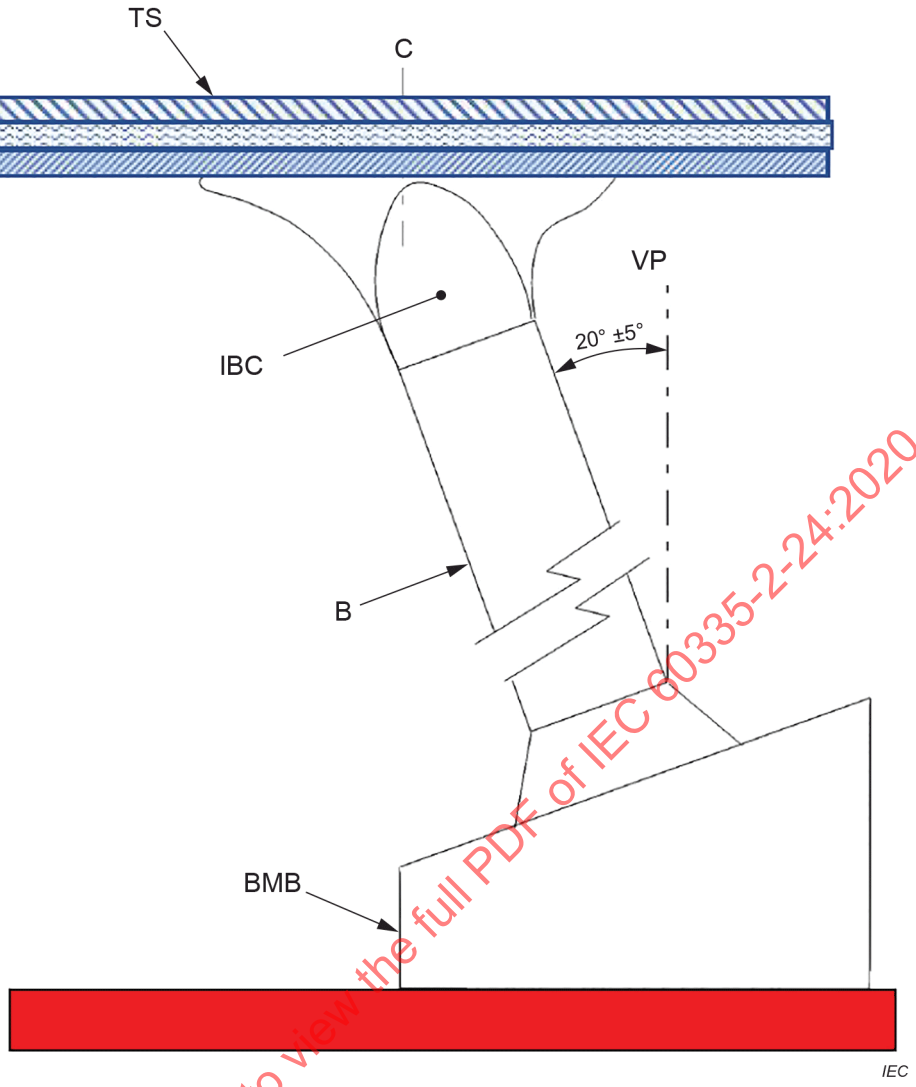
The test is carried out by applying the flame from the laboratory burner to the approximate centre of the bottom surface of the test specimen at an angle of 20° ± 5° from the vertical, so that the tip of the inner blue cone (see Figure EE.1) just touches the surface of the specimen.

The flame is applied for 5 s ± 0,5 s and then removed for 5 s ± 0,5 s. The application cycle is repeated until the test specimen has been subjected to five applications of the test flame. Following each flame application, the laboratory burner is immediately withdrawn to a distance not less than 150 mm so that is has no effect on the test specimen.

During and after the test, there shall be no burn-through and no flaming particles or drops which ignite the cotton pad indicator.

Burn-through shall be considered the production of a hole or crack in the encasing material of the test specimen that exposes thermal insulation such that:

- *visible flame is observed during the test on the thermal insulation or on the surface of the test specimen opposite to the surface to which the test flame is applied; or*
- *any opening or crack is present in the outer encasing material after the test which exposes thermal insulation, when the test specimen has cooled for at least 30 s.*



Key

TS	test specimen		cotton pad
C	centre		inner casing material
VP	vertical plane		thermal insulation
IBC	inner blue cone		outer casing material
B	burner		
BMB	burner mounting block		

Figure EE.1 – Arrangement of the test specimen and burner

Bibliography

The bibliography of Part 1 is applicable, except as follows.

Addition

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60335-2-75, *Household and similar electrical appliances – Safety – Part 2-75: Particular requirements for commercial dispensing appliances and vending machines*

IEC 60335-2-89, *Household and similar electrical appliances – Safety – Part 2-89: Particular requirements for commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant ~~condensing~~ unit or motor-compressor*

IEC 60335-2-118, *Household and similar electrical appliances – Safety – Part 2-118: Particular requirements for professional ice-cream makers*

IEC 62552 (all parts), *Household refrigerating appliances – Characteristics and test methods*

IEC 62552-1:2015, *Household refrigerating appliances – Characteristics and test methods – Part 1: General requirements*

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

List of comments

1 The note is intended to aid clarity and improve the technical precision of the terms used.

Sphere with a 150 mm diameter defines the wording "any single dimension not exceeding 150 mm".

Square with a 200 mm side defines the wording "any two orthogonal dimensions, each of which do not exceed 200 mm".

2 Measurement of the input current of refrigerating appliances using inverter driven motor-compressors is included considering the different motor speeds that varied during the operation of an appliance.

3 Compatibility tests for winding insulation of motor-compressors used with different types of refrigerants and oils have been introduced to be consistent with IEC 60335-2-34 (Annex BB and Annex CC). Tests are required only if the compressor does not comply with IEC 60335-2-34.

4 Change is required because of revision in IEC 60079 series but the requirements for the appliances covered by part IEC 60335-2-24:2020 are not changed.

Requirements for enclosed break devices have been removed from IEC 60079-15:2017 and the concept has been transferred to 60079-1 designated as "dc".

Test conditions for enclosed break devices, designed as "dc", have been introduced in Annex CC.

Added the reference to IEC 60079-1:2014 changing the clause 15.5.3.1 to define test gas according group equipment IIA as ethylene/air to be consistent with IEC 60079-15:2017, clause 11.

In Annex CC Normative references and associated text have been updated according IEC 60079-15:2017.

5 Values changed according ISO 817:2014, the appropriate standard for refrigerant properties.

6 The revised wording provides a more precise technical description of the intended requirement.

7 New requirements for material encasing and in contact with thermal insulation have been introduced to review the fire safety of the appliance covered by IEC 60335-2-24:2020, considering of the fire risk of thermal insulation. The consequential text in clause 30.2 and in 30.2.101 has been deleted.

New materials shall be used to protect the thermal insulation and new requirements for holes (exposed thermal insulation) has been added.

Compliances for materials described in third and fourth dashed item is checked according Annex EE.

These requirements are also applicable to material encasing thermal insulation between the compressor compartment and food storage compartments.

8 Requirement for motor running capacitors have been updated.

Only capacitor with class of safety protection S2 and class operation A or B shall be used.

The voltage measurement across the capacitor and the damp heat test has been introduced.

IEC 60335-2-24

Edition 8.0 2020-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Household and similar electrical appliances – Safety –
Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

Appareils électrodomestiques et analogues – Sécurité –
Partie 2-24: Exigences particulières pour les appareils de réfrigération, les sorbetières et les fabriques de glace

IEC 60335-2-24:2020-09(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

FOREWORD

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This part of IEC 60335 has been prepared by subcommittee 61C: Safety of refrigeration appliances for household and commercial use, of IEC Technical Committee 61: Safety of household and similar electrical appliances.

This eighth edition cancels and replaces the seventh edition published in 2010, Amendment 1:2012 and Amendment 2:2017. This edition constitutes a technical revision.

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

– aligns the text with IEC 60335-1, Ed 5.2;
– some notes have been converted to normative text or deleted (4, 5.2, 5.7, 7.1, 7.6, 7.10, 7.12, 19.1, 19.101, 19.102, 20.101, 20.102, 20.103, 20.104, 21, 22.7, 22.33, 22.101, 22.102, 22.103, 22.107, 22.108, 22.109, 30.1);

– normative references and associated text have been updated (2, 22.108, 22.109, Table 102, Annex CC);
– definition of free space has been clarified (3.6.104);
– measurement of the input current of refrigerating appliances using inverter driven motor-compressors is included (10.2);
– compatibility tests for winding insulation of motor-compressors used with different types of refrigerants and oils have been introduced (22.9);
– requirements for inadvertent contact points between uncoated aluminium pipes and copper pipes have been updated (22.111);
– testing of accessible glass panels has been clarified (22.116);
– in refrigerating appliances, requirements for material encasing and in contact with thermal insulation have been introduced and consequential text has been deleted (22.117, 30.2, 30.2.101, Annex EE);
– requirements for motor running capacitors have been updated (24.5, 24.8);
– the locked rotor test for fan motors has been clarified (Annex AA).

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

FDIS	Report on voting
61C/861/FDIS	61C/863/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 refrigerating appliances, ice-cream appliances and ice-makers.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When 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 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).

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

– 22.117: Only the first two dashed items in the first paragraph of the requirement are allowed (Australia and New Zealand).

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 that 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 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of the following appliances, their **rated voltage** being not more than 250 V for single-phase appliances, 480 V for other appliances and 24 V DC for appliances when battery operated:

– **refrigerating appliances** for household and similar use;

– **ice-makers** incorporating a motor-compressor and **ice-makers** intended to be incorporated in frozen food storage compartments;

– **refrigerating appliances** and **ice-makers** for use in camping, touring caravans and boats for leisure purposes.

These appliances may be operated from the mains, from a separate battery or operated either from the mains or from a separate battery.

This standard also deals with the safety of **ice-cream appliances** intended for household use, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

It also deals with **compression-type appliances** for household and similar use, which use **flammable refrigerants**.

This standard does not cover features of the construction and operation of those **refrigerating appliances** which are dealt with in other IEC standards.

Refrigerating appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as

- **refrigerating appliances** used in staff kitchen areas in shops, offices and other working environments,
- **refrigerating appliances** used in farm houses and by clients in hotels, motels and other residential type environments,
- **refrigerating appliances** used in bed and breakfast type environments, and
- **refrigerating appliances** used in catering and similar non-retail applications

are within the scope of this standard.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account

– persons (including children) whose
  - physical, sensory or mental capabilities or
  - lack of experience and knowledge

  prevents them from using the appliance safely without supervision or instruction;
– children playing with the appliance.

NOTE 1 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board 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.

This standard does not apply to

– appliances intended to be used in the open air;
– appliances designed exclusively for industrial purposes;
– appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas);
– appliances incorporating a battery intended as a power supply for the refrigerating function;
– appliances assembled on site by the installer;
– appliances with remote motor-compressors;
– motor-compressors (IEC 60335-2-34);
– commercial dispensing appliances and vending appliances (IEC 60335-2-75);
– commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or motor-compressor (IEC 60335-2-89);
– professional ice-cream makers (IEC 60335-2-118).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60068-2-11:1981, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60079-1:2014, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

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 60252-1:2010, *AC motor capacitors – Part 1: General – Performance, testing and rating – Safety requirements – Guidance for installation and operation*
IEC 60252-1:2010/AMD1:2013

[1] There exists a consolidated edition 5.1:2017 that includes edition 5 and its Amendment 1.

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

IEC 60598-1:2014, *Luminaires – Part 1: General requirements and tests*
IEC 60598-1:2014/AMD1:2017[3]

IEC 60695-11-3:2012, *Fire hazard testing – Part 11-3: Test flames – 500 W flames – Apparatus and confirmational test methods*

IEC 60695-11-20:2015, *Fire hazard testing – Part 11-20: Test flames – 500 W flame test method*

IEC 60730-2-6:2015, *Automatic electrical controls – Particular requirements for automatic electrical pressure sensing controls including mechanical requirements*
IEC 60730-2-6:2015/AMD1:2019[4]

IEC 60851-4:2016, *Winding wires – Test methods – Part 4: Chemical properties*

ISO 209:2007, *Aluminium and aluminium alloys – Chemical composition*

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

ISO 4126-2:2018, *Safety devices for protection against excessive pressure – Part 2: 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 7010:2019, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

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 from 3.1.9.101 to 3.1.9.104.

3.1.9.101
normal operation of a refrigerating appliance
operation at an ambient temperature in accordance with 5.7, empty, with the doors and lids closed. User-adjustable temperature control devices which control the operation of the motor-compressor in **compression-type appliances** are short-circuited or otherwise rendered inoperative

[2] There exists a consolidated edition 5.2:2016 that includes edition 5 and its Amendment 1 and Amendment 2.

[3] There exists a consolidated edition 8.1:2017 that includes edition 8 and its Amendment 1

[4] There exists a consolidated edition 3.1:2019 that includes edition 3 and its Amendment 1

3.1.9.102
normal operation of an ice-maker
operation at an ambient temperature in accordance with 5.7, with the supply water at a temperature of 15 °C ± 2 °C

3.1.9.103
normal operation of an incorporated ice-maker
operation at the normal temperature of the frozen food storage compartment, with the supply water at a temperature of 15 °C ± 2 °C

3.1.9.104
normal operation of an ice-cream appliance
operation of the appliance using the maximum quantity of the mixture of ingredients indicated in the instructions; the mixture used being that which gives the most unfavourable results, the mixture being at an initial temperature of 23 °C ± 2 °C

3.5 Definitions relating to types of appliances

3.5.101
refrigerating appliance
enclosed thermally insulated appliance of suitable volume for household use, cooled by an incorporated device and having one or more compartments intended for the preservation of foodstuffs including cooling of beverages

3.5.102
compression-type appliance
appliance in which refrigeration is effected by the vaporization at low pressure in a heat exchanger (**evaporator**) of a liquid refrigerant, the vapour thus formed being restored to the original state by mechanical compression at a higher pressure and subsequent cooling in another heat exchanger (**condenser**)

3.5.103
ice-maker
appliance in which ice is made by freezing water by a device consuming electrical energy and having a compartment for storing the ice

3.5.104
incorporated ice-maker
ice-maker specially designed to be incorporated into a frozen food storage compartment and without independent means for freezing water

3.5.105
absorption-type appliance
appliance in which refrigeration is effected by the evaporation in a heat exchanger (**evaporator**) of a liquid refrigerant, in the liquid state, the resulting vapour being then absorbed by an absorbent medium from which it is subsequently expelled at a higher partial vapour pressure by heating and liquefied by cooling in another heat exchanger (**condenser**)

3.5.106
ice-cream appliance
compression-type appliance which is used to make ice-cream

3.6 Definitions relating to parts of an appliance

3.6.101
heating system
heating element with associated components such as timers, switches, **thermostats** and other controls

3.6.102
condenser
heat exchanger in which, after compression, vaporized refrigerant is liquefied by losing heat to an external cooling medium

3.6.103
evaporator
heat exchanger in which, after pressure reduction, the liquid refrigerant is vaporized by absorbing heat from the medium to be refrigerated

3.6.104
free space
space with a volume exceeding 60 l where 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.

Note 1 to entry: Evaluation of the ignored volume can be checked by applying a 150 mm ± 0,5 mm diameter sphere or a square with 200 ± 0,5 mm side without appreciable force. The volume can be ignored if the sphere or square cannot fit inside.

3.6.105
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

3.6.106
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**.

3.7 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

3.8 Definitions relating to miscellaneous matters

3.8.101
design pressure
DP
gauge pressure that has been assigned to the high-pressure side of a **transcritical refrigeration system**

3.8.102
flammable refrigerant
refrigerant with a flammability classification of A2L, A2 or A3 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.

4 General requirement

This clause of Part 1 is applicable except as follows.

Addition:

The use of **flammable refrigerants** involves additional hazards which are not associated with appliances using non-**flammable refrigerants**.

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

The hazard due to ignition of leaked **flammable refrigerant** by an external potential ignition source associated with the environment in which the appliance is installed is compensated by the low probability of ignition.

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 22.107.

Unless the motor-compressor conforms to 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 test of 22.7 may be performed on separate samples.

Due to the potentially hazardous nature of the tests of 22.107, 22.108 and 22.109, special precautions may need to be taken when performing the tests.

5.3 *Addition:*

Before starting the tests,

- ***ice-cream appliances** are operated empty at **rated voltage** for 1 h, or for the maximum setting of an incorporated timer, whichever is shorter;*
- *other **compression-type appliances** shall be operated at **rated voltage** for at least 24 h, then switched off and left to stand for at least 12 h.*

The test of 11.102 is carried out immediately after the tests of Clause 13.

The test of 15.105 is carried out immediately after the test of 11.102.

The tests of 15.101.1, 15.101.2, 15.103 and 15.104 are carried out immediately after the test of 15.2.

5.4 *Replacement*:

Tests are carried out using each source of energy (electricity, gas or other fuel) in turn. Gas appliances are supplied at the appropriate rated pressure.

Tests are additionally carried out with all combinations of energy sources supplied simultaneously unless this is prevented by interlocking devices.

5.7 *Addition:*

*For **ice-cream appliances**, tests specified in Clauses 10, 11 and 13 are carried out at an ambient temperature of 23 °C ± 2 °C.*

For other appliances, tests specified in Clauses 10, 11, 13 and Subclause 19.103 are carried out at an ambient temperature of

- *32 °C ± 1 °C on appliances of extended temperate (SN) and temperate (N) classes;*
- *38 °C ± 1 °C on appliances of subtropical (ST) class;*
- *43 °C ± 1 °C on appliances of tropical (T) class.*

Before starting these tests, the appliance with the doors or lids open is brought to within 2 K of the ambient temperature specified.

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

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

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.

5.8.1 *Addition:*

Appliances which can be battery operated are tested at the more unfavourable polarity when the supply terminals or terminations for the connection of the battery have no indication for polarity.

5.9 *Addition:*

*Appliances incorporating an **ice-maker** are tested with the **ice-maker** operating to give the most unfavourable results.*

5.10 *Addition*:

For the tests of 22.107, 22.108 and 22.109, the appliance is empty and installed as outlined below:

***Built-in appliances** are installed in accordance with the instructions for installation.*

Other appliances are placed in a test enclosure, the walls enclosing the appliance as near to all its sides and the top of the appliance as possible, unless the manufacturer indicates in the instructions for installation that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test.

NOTE 101 Commonly available fixing hardware, such as screws and bolts, need not be delivered with a fixed appliance.

5.101 *Appliances which are constructed so that an **ice-maker** may be incorporated are tested with the intended **ice-maker**.*

5.102 ***Compression-type appliances** with **heating systems** and Peltier-type appliances are tested as **combined appliances**.*

5.103 ***Compression-type appliances** which use **flammable refrigerants** and which, according to the instructions, may be used with other electrical appliances inside a food storage compartment are tested with such recommended appliances incorporated and being operated as in normal use.*

NOTE Examples of such electrical appliances are ice-cream makers and deodorizers.

6 Classification

This clause of Part 1 is applicable except as follows.

6.101 Appliances, other than **ice-cream appliances**, shall be of one or more of the following climatic classes:

– appliances of extended temperate class (SN);
– appliances of temperate class (N);
– appliances of subtropical class (ST);
– appliances of tropical class (T).

Compliance is checked by inspection.

NOTE The climatic classes are specified in IEC 62552-1:2015.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

Appliances shall also be marked with

– the power input, in watts, of **heating systems**, if greater than 100 W;
– the defrosting input, in watts, if greater than the input corresponding to the **rated power input**;
– **rated power input** in watts or **rated current** in amperes, except that **compression-type appliances**, other than **ice-cream appliances**, shall be marked with the **rated current** in amperes;
– the letters SN, N, ST or T indicating the climatic class of the appliance;
– the maximum rated wattage of lamps, in watts (not applicable if the lamps can only be replaced by the manufacturer or its service agent, together with a part of the appliance);

– the total mass of the refrigerant;
– for a single component refrigerant, at least one of the following:
  • the chemical name;
  • the chemical formula;
  • the refrigerant number;
– for a blended refrigerant, at least one of the following:
  • the chemical name and nominal proportion of each of the components;
  • the chemical formula and nominal proportion of each of the components;
  • the refrigerant number and nominal proportion of each of the components;
  • the refrigerant number of the refrigerant blend;
– the chemical name or refrigerant number of the principal component of the insulation blowing gas.

Refrigerant numbers are given in ISO 817.

For **compression-type appliances**, the defrosting power input in watts shall be marked separately if the current corresponding to the defrosting power input is greater than the **rated current** of the appliance.

Appliances which can be mains and battery operated shall be marked with the battery voltage.

Appliances which can be battery operated shall be marked with the type of battery, distinguishing between rechargeable and non-rechargeable batteries, if necessary, unless the type is irrelevant for the operation of the appliance.

The means provided for connection of any additional electrical supply shall be marked with the voltage and nature of the supply.

Appliances having provision for an **incorporated ice-maker** shall be marked with the maximum power input for an **incorporated ice-maker**, if greater than 100 W.

Ice-makers without automatic water level control shall be marked with the maximum permissible water level.

Appliances shall be marked with details of the source of supply other than electrical, if any.

For **compression-type refrigerating systems**, the appliance shall also be marked with the mass of the refrigerant for each separate refrigerant circuit.

Compression-type appliances which use **flammable refrigerants** shall be marked with the symbol ISO 7010 W021 (2019-07).

Appliances employing R-744 in a **transcritical refrigeration system** shall be marked with the substance of the following:

WARNING: System contains refrigerant under high pressure. Do not tamper with the system. It must be serviced by qualified persons only.

Appliances employing R-744 in a **transcritical refrigeration system** shall be marked with symbol ISO 7000- 1701 (2004-01).

7.6 *Addition:*

	[symbol IEC 60417-5005 (2002-10)]	Plus; Positive polarity
	[symbol IEC 60417-5006 (2002-10)]	Minus; Negative polarity
	[symbol ISO 7010 W021 (2019-07)]	Warning; Risk of fire / Flammable materials
	[symbol ISO 7000-1701 (2004-01)]	Pressure

7.12 *Addition:*

The instructions for **refrigerating appliances** and **ice-makers** for camping or similar use shall include the substance of the following:

– suitable for camping use;

– the appliance may be connected to more than one source of energy (not applicable to appliances which are intended to be supplied by electricity only);

– the appliance shall not be exposed to rain (not applicable to appliances with a degree of protection against harmful ingress of water of at least IPX4).

The instructions for **ice-makers** not intended to be connected to the water supply shall state the substance of the following warning:

WARNING: fill with potable water only.

For **compression-type appliances** which use **flammable refrigerants**, the instructions shall include information pertaining to the installation, handling, servicing and disposal of the appliance.

The instructions for **compression-type appliances** that use **flammable refrigerants** shall additionally include the substance of the warnings listed below:

– WARNING: Keep ventilation openings, in the appliance enclosure or in the built-in structure, clear of obstruction.

– WARNING: Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.

– WARNING: Do not damage the refrigerant circuit.

This warning is only applicable for appliances with refrigerating circuits which are accessible by the user.

– WARNING: Do not use electrical appliances inside the food storage compartments of the appliance, unless they are of the type recommended by the manufacturer.

For appliances which use flammable insulation blowing gases, the instructions shall include information regarding disposal of the appliance.

The instructions for **ice-cream appliances** shall include the ingredients and maximum quantity of mixtures that can be used in the appliance.

The instructions shall state the substance of the following.

> Do not store explosive substances such as aerosol cans with a flammable propellant in this appliance.

If symbol ISO 7000-1701 (2004-01) is used, its meaning shall be explained.

The instructions shall include the substance of the following:

This appliance is intended to be used in household and similar applications such as

– staff kitchen areas in shops, offices and other working environments;
– farm houses and by clients in hotels, motels and other residential type environments;
– bed and breakfast type environments;
– catering and similar non-retail applications.

If the manufacturer wants to limit the use of the appliance to less than the above, this has to be clearly stated in the instructions.

If symbol ISO 7010 W021 (2019-07) is used, its meaning shall be explained.

The instructions for **refrigerating appliances** and **ice-makers** shall include the substance of the following:

WARNING: When positioning the appliance, ensure the supply cord is not trapped or damaged.

WARNING: Do not locate multiple portable socket-outlets or portable power supplies at the rear of the appliance.

7.12.1 *Addition:*

Instructions shall include the method for replacing illuminating lamps, if the lamps can be replaced by the user.

For appliances designed for incorporating **ice-makers**, the instructions shall include the types of **ice-makers** which can be incorporated.

The instructions shall include information on the installation of **incorporated ice-makers** which are available as optional accessories and intended to be installed by the user. If it is intended that **incorporated ice-makers** are to be installed only by the manufacturer or its service agent, this shall be stated.

The instructions for **ice-makers** intended to be connected to the water supply shall state the substance of the following warning:

WARNING: Connect to potable water supply only.

The instructions for **fixed appliances** shall include the substance of the following warning:

WARNING: To avoid a hazard due to instability of the appliance, it must be fixed in accordance with the instructions.

In appliances employing R-744 in a **transcritical refrigeration system**, the instructions shall include the substance of the following:

WARNING: The refrigeration system is under high pressure. Do not tamper with it. Contact qualified service personal before disposal.

7.12.4 *Modification:*

This subclause is also applicable to **fixed appliances**.

7.14 *Addition:*

The height of the triangle in the symbol ISO 7010 W021 (2019-07) shall be at least 15 mm.

The height of the letters used for the marking of the type of flammable insulation blowing gas shall be at least 40 mm.

7.15 *Addition:*

The marking of the maximum rated wattage of illuminating lamps that can be replaced by the user shall be easily discernible while the lamp is being replaced.

For **compression-type appliances**, the marking of the type of **flammable refrigerant** and of the flammable insulation blowing gas, as well as the symbol ISO 7010 W021 (2019-07), shall be visible when gaining access to the motor-compressors.

For other appliances, the marking of the type of flammable insulation blowing gas shall be on the external enclosure.

7.101 For appliances which can be battery operated, the supply terminals or terminations for connections to the battery shall be clearly indicated by symbols.

The positive terminal shall be indicated by symbol IEC 60417-5005 (2002-10) and the negative terminal by symbol IEC 60417-5006 (2002-10).

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.1 *Modification:*

Replace the second paragraph of the test specification by the following:

*Lamps are not removed, provided that the appliance can be isolated from the supply by means of a plug or an all-pole switch. However, during the insertion or removal of lamps, protection against contact with **live parts** of the lamp cap shall be ensured.*

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.1 *Modification:*

Replace the third dashed item of the first paragraph of the test specification by the following:

– *the appliance being operated under **normal operation** except that user adjustable temperature controls are set to give the lowest temperature.*

Addition:

The power input is considered to be stabilized when steady conditions are established or when any incorporated timer operates, whichever occurs first.

*A representative period is one between the making and the breaking of the temperature control, or between the highest and lowest values of power input measured, excluding starting power input but including the power input of the **incorporated ice-maker**, if any.*

NOTE 101 The power input of a defrosting system which is separately marked on the appliance is not taken into consideration during the test.

10.2 *Modification:*

Replace the third dashed item of the first paragraph of the test specification by the following:

– *the appliance being operated under **normal operation** except that user adjustable temperature controls are set to give the lowest temperature.*

Addition:

*For **refrigerating appliances** using inverter driven motor-compressors, the appliance shall be operated for a period of 6 h or the maximum setting of an incorporated timer, whichever is shorter. Defrost cycles are excluded, if any. Other appliances are operated for a period of 1 h or the maximum setting of an incorporated timer, whichever is shorter. Excluding starting current, the maximum value of the current averaged over any 5 min period is obtained. The interval between current measurements shall not exceed 30 s.*

NOTE 101 Starting current is considered to be excluded if the first current measurement is made approximately 1 min after starting.

10.101 The power input of the defrosting system shall not deviate from the defrosting power input marked on the appliance by more than the deviation shown in Table 1.

*Compliance is checked by operating the appliance at **rated voltage** and measuring the power input of the defrosting system after the power input has stabilized.*

10.102 The power input of any **heating system** shall not deviate from the power input of these systems marked on the appliance by more than the deviation shown in Table 1.

*Compliance is checked by operating the appliance at **rated voltage** and measuring the power input of the **heating system** after the power input has stabilized.*

11 Heating

This clause of Part 1 is applicable except as follows.

11.1 *Modification:*

Compliance is checked by determining the temperature rise of the various parts under the conditions specified in 11.2 to 11.7.

If the winding temperatures of motor-compressors exceed the values given in Table 101, compliance is checked by the test of 11.101.

The winding temperatures of motor-compressors conforming to IEC 60335-2-34 (including its Annex AA) are not measured.

11.2 *Replacement:*

***Built-in appliances** are installed in accordance with the instructions for installation.*

***Ice-cream appliances** are placed as near to the walls of the test corner as possible, unless the manufacturer indicates in the instructions for use that a free distance shall be observed from the walls, in which case this distance is observed during the test. If means of ventilation are supplied by the manufacturer, they are mounted as intended.*

Other appliances are placed in a test enclosure. The walls enclose the appliance as near to all its sides and above as possible, unless the manufacturer indicates in the instructions for installation that a free distance shall be observed from the walls or the ceiling, in which case this distance is observed during the test.

*Dull black painted plywood approximately 20 mm thick is used for the test corner, supports and installation of **built-in appliances** and for the test enclosure for other appliances.*

11.7 *Replacement:*

The appliance is operated until steady conditions are established.

11.8 *Modification:*

Replace the text above Table 3 by the following:

*During the test, **protective devices** other than self-resetting thermal motor-protectors for motor-compressors shall not operate. When steady conditions are established, self-resetting thermal motor-protectors for motor-compressors shall not operate.*

During the test, sealing compound, if any, shall not flow out.

During the test, temperature rises are monitored continuously.

For appliances of extended temperate (SN) or temperate (N) class, the temperature rises shall not exceed the values given in Table 3.

For appliances of subtropical (ST) or tropical (T) class, the temperature rises shall not exceed the values given in Table 3 reduced by 7 K.

Addition:

For motor-compressors not conforming to IEC 60335-2-34 (including its Annex AA), the temperatures of

– *housings of motor-compressors, and*

– *windings of motor-compressors*

shall not exceed the values given in Table 101.

For motor-compressors conforming to IEC 60335-2-34 (including its Annex AA), the temperatures of their

– *housings of motor-compressors,*

– *windings of motor-compressors, and*

– *other parts such as its protection system and control system, and all other components that have been tested together with the motor-compressor during the tests of IEC 60335-2-34 and its Annex AA*

are not measured.

The entry in Table 3 relating to the temperature rise of the external enclosure of ***motor-operated appliances*** *is applicable to all appliances covered by this standard. However, it is not applicable to those parts of the external enclosure of the appliance that are,*

– *for* ***built-in appliances****, not* ***accessible parts*** *after installation in accordance with the instructions for installation;*

– *for other appliances, on that part of the appliance that according to the instructions for installation is intended to be placed against a wall with a free distance not exceeding 75 mm.*

Table 101 – Maximum temperatures for motor-compressors

Part of the motor-compressor	***Temperature*** ***°C***
Windings with	
– synthetic insulation	*140*
– cellulose insulation or the like	*130*
Housing	*150*

The temperature of ballast windings and their associated wiring shall not exceed the values specified in 12.4 of IEC 60598-1:2014/AMD1:2017 when measured under the conditions stated.

11.101 *If the temperatures of the windings of motor-compressors other than those complying with IEC 60335-2-34 including its Annex AA are higher than the temperature limits given in Table 101, the test is carried out again, the* ***thermostat*** *or similar control device being set at the lowest temperature, and the short circuit of the user-adjustable temperature control device removed.*

The winding temperatures are measured at the end of a running cycle.

The temperatures shall be not higher than the temperature limits given in Table 101.

11.102 Any defrosting system shall not give rise to excessive temperatures.

Compliance is checked by the following test.

The appliance is supplied at the most unfavourable voltage between 0,94 and 1,06 times the ***rated voltage****:*

– *in the case of appliances where defrosting is manually controlled, until the* ***evaporator*** *is coated with a layer of frost;*

– *in the case of appliances where defrosting is automatically or semi-automatically controlled, until the* ***evaporator*** *is coated with a layer of frost; however, this layer shall be not thicker than that which occurs in normal use during the intervals between the successive automatic defrosting operations or, for the semi-automatic defrosting, during the intervals between the defrosting operations recommended by the manufacturer, if any.*

NOTE 1 One method of accumulation of frost for **refrigerating appliances** is given in Annex BB.

With the defrosting system operating:

– *for* ***absorption-type appliances*** *and for* ***compression-type appliances*** *in which the defrosting system can be energized with the rest of the appliance unenergized, the supply voltage is as specified in 11.4;*

– *for other* ***compression-type appliances****, the supply voltage is as specified in 11.6.*

NOTE 2 The defrosting system is regarded as being able to be energized separately if this can be done without the use of a **tool**.

If the defrosting time is controlled by an adjustable device, the device is set to the time recommended by the manufacturer. If a control device is used which stops the defrosting at a given temperature or pressure, the defrosting period is automatically terminated when the control operates.

For manually controlled defrosting, the test is continued until steady conditions are established; otherwise the test is continued until the defrosting period is automatically terminated by a control device.

The temperatures of combustible materials and of electrical components liable to be affected by the defrosting operation are measured with thermocouples.

The temperatures and temperature rises shall not exceed the values given in 11.8.

NOTE 3 During the recovery period after defrosting, the thermal overload protector of the motor compressor can operate.

11.103 Heating systems, other than defrosting systems, incorporated in an appliance shall not give rise to excessive temperatures.

Compliance is checked by the following test.

Heating systems *other than defrosting systems are energized as follows:*

– *for* ***absorption-type appliances*** *and for* ***compression-type appliances*** *in which the* ***heating system*** *can be energized with the rest of the appliance unenergized, the supply voltage is as specified in 11.4;*

– *for other* ***compression-type appliances****, the supply voltage is as specified in 11.6.*

NOTE The defrosting system is regarded as being able to be energized separately, if this can be done without the use of a **tool**.

The test is continued until steady conditions are established.

Temperature rises are measured by means of thermocouples fixed on the outside surface of the insulation of the ***heating systems****.*

Temperature rises shall not exceed the values given in 11.8.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable except as follows.

13.1 *Addition:*

The test of 13.2 does not apply to battery circuits.

13.2 *Modification:*

*Instead of the values specified for **class 0I appliances** and the various types of **class I appliances**, the following values apply:*

– *for **class 0I appliances***	*0,75 mA;*
– *for **class I refrigerating appliances***	*the values specified for the various types of stationary **class I appliances**;*
– *for other **class I appliances***	*1,5 mA.*

13.3 *Addition*:

*The test voltage specified in Table 4 for **reinforced insulation** is applied between separate circuits for battery operation and mains supply operation.*

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.2 *Addition:*

Lamp covers are not removed.

15.101 Appliances subject to spillage of liquid from containers onto the inside walls of the cabinet or compartment shall be constructed so that such spillage does not affect their electrical insulation.

Compliance is checked by the relevant tests of 15.101.1 and 15.101.2 using the spillage solution specified in 15.2.

15.101.1 *The apparatus shown in Figure 101 is filled with the spillage solution to the level of the lip, and the displacement block is supported just above the solution by means of any suitable release mechanism and bridge support.*

*All shelves and containers which can be removed without the use of a **tool** are removed and the appliance is disconnected from the supply. Lamp covers are not removed.*

The apparatus is supported with its base horizontal and so positioned and at such a height that when the release mechanism is operated, the solution is discharged over the back and side interior walls of the cabinet or compartment including any electrical components mounted thereon, in the most unfavourable manner. The test is made only once with the apparatus in any one position, but the test may be repeated as many times as necessary in different positions, provided that there is no residual solution on parts wetted by a previous test.

Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of the solution on insulation which could result in a reduction of ***clearances*** *and* ***creepage distances*** *below the values specified in Clause 29.*

Furthermore, if the inspection shows that the solution is in contact with the defrost heating element or its insulation, then the complete heating element shall withstand the test of 22.102.

15.101.2 *A rectangular container having dimensions of 200 mm x 110 mm and a height of 50 mm is filled with 0,5 l of the spillage solution.*

The container is positioned, with its longest side parallel to the wall to be tested, on the highest shelf on which it will fit, the shelf shall have a clearance to the ceiling of the compartment of at least 130 mm. All other shelves and containers which can be removed without the use of a ***tool*** *are removed. Lamp covers are not removed.*

The appliance is disconnected from the supply and the solution in the vessel is discharged over the back and side interior walls of the cabinet or compartment including any electrical components mounted thereon, in the most unfavourable manner within a period of 2 s. The test is made only once with the container in any one position, but the test may be repeated as many times as necessary in different positions, provided that there is no residual solution on parts wetted by a previous test.

Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of the solution on insulation which could result in a reduction of ***clearances*** *and* ***creepage distances*** *below the values specified in Clause 29.*

Furthermore, if the inspection shows that the solution is in contact with the defrost heating element or its insulation, then the complete heating element shall withstand the test of 22.102.

15.102 Appliances subject to spillage of liquid onto the top of the cabinet shall be constructed so that such spillage does not affect their electrical insulation.

Compliance is checked by the relevant tests of 15.103 and 15.104. The spillage solution specified in 15.2 is used for the test of 15.103.

15.103 *Appliances, other than* ***built-in appliances****,* ***ice-makers*** *and* ***ice-cream appliances*** *are tilted at an angle of up to 2° in relation to the position of normal use in the direction which is likely to be the most unfavourable for this test. One half-litre of the spillage solution is poured uniformly over the top of the appliance in approximately 60 s at the most unfavourable place from a height of approximately 50 mm with the controls in the on position and the appliance disconnected from the supply.*

Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of the solution on insulation which could result in a reduction of ***clearances*** *and* ***creepage distances*** *below the values specified in Clause 29.*

15.104 *For* ***ice-makers*** *which are directly connected to the water supply, the container, or that part of the appliance which serves as the container, is filled with water as in normal use. The inlet valve is then held open and the filling is continued for 1 min after the first evidence of overflow.*

Where no spillage occurs due to operation of a device that prevents such spillage, the inlet valve is held open for a further 5 min following the operation of this device.

Immediately after the test, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation which could result in a reduction of ***clearances*** *and* ***creepage distances*** *below the values specified in Clause 29.*

15.105 Operation of a defrosting system shall not affect the electrical insulation of defrost heating elements.

Compliance is checked by the following test.

Immediately after the test of 11.102, the appliance shall withstand the electric strength test of 16.3 and inspection shall show that there is no trace of water on insulation which could result in a reduction of ***clearances*** *and* ***creepage distances*** *below the values specified in Clause 29.*

Furthermore, if the inspection shows that water is in contact with the defrost heating element or its insulation, then the apparatus shall withstand the test of 22.102.

16 Leakage current and electric strength

This clause of Part 1 is applicable except as follows.

16.1 *Addition:*

The test of 16.2 does not apply to battery circuits.

16.2 *Modification:*

Instead of the values specified for ***class 0I appliances*** *and the various types of* ***class I appliances****, the following values apply:*

– *for* ***class 0I appliances***	*0,75 mA;*
– *for* ***class I refrigerating appliances***	*the values specified for the various types of stationary* ***class I appliances****;*
– *for other* ***class I appliances***	*1,5 mA.*

16.3 *Addition:*

The test voltage specified in Table 7 for reinforced insulation is applied between separate circuits for battery operation and mains supply operation.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 *Addition:*

Subclauses 19.2 and 19.3 do not apply to ***heating systems****.*

In addition, fan motors and their thermal motor-protectors, if any, are subjected to the test specified in Annex AA.

For any given type of fan motor and thermal motor-protection combination, this test is performed only once.

Motor compressors not conforming to IEC 60335-2-34 are subjected to the tests specified in 19.101 and 19.102 of IEC 60335-2-34 and shall also conform to 19.104 of that standard.

For any given type of motor-compressor, this test is performed only once.

Fan motors of ***ice-cream appliances*** *are not subject to the locked-rotor test of Annex AA.*

19.7 *Addition:*

Fan motors of ***ice-cream appliances*** *are tested for 5 min.*

19.8 *Addition:*

This test is not applicable to three-phase motor-compressors complying with IEC 60335-2-34.

19.9 Not applicable.

19.13 *Addition:*

The temperature of the housing of motor-compressors other than those which comply with IEC 60335-2-34 is determined at the end of the test period and shall not exceed 150 °C.

19.101 **Heating systems** shall be so dimensioned and located that there is no risk of fire even in the case of abnormal operation.

Compliance is checked by inspection and the following test.

Doors and lids of the appliance are closed and the refrigerating system is switched off.

Any ***heating system*** *intended to be switched on and off by the user is switched on.*

Heating systems *are continuously energized at a voltage equal to 1,1 times their* ***working voltage****, until steady conditions are established. If there is more than one* ***heating system****, they are operated each in turn, unless failure of a single component will cause two or more to operate together, in which case they are tested in combination.*

NOTE It can be necessary to short-circuit one or more components which operate during **normal operation** in order to ensure that the **heating systems** are continuously energized.

Self-resetting thermal cut-outs *are short-circuited unless they comply with 24.1.4, the number of cycles of operation being 100 000.*

*The refrigerating system is not switched off if this prevents the **heating system** from operating.*

During and after the test, the appliance shall comply with 19.13.

19.102 **Ice-makers** and **ice-cream appliances** shall be constructed so that they shall not cause any risk of fire, mechanical hazard or electric shock even in the case of abnormal operation.

*Compliance is checked by applying any defect which may be expected in normal use, while the **ice-maker**, **incorporated ice-maker** or **ice-cream appliance** is operated under **normal operation** at **rated voltage**. Only one fault condition is reproduced at a time and the tests are made consecutively.*

The tests are made with the tap closed or opened, whichever gives the more unfavourable result.

Components complying with the relevant IEC standard are not open-circuited or short-circuited, provided the appropriate standard covers the conditions which occur in the appliance.

Water level switches complying with IEC 61058-1 are not short-circuited during these tests.

*During the tests, the temperatures of the windings of the **ice-maker**, **incorporated ice-maker**, **ice-cream appliance** or of the appliance incorporating the **ice-maker** shall not exceed the values given in Table 8.*

During and after the tests, the appliance shall comply with 19.13.

NOTE 1 Examples of fault conditions are:

– timer stopping in any position;

– disconnection and reconnection of one or more phases of the supply during any part of the programme;

– open-circuiting or short-circuiting of components, thermal controls are not short-circuited;

– failure of a magnetic valve;

– operation with an empty container.

NOTE 2 In general, tests are limited to those cases which can be expected to give the most unfavourable results.

NOTE 3 The test during which the automatic filling device is held open has already been made during the test of 15.104.

19.103 Appliances intended for camping and similar use shall be constructed so that the risk of fire, mechanical hazard or electric shock is obviated as far as is practicable in the event of the appliance being operated whilst inclined.

Compliance is checked by the following test.

*The appliance is placed on a support inclined by 5° in the most unfavourable position and is operated under **normal operation** at **rated voltage** until steady conditions are established.*

*During the test, **non-self-resetting thermal cut-outs** which are accessible only with the aid of a **tool** or which require the replacement of a part shall not operate and no ignitable gas shall accumulate in the appliance.*

During and after the test, the appliance shall comply with 19.13.

19.104 Illuminating equipment shall not cause a hazard under abnormal operating conditions.

Compliance is checked by the following test, for which the appliance is empty, the refrigerating system is switched off or rendered inoperative, with the lamp circuit remaining operable, and doors or lids are in the most unfavourable open position or closed, whichever is the more onerous.

The complete illuminating equipment including its protective cover, fitted with a lamp as recommended by the manufacturer, is operated for 12 h at 1,06 times the ***rated voltage***.

If an incandescent lamp does not attain the maximum rated wattage at ***rated voltage****, the voltage is varied until the maximum rated wattage is reached and is then increased to 1,06 times this voltage.*

Illuminating equipment having discharge lamps is operated under the fault conditions specified in items a), d) and e) of 12.5.1 of IEC 60598-1:2014/AMD1:2017, the appliance being supplied at ***rated voltage*** *until temperature stabilization of the measured parts*

During and after the test, the appliance shall comply with 19.13.

The temperatures of ballast windings and their associated wiring shall not exceed the values specified in 12.5 of IEC 60598-1:2014/AMD1:2017 when measured under the conditions specified.

19.105 Appliances intended for battery operation and having the polarity marked on or adjacent to the terminals or terminations shall be constructed so that the risk of fire, mechanical hazard or electric shock is obviated in the event of an inverted polarity connection.

Compliance is checked by operating the appliance under the conditions specified in Clause 11 but with a fully charged 70 Ah battery connected with reversed polarity.

During and after the test, the appliance shall comply with 19.13.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 *Modification:*

Instead of the requirement, the following applies:

Ice-cream appliances shall have adequate stability.

20.101 **Refrigerating appliances** and **ice-makers** shall have adequate stability. If stability of the appliance is provided by an open door, the door shall be designed to provide support.

This requirement does not apply to **built-in appliances**.

Compliance is checked by inspection and by the tests of 20.102, 20.103 and 20.104, which are carried out after the empty appliance has been disconnected from the supply, placed on a horizontal support and levelled in accordance with the instructions for installation, with castors and rollers, if any, oriented or adjusted to the most unfavourable position. ***Fixed appliances*** *having a height exceeding 1,3 m are installed in accordance with the instructions for installation.*

Fixed appliances *with a height not exceeding 1,3 m are tested as free-standing appliances.*

During these tests, the appliance shall not tilt by more than 2° from the horizontal position and, after the tests, compliance with Clauses 8, 16 and 29 shall not be impaired.

20.102 *Appliances provided with doors shall be subjected to the following test.*

Unless otherwise specified in this standard, all door shelves, other than those which are specifically designed for storing eggs, shall be loaded using cylindrical weights having a diameter of 80 mm and a mass of 0,5 kg.

If egg racks can be removed, the relevant shelf is not considered to be specifically designed for storing eggs.

As many weights as possible are placed horizontally on the door shelves starting as far as possible from the hinge and touching each other along the shelf, even if extended beyond the edge of the shelf, except for a space less than 80 mm wide at the end of the shelf.

Three of these weights are placed in each position on those shelves where the free height above the shelf is 340 mm or higher, two weights in each position on those shelves where the free height above the shelf is between 170 mm and 340 mm and one weight in each position where the free height above the shelf is less than 170 mm. Shelves that can be adjusted to different positions by the user are placed in the position which will give the most unfavourable results.

If the shelf is too narrow to accommodate the weights lying flat, the weights may overhang the shelf or be tipped up.

Liquid containers located on the door are filled with a quantity of water to their full mark or, in the absence of a full mark, are completely filled.

For appliances with only one door, this is opened through an angle of approximately 90° and a weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of the door.

For appliances with more than one door, any two doors, in the most unfavourable combination, are opened through an angle of approximately 90°. The shelves of closed doors are not loaded. A weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of one of the open doors, chosen so as to give the most onerous test conditions.

The test is repeated with the door or doors opened through an angle of approximately 180° or to the limit of the door stop, whichever results in the smaller angle of opening.

Where appliances are provided with reversible doors, the test with the doors open to 180° or to the limit of the door stop, is repeated with the doors hinged on the other side in accordance with the instructions, if this will give a more unfavourable result.

20.103 *Appliances provided with sliding drawers inside food storage compartments are subjected to the following test.*

Each drawer is loaded with a uniformly distributed load/unit storage volume of the drawer of 0,5 kg/l.

Unit storage volume is the geometric volume of the drawer taking into account the free height of the space above the drawer.

In appliances provided with up to three sliding drawers within food storage compartments, one of the drawers, selected to give the most unfavourable result, is pulled to the most onerous out position or to its stops, if fitted, with the appropriate door opened through an angle of approximately 90°.

In appliances provided with more than three sliding drawers within food storage compartments, two non-adjacent drawers, selected to give the most unfavourable result, are pulled to their most onerous out position or to their stops, if fitted, with any doors necessary to gain access to the drawers opened through an angle of approximately 90°.

The door shelves on opened doors are loaded in accordance with 20.102

20.104 *Appliances provided with sliding drawers accessible without opening a door are subjected to the following test.*

Each sliding drawer accessible without opening a door is loaded with a uniformly distributed load/unit storage volume of the compartments of 0,5 kg/l.

Unit storage volume is the geometric volume of the drawer taking into account the free height of the space above the drawer.

One drawer, selected to give the most unfavourable result is pulled to its most onerous out position or to its stops, if fitted, and a weight of 23 kg is gently applied to or suspended from the centre of the drawer.

If the appliance also is provided with a door or doors, unless otherwise specified, the door shelves are loaded as specified in 20.102.

For appliances with only one door, this is opened through an angle of approximately 90° and a weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of the door.

For appliances with more than one door, any two doors, in the most unfavourable combination, are opened through an angle of approximately 90°. The shelves of closed doors are not loaded. A weight of 2,3 kg is placed 40 mm from the edge farthest from the hinge on top of one of the open doors, chosen so as to give the most onerous test conditions.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 *Modification:*

Covers of lamps within the appliance are considered likely to be damaged in normal use. Lamps are not tested.

Addition:

For ***accessible glass panels****, the impact energy is 1,00 J ± 0,05 J.*

21.101 Appliances for camping or similar use shall withstand the effects of dropping and vibration.

Compliance is checked by the following test.

The appliance is placed on a horizontal wooden panel which is dropped 50 times from a height of 50 mm onto a solid base of wood.

The appliance is then fastened in its normal position of use to a vibration-generator by means of straps around the enclosure. The type of vibration is sinusoidal, the direction is vertical and the severity is as follows:

– *duration* *30 min;*
– *amplitude* *0,35 mm;*
– *sweep frequency range* *10 Hz, 55 Hz, 10 Hz;*
– *sweep rate* *approximately one octave per minute.*

After the test, the appliance shall show no damage affecting safety; in particular, no connections or parts the loosening of which may impair safety shall have loosened.

21.102 Lamps shall be protected against mechanical shocks.

Compliance is checked by applying a 75 mm ± 0,5 mm diameter sphere without appreciable force in an attempt to touch the lamp with the lamp cover in place.

The sphere shall not touch the lamp.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

Thermostats, with the exception of their thermosensitive parts, shall not be in contact with the **evaporator** unless they are adequately protected against condensation on cold surfaces and against the effect of water formed during the defrosting process.

NOTE 101 Attention is drawn to the fact that fluids can flow along parts such as stems and tubes of thermostats.

22.7 *Replacement:*

Compression-type appliances, including protective enclosures of a protected cooling system, using **flammable refrigerants** shall withstand

– a gauge pressure of 3,5 times the saturated vapour pressure of the refrigerant at 70 °C for parts exposed to the high-side pressure during normal operation;
– a gauge pressure of 5 times the saturated vapour pressure of the refrigerant at 20 °C for parts exposed only to low-side pressure during normal operation.

NOTE Specific constructional requirements of appliances with a protected cooling system are given in 22.107.

Compliance is checked by the following test.

The appropriate part of the appliance under test is subjected to a pressure that is gradually increased hydraulically until the required test pressure is reached. This pressure is maintained for 1 min. The part under test shall show no leakage.

The test is not carried out on motor-compressors complying with IEC 60335-2-34.

22.9 *Addition:*

For the types of refrigerant and types of oil for which the motor-compressor is intended to be used, compliance of winding wire insulation shall be checked by the tests detailed in Annex BB of IEC 60335-2-34:2012/AMD1:2015 or for motor-compressors that do not use oil by test 16 in IEC 60851-4 for resistance to refrigerants. For test 16 in IEC 60851-4, the percentage of extractable matter shall not exceed 0,5 %. The breakdown voltage shall be at least 75 % of the minimum specified value.

For the types of refrigerant and types of oil for which the motor-compressor is intended to be used, compliance of tie cords and insulation materials other than winding wire insulation shall be checked by the tests detailed in Annex CC of IEC 60335-2-34:2012/AMD1:2015.

The tests are not performed on motor-compressors complying with IEC 60335-2-34.

22.17 *Modification:*

The requirement is not applicable to **refrigerating appliances** and **ice-makers**.

22.33 *Addition:*

Heating conductors having only one layer of insulation shall not be in direct contact with water or ice during normal use.

22.101 Lampholders shall be fixed so that they do not work loose in normal use, including during replacement of lamps.

Compliance is checked by inspection and, if necessary, by subjecting the lampholders to a torque of 0,15 Nm for E14 and B15 lampholders, and 0,25 Nm for E27 and B22 lampholders. The lampholders shall then withstand a push force and then a pull force of 10 N ± 1 N, each applied for 1 min in the direction of the axis of the lampholder.

After the tests, lampholders shall not have worked loose.

Lampholders for a fluorescent lamp shall comply with the test of 4.4.4 i) in IEC 60598-1:2014/AMD1:2017.

22.102 Insulated wire heaters and their joints located in, and in integral contact with, thermal insulation shall be protected against entry of water.

The requirement is not applicable to insulated wire heater connections to electrical terminals.

Compliance is checked by immersing three samples of the complete heating element in water containing approximately 1 % NaCl and having a temperature of 20 °C ± 5 °C for a period of 24 h.

A voltage of 1 250 V is then applied for 15 min between the live part(s) of the heating element and the water.

During the test, no breakdown shall occur.

22.103 Appliances employing a **transcritical refrigeration system** shall in the high pressure side of the refrigeration system include a **pressure relief device** on the compressor or between the compressor and the **gas cooler**. There shall be no shut off devices or other components except piping between the compressor and the **pressure relief device**, which could introduce a pressure drop.

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.

The **pressure relief device** shall have no provisions for setting by the end user.

The operating pressure of the **pressure relief device** shall be no higher than the **design pressure** of the high pressure side.

The **design pressure** of the high pressure side shall be not less than the minimum high side test pressure required in Table 101 of IEC 60335-2-34:2012/AMD2:2016 divided by 3.

The refrigeration system, including all components, shall withstand the pressures expected in normal and abnormal use and during standstill.

Pressure testing has to be done on the complete refrigeration system, however it can be done separately for the low pressure side and for the high pressure side.

Compliance is checked by inspection and by the following test.

*The **pressure relief device** is made inoperable and the test pressure is raised gradually*

- *for the high pressure side, until a pressure not less than the minimum high side test pressure required in Table 101 of IEC 60335-2-34:2012/AMD2:2016 is reached, however not less than 3 times the **design pressure**;*
- *for the low pressure side, until a pressure not less than the minimum low side test pressure required in Table 102 of IEC 60335-2-34:2012/AMD2:2016 is reached.*

For a refrigeration system with an intermediate pressure between high pressure side and low pressure side, all parts subjected to the intermediate pressure are considered to be on the low pressure side.

The pressure is maintained for one minute and the parts under test shall show no leakage.

The test is not carried out on motor-compressors complying with IEC 60335-2-34.

22.104 Appliances with two or more temperature control devices which control the same motor-compressor shall not cause undue operation of the thermal motor-protector of the motor-compressor.

Compliance is checked by the following test.

*The appliance is operated at **rated voltage** under **normal operation** except that user adjustable temperature control devices are set to give cyclic operation.*

When steady conditions are established, and immediately after a breaking of the first control device, the second control device is activated. The thermal motor-protector of the motor-compressor shall not operate.

In the case of appliances where more than two control devices may act on a motor-compressor, the test is carried out separately with each combination of control devices.

22.105 For mains-operated appliances which can also be battery operated, the battery circuit shall be insulated from **live parts** by **double insulation** or **reinforced insulation**.

Moreover, it shall not be possible to touch **live parts** when making the connections to the battery. This applies even if covers, or other parts which have to be removed to make the connections, are **non-detachable parts**.

*Compliance is checked by inspection and by the tests specified for **double insulation** or **reinforced insulation**.*

22.106 The mass of refrigerant in **compression-type appliances** which use **flammable refrigerant** in their cooling system shall not exceed 150 g in each separate refrigerant circuit.

Compliance is checked by inspection.

22.107 Compression-type appliances with a protected cooling system and which use **flammable refrigerants** shall be constructed to avoid any fire or explosion hazard, in the event of leakage of the refrigerant from the cooling system.

Separate components such as **thermostats** which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage from the component itself.

Appliances with a protected cooling system are those

– without any part of the cooling system inside a food storage compartment;
– where any part of the cooling system which is located inside a food storage compartment is constructed so that the refrigerant is contained within an enclosure with at least two layers of metallic materials separating the refrigerant from the food storage compartment. Each layer shall have a thickness of at least 0,1 mm. The enclosure has no joints other than the bonded seams of the evaporator where the bonded seam has a width of at least 6 mm;
– where any part of the cooling system which is located inside a food storage compartment has the refrigerant contained in an enclosure which itself is contained within a separate protective enclosure. If leakage from the containing enclosure occurs, the leaked refrigerant is contained within the protective enclosure and the appliance will not function as in normal use. The protective enclosure shall also withstand the test of 22.7. No critical point in the protective enclosure shall be located within the food storage compartment.

Separate compartments with a common air circuit are considered to be a single compartment.

Compliance is checked by inspection and by the tests of 22.107.1, 22.107.2 and if necessary, 22.107.3.

NOTE An appliance with a protected cooling system which, when tested, is found not to comply with the requirements specified for a protected cooling system, can be considered as having an unprotected cooling system if it is tested in accordance with 22.108 and found to comply with the requirements for an unprotected cooling system.

22.107.1 *A leakage is simulated at the most critical point of the cooling system. For refrigerant circuits that do not meet the corrosion requirements of 22.107.3, a leak is also simulated at any point of the cooling circuit that is nearest to an entry of a pipe or cable into a food storage compartment.*

Critical points are only interconnecting joints between parts of the refrigerant circuit including the gasket of a semi-hermetic motor compressor. Aluminium to copper joints are also critical points unless they are protected against corrosion by a coating or sleeving that excludes oxygen. Welded telescopic joints of the motor-compressor housing, the welding of the pipes through the motor-compressor housing and the welding of the hermetic glass to metal seals (fusite) are not considered to be pipework joints.

NOTE 1 To find the most critical point of the cooling system, it can be necessary to carry out more than one test.

The method for simulating a leakage is to inject the refrigerant vapour through a capillary tube at the critical point. The capillary tube shall have a diameter of 0,7 mm ± 0,05 mm and a length between 2 m and 3 m.

NOTE 2 Care can be taken that the installation of the capillary tube does not unduly influence the results of the test and that the foam does not enter the capillary tube during foaming. The capillary tube can be positioned before the appliance is foamed.

*During this test, the appliance is tested with doors and lids closed, and is switched off or operated under **normal operation** at **rated voltage**, whichever gives the more unfavourable result.*

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

The quantity of refrigerant of the type indicated by the manufacturer to be injected is equal to 80 % of the nominal charge of the refrigerant ± 1,5 g or the maximum which can be injected in one hour, whichever is the smaller.

The quantity injected is taken from the vapour side of a gas bottle which shall contain enough liquid refrigerant to ensure that at the end of the test there is still liquid refrigerant left in the bottle.

If a blend can fractionate, the test is carried out using the fraction that has the smallest value of the lower flammability limit.

The gas bottle is kept at a temperature of

a) 32 °C ± 1 °C for leakage simulation on low-side pressure circuits;

b) 70 °C ± 1 °C for leakage simulation on high-side pressure circuits.

NOTE 3 The quantity of gas injected can preferably be measured by weighing the bottle.

*The concentration of leaked refrigerant is measured at least every 30 s from the beginning of the test and for at least 24 h after injection of the gas has stopped, inside and outside the food storage compartment, as close as possible to electrical components which, during **normal operation**, or abnormal operation, produce sparks or arcs.*

The concentration is not measured close to

– ***non-self-resetting protective devices** necessary for compliance with Clause 19 even if they produce arcs or sparks during operation;*

– ***intentionally weak parts** that become permanently open-circuited during the tests of Clause 19 even if they produce arcs or sparks during operation;*

– *electrical apparatus that has been tested and found to comply with at least the requirements in Annex CC.*

NOTE 4 The instrument used for monitoring gas concentration, such as those which use infrared sensing techniques, can have a fast response, typically 2 s to 3 s and should not unduly influence the result of the test.

NOTE 5 If gas chromatography is to be used, the gas sampling in confined areas can occur at a rate not exceeding 2 ml every 30 s.

NOTE 6 Other instruments are not precluded from being used provided that they do not unduly influence the results.

The measured value shall not exceed 75 % of the lower flammability limit of the refrigerant specified in Table 102 and shall not exceed 50 % of the lower flammability limit of the refrigerant specified in Table 102 for a period exceeding 5 min.

NOTE 7 For appliances with a protected cooling system, there are no additional requirements applicable to electrical components located inside food storage compartments.

22.107.2 *All accessible surfaces of protected cooling system components, including accessible surfaces in intimate contact with protected cooling systems, are scratched using the tool whose tip is shown in Figure 102.*

The tool is applied using the following parameters:

– *force at right angles to the surface to be tested……..35 N ± 3 N;*
– *force parallel to the surface to be tested……not exceeding 250 N.*

The tool is drawn across the surface to be tested at a rate of approximately 1 mm/s.

The surface to be tested is scratched at three different positions in a direction at right angles to the axis of the channel and at three different positions on the channel in a direction parallel to it. In the latter case, the length of the scratch shall be approximately 50 mm.

The scratches shall not cross each other.

The appropriate part of the appliance shall withstand the test of 22.7, the test pressure being reduced by 50 %.

22.107.3 *If aluminium having a purity of less than 99,5 % according to ISO 209 is used in a protected cooling system that is embedded in thermal insulation, a sample of the cooling system is subjected to the salt mist test of IEC 60068-2-11 for a test duration of 48 h.*

After the test there shall be no sign of blistering, pitting or other active corrosion of the aluminium or its coating, if any.

NOTE Aluminium with an ISO designation of Al 99,5 or an international registration record of 1050 A has a purity of 99,5 %.

22.108 For **compression-type appliances** with unprotected cooling systems and which use **flammable refrigerants**, any electrical component, other than luminaires, located inside the food storage compartment, that during **normal operation** or abnormal operation produces arcs or sparks, shall be tested and found at least to comply with the requirements of IEC 60079-15 or the requirements for level protection “dc” of IEC 60079-1, as modified by Annex CC, for group IIA gases or the refrigerant used.

This requirement does not apply to

– **non-self-resetting protective devices** necessary for compliance with Clause 19, nor to
– **intentionally weak parts** that become permanently open-circuited during the tests of Clause 19,

even if they produce arcs or sparks during operation.

Refrigerant leakage into food storage compartments shall not result in an explosive atmosphere outside the food storage compartments in areas where luminaires and electrical components that produce arcs and sparks during **normal operation** or abnormal operation are mounted, when doors or lids remain closed or when opening or closing doors or lids, unless these electrical components, other than luminaires, have been tested and found at least to comply with the requirements of IEC 60079-15 or the requirements for level protection “dc” of IEC 60079-1, as modified by Annex CC, for group IIA gases or the refrigerant used.

This requirement does not apply to

– **non-self-resetting protective devices** necessary for compliance with Clause 19, nor to
– **intentionally weak parts** that become permanently open-circuited during the tests of Clause 19

even if they produce arcs or sparks during operation.

Separate components such as **thermostats** which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage from the component itself.

Appliances with an unprotected cooling system are those where at least one part of the cooling system is placed inside a food storage compartment or those which do not comply with 22.107.

Other types of protection for electrical apparatus used in potentially explosive atmospheres covered by IEC 60079 (all parts) are also acceptable.

NOTE 1 Changing of a lamp is not considered a potential explosion hazard, because the door or lid is open during this operation.

For luminaires, compliance is checked by inspection and by the appropriate tests in 5.3 of IEC 60079-7:2015. For other luminaires, the vibration test for "rough service luminaires" according 4.20 of IEC 60598-1:2014/AMD1:2017 *shall be carried out.*

For electrical components other than luminaires, compliance is checked by inspection and by the appropriate tests of IEC 60079-1, IEC 60079-15 and by the following test.

NOTE 2 The tests called up by Annex CC can be carried out using the stoichiometric concentration of the refrigerant used. However, apparatus which have been independently tested and found to comply with Annex CC using the gas specified for group IIA need not be tested.

Irrespective of the requirement given in Clause 5 of IEC 60079-15, surface temperature limits are specified in 22.110.

The test is performed in a draught-free location with the appliance switched off or operated under conditions of ***normal operation*** *at* ***rated voltage****, whichever gives the more unfavourable result.*

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

The test is carried out twice and is repeated a third time if one of the first tests gives more than 40 % of the lower flammability limit.

Through an appropriate orifice, 80 % of the nominal refrigerant charge ±1,5 g, in the vapour state is injected into a food storage compartment in a time not exceeding 10 min. The orifice is then closed. The injection shall be as close as possible to the centre of the back wall of the compartment at a distance from the top of the compartment approximately equal to one-third of the height of the compartment. Thirty minutes after the injection is completed, the door or lid is opened at a uniform rate in a time between 2 s and 4 s, to an angle of 90° or to the maximum possible, whichever is less.

For appliances having more than one door or lid, the most unfavourable sequence or combination for opening the lids or doors is used.

For appliances fitted with fan motors, the test is done with the most unfavourable combination of motor operation.

The concentration of leaked refrigerant is measured at least every 30 s from the beginning of the test, at positions as close as possible to electrical components. However, it is not measured at the positions of

– ***non-self-resetting protective devices*** *necessary for compliance with Clause 19, nor to;*
– ***intentionally weak parts*** *that become permanently open-circuited during the tests of Clause 19,*

even if they produce arcs or sparks during operation.

The concentration values are recorded for a period of 15 min after a sustained decrease is observed.

The measured value shall not exceed 75 % of the lower flammability limit of the refrigerant as specified in Table 102, and shall not exceed 50 % of the lower flammability limit of the refrigerant as specified in Table 102 for a period exceeding 5 min.

The above test is repeated, except that the door or lid is subjected to an open/close sequence at a uniform rate in a time of between 2 s and 4 s, the door or lid being opened to an angle of 90° or to the maximum possible, whichever is less, and closed during the sequence.

22.109 Compression-type appliances which use **flammable refrigerants** shall be constructed so that leaked refrigerant will not stagnate and thus cause a fire or explosion hazard in areas outside the food storage compartments where components producing arcs or sparks or luminaires are mounted.

The requirement does not apply to areas where

– **non-self-resetting protective devices** necessary for compliance with Clause 19, or
– **intentionally weak parts** that become permanently open-circuited during the tests of Clause 19

are mounted, even if they produce arcs or sparks during operation.

Separate components such as **thermostats** which contain less than 0,5 g of flammable gas are not considered liable to cause a fire or explosion hazard in the event of a leakage of the component itself.

*Compliance is checked by the following test unless components that produce arcs and sparks during **normal operation** or abnormal operation and which are mounted in the areas under consideration, have been tested and found at least to comply with the requirements of IEC 60079-15 or the requirements for level of protection "dc" of IEC 60079-1, as modified by Annex CC, for group IIA gases or the refrigerant used.*

For luminaires, compliance is checked by inspection and by the appropriate tests in 5.3 of IEC 60079-7:2015. For other luminaires the vibration test for "rough service luminaires" according 4.20 of IEC 60598-1:2014/AMD1:2017 *shall be carried out.*

Irrespective of the requirement given in Clause 5 of IEC 60079-15, surface temperature limits are specified in 22.110.

Other types of protection for electrical apparatus used in potentially explosive atmospheres covered by IEC 60079 (all parts) are also acceptable.

*The test is performed in a draught-free location with the appliance switched off or operated under **normal operation** at **rated voltage**, whichever gives the more unfavourable result.*

During a test in which the appliance is operated, gas injection is started at the same time as the appliance is first switched on.

A quantity equal to 50 % of the refrigerant charge ±1,5 g is injected into the considered area using a capillary tube having a diameter of 0,7 mm ± 0,05 mm.

Injection is to be at constant rate over a period of 1 h and is to be at the point of closest approach of

– *pipework joints in external parts of the cooling circuit, or*

– *the gasket of semi-hermetic motor-compressors*

to the electrical component under consideration; any direct injection shall be avoided.

Welding telescopic joints of the motor-compressor housing, the welding of the pipes through the motor-compressor housing and the welding of the hermetic glass to metal seals (fusite) are not considered to be pipework joints.

If the electrical component under consideration is situated within a separate enclosure and if the refrigerant can stagnate within that enclosure, then the direction of refrigerant injection shall be from the pipework joint under consideration towards any opening (such as ventilation slots or cable entry ducts) in the separate enclosure.

The concentration of leaked refrigerant as close as possible to the electrical component is measured at least every 30 s from the beginning of the test until 15 min after a sustained decrease is observed.

The measured value shall not exceed 75 % of the lower flammability limit of the refrigerant as specified in Table 102, and shall not exceed 50 % of the lower flammability limit of the refrigerant as specified in Table 102 for a period exceeding 5 min.

22.110 Temperatures on surfaces that may be exposed to leakage of **flammable refrigerants** shall not exceed the auto-ignition temperature of the refrigerant, as specified in Table 102, reduced by 100 K.

Compliance is checked by measuring the appropriate surface temperatures during the tests specified in Clauses 11 and 19.

Temperatures of

– ***non-self-resetting protective devices*** *that operate during the tests specified in Clause 19, or of*

– ***intentionally weak parts*** *that become permanently open-circuited during the tests specified in Clause 19*

are not measured during those tests specified in Clause 19 that cause these devices to operate.

Table 102 – Refrigerant flammability parameters

Refrigerant number	Refrigerant name	Refrigerant formula	Refrigerant auto-ignition temperature [a] °C	Refrigerant lower flammability limit [b] % V/V
R-50	Methane	CH_4	645	5,0
R-290	Propane	$CH_3CH_2CH_3$	470	2,1
R-600	Butane	$CH_3CH_2CH_2CH_3$	365	1,6
R-600a	Isobutane	$CH(CH_3)_2CH_3$	460	1,8

[a] Auto-ignition values for other **flammable refrigerants** can be obtained from ISO 5149-1.

[b] LFL values for other **flammable refrigerants** can be obtained from ISO 817.

22.111 In **compression-type appliances** which use **flammable refrigerant** in their cooling system, all possible inadvertent contact points between uncoated aluminium pipes and copper pipes or similar dissimilar metals shall be prevented from galvanic coupling by positive means such as the use of insulated sleeving or spacers. This requirement is not applicable to the

aluminium fins of heat exchangers and other aluminium parts that are in contact with outer surface of copper pipes.

Compliance is checked by inspection.

22.112 The doors and lids of compartments in appliances with a **free space** shall be capable of being opened from the inside.

Compliance is checked by the following test.

The empty appliance is disconnected from the supply, placed on a horizontal support and levelled in accordance with the instructions for installation, with castors and rollers, if any, oriented, adjusted or blocked so as to prevent the appliance from moving. Locks, if any, on doors or lids are left unlocked.

Doors and lids are closed for a period of 15 min.

A force is then applied to a point, equivalent to an accessible inside point, of each appropriate door or lid of the appliance, at the midpoint of the edge farthest from the hinge axis in the direction perpendicular to the plane of the lid or door.

The force shall be applied at a rate not exceeding 15 N/s and the lid or door shall open before the force exceeds 70 N.

NOTE 1 The force can be applied by means of a spring balance with the aid of a suction pad if necessary, to the point on the outer surface of the door or lid which corresponds to the accessible inside point.

NOTE 2 If the handle of the door or lid is at the mid-point of the edge farthest from the hinge axis, the force can be applied by means of a spring balance, to the handle. In this case, the value of the force required to open the door or lid from the inside can be determined by the proportional calculation relating to the distances of the handle and the accessible inside point from the hinge axis.

22.113 Drawers which are only accessible after opening a door or lid shall not contain a **free space**.

Compliance is checked by inspection and measurement.

22.114 Drawers which are accessible without opening a door or lid and which contain a **free space** shall

– have an opening in their rear wall that has a height of at least 250 mm and a width of at least two-thirds of the inner width of the drawer;
– be capable of being opened from the inside.

Compliance is checked by inspection, measurement and by the following test which is carried out with a weight of 23 kg placed inside the drawer.

The empty appliance is disconnected from the supply, placed on a horizontal support and levelled in accordance with the instructions for installation, with castors and rollers, if any, oriented, adjusted or blocked so as to prevent the appliance from moving. Locks, if any, on drawers are left unlocked.

Drawers shall be maintained closed for a period of 15 min.

A force is then applied to the drawer of the appliance at the geometrical centre of the front plane of the drawer equivalent to an accessible inside point, in the direction perpendicular to the front plane of the drawer.

The force shall be applied at a rate not exceeding 15 N/s and the drawer shall open before the force exceeds 70 N.

22.115 In appliances intended for household use and which contain compartments with a **free space**, any door or drawer giving access to these compartments shall not be fitted with a self-latching lock.

Key-operated locks shall require two independent movements to actuate the lock or be of a type that automatically ejects the key when unlocked.

NOTE Push and turn is considered to be an example of two independent movements.

Compliance is checked by inspection and test.

22.116 Accessible glass panels with an area having any two orthogonal dimensions exceeding 75 mm shall be made from

- glass that breaks into small pieces when it fractures; or
- glass that is not released or dropped from its normal position when broken;
- glass that has enhanced mechanical strength.

Compliance is checked by tests a), b) or c) as applicable.

a) For glass that breaks into small pieces when it fractures, compliance is checked by the following test, which is performed on two samples.

Frames or other parts attached to the glass panel to be tested are removed and the glass is placed on a rigid horizontal flat surface.

NOTE 1 The edges of the sample to be tested are contained within a frame of adhesive tape in such a manner that the broken pieces remain in place after breakage but without hindering expansion of the sample.

The sample under test is broken by means of a test punch having a head with a mass of 75 g ± 5 g and a conical tungsten carbide tip with an angle of 60° ± 2°. The punch shall be positioned approximately 13 mm in from the longest edge of the glass at the midpoint of that edge. The punch is then hit by a hammer so that the glass breaks.

A transparent mask of 50 mm × 50 mm is placed on the fractured glass except within a peripheral margin of 25 mm from the edge of the sample.

The assessment shall be undertaken on at least two areas of the sample, and the areas chosen shall contain the largest particles.

The number of crack free particles within the mask are counted and for each assessment shall not be less than 40. The particle count shall be made within 5 minutes of the fracture. Each particle wholly contained within the area of the mask shall be counted as one particle and each particle that is partially within the mask shall be counted as a half particle.

NOTE 2 In the case of curved glass, plane pieces of the same material can be used for the test.

b) For glass that is not released or dropped from its normal position when broken, compliance is checked by breaking the glass when mounted in its normal position in the appliance by means of a test punch having a head with a mass of 75 g ± 5 g and a conical tungsten carbide tip with an angle of 60° ± 2°. The punch shall be positioned approximately 13 mm in from the longest edge of the glass at the midpoint of that edge. The punch is then hit by a hammer so that the glass breaks.

At the conclusion of this test, the glass shall not be broken or cracked in such a manner that pieces are released or dropped from their normal position. Glass that is released within the immediate vicinity of the punch tip as a result of the punch impacting the sample under test is ignored.

c) For glass with enhanced mechanical strength, compliance is checked by the pendulum hammer test Eha of IEC 60068-2-75.

For the test, the glass panels are supported according to their method of incorporation in the appliance.

The test is performed with three blows applied at the most critical point on two samples; the impact energy of each blow shall be 5 J.

At the conclusion of the tests, the glass shall not be broken or cracked.

22.117 In **refrigerating appliances**, thermal insulation shall be encased in and be in contact with

– metallic material having a thickness not less than 0,20 mm and having a melting point temperature of not less than 1 000 °C; or
– a polymeric material classified as 5VA according to IEC 60695-11-20 provided that the test sample used for the classification was no thicker than the relevant part of the appliance; or
– a single layer non-polymeric material that has been tested in accordance with Annex EE; or
– a material with multiple layers, at least one of which is non-polymeric, that has been tested in accordance with Annex EE.

A hole or the combined area of holes within 150 mm of each other shall not exceed 25 cm^2. The total combined area of the holes shall not exceed 125 cm^2. Holes up to 3 mm^2 and material that join overlapping metal parts are ignored. The area of holes that have metallic objects such as pipes protruding from them are calculated omitting the area taken up from the metallic material.

These requirements are also applicable to material encasing thermal insulation between the compressor compartment and food storage compartments.

These requirements are not applicable to:

– parts in food storage compartments such as compartment liner, partition of the cabinet;
– parts providing access to the food storage compartment such as doors, drawers and lids;
– parts within 150 mm from the top surface of the appliance, the top surface being a horizontal plane from the highest point of the appliance, unless the inlet opening for the **supply cord** is within 150 mm of the exempt area;
– parts within 50 mm of food storage compartment seals;
– **portable appliances** with no motor-compressor.

Compliance is checked by inspection, measurement and the appropriate tests.

23 Internal wiring

This clause of Part 1 is applicable except as follows.

23.3 *Modification:*

Instead of the test being carried out while the appliance is in operation, it is carried out with the appliance disconnected from the supply.

The number of flexings for conductors flexed during normal use is increased to 100 000.

*The number of flexings for conductors flexed during normal use of an **incorporated ice maker** is increased to 50 000.*

Addition:

NOTE 101 The requirement concerning open-coil springs does not apply to external conductors.

24 Components

This clause of Part 1 is applicable except as follows.

24.1 *Addition:*

Motor-compressors are not required to be separately tested in accordance with IEC 60335-2-34 nor are they required to meet the requirements of IEC 60335-2-34 if they meet the requirements of this standard.

24.1.3 *Addition:*

The number of operations for other switches shall be as follows:

– *quick freeze switches*	*300*
– *manual and semi-automatic defrost switches*	*300*
– *door switches*	*50 000*
– *on/off switches*	*300*

24.1.4 *Addition:*

– ***self-resetting thermal cut-outs*** *which may influence the test results of 19.101 and which are not short-circuited during the test of 19.101*	*100 000*
– ***thermostats*** *which control the motor-compressor*	*100 000*
– *motor-compressor starting relays*	*100 000*
– *automatic thermal motor-protectors for motor-compressors of the hermetic and semi-hermetic type*	*minimum 2 000, but not less than the number of operations during the 15-day locked rotor test, whichever is the greater*
– *manual reset thermal motor-protectors for motor-compressors of the hermetic and semi-hermetic type*	*50*
– *other automatic thermal motor-protectors except for fan motors*	*2 000*
– *other manual reset thermal motor protectors*	*30*
– *for* ***pressure relief devices*** *of the* ***bursting disc*** *type, three separate samples of the appropriate parts of the refrigeration system are tested and the* ***bursting disc*** *shall operate in the same way for each sample tested*	*1*
– *electrical* ***pressure relief devices***	*30 000*
• *for automatic operation:*	*300*
• *for manual reset*	

Electrical pressure relief devices *shall comply with IEC 60730-2-6 and*

– *shall be of type 2.B and type 2.N;*

– *shall have a trip free mechanism of type 2.E;*

– *the deviation and drift shall not exceed + 0 %.*

*For **mechanical pressure relief devices** not falling under the scope of IEC 60730, the operating pressure shall be no more than the setting of the device plus 10 %.*

***Pressure relief devices** of the **bursting disc** type that are not certified to ISO 4126-2 shall be tested as part of the appliance to 14.3.4 of ISO 4126-2:2018. They shall be marked with*

– *name, trademark or identification mark of the manufacturer or responsible vendor;*
– *model name or type reference.*

24.3 *Addition:*

Voltage selection switches used in appliances for camping or similar use shall have a contact separation in all poles that provide full disconnection from the supply under overvoltage category III conditions.

24.5 *Replacement:*

Capacitors in auxiliary windings of motors shall be marked with their voltage rating and their rated capacitance and shall be used in accordance with these markings.

Compliance is checked by inspection and by the appropriate tests.

For motor running capacitors, the voltage across the capacitor shall not exceed

– *95 % of its voltage rating for capacitors of class of operation: class A;*
– *80 % of its voltage rating for capacitors of class of operation: class B;*

*when the appliance is supplied at 1,1 times **rated voltage** under **normal operation**.*

*For starting capacitors, the voltage across the capacitors shall not exceed 1,3 times the voltage rating of the capacitor when the appliance is operating at 1,1 times **rated voltage**.*

24.7 *Addition:*

For coupling nuts used with hose-sets marked 25 °C max., the 96 h ageing test is carried out at a temperature of

- *32 °C ± 1 °C on hose-sets supplied with appliances of extended temperate (SN) and temperate (N) classes;*
- *38 °C ± 1 °C on hose-sets supplied with appliances of subtropical (ST) class;*
- *43 °C ± 1 °C on hose-sets supplied with appliances of tropical (T) class.*

24.8 *Replacement:*

Motor running capacitors shall comply with IEC 60252-1 under the following conditions.

– class of safety protection: S2;
– class of operation: class A or class B;
– damp heat test severity;
  - test duration 21 days;
  - temperature 40 °C ± 2 °C at a relative humidity of 93 % ± 3 %.

Compliance is checked by inspection and the appropriate tests, including the tests in 5.16.3 and 5.16.5 of IEC 60252-1:2010/AMD1:2013 for class of safety protection S2 capacitors. After the destruction tests of 5.16 in IEC 60252-1:2010/AMD1:2013, evaluation of failure is checked according to the 5.16.7 in IEC 60252-1:2010/AMD1:2013.

24.101 Lampholders shall be of the insulated type.

Compliance is checked by inspection.

24.102 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.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

Addition:

This clause of Part 1 is not applicable to those parts related to motor-compressors with facilities for connecting a **supply cord**, complying with the appropriate requirements of IEC 60335-2-34.

25.2 *Modification:*

Replace the requirement by the following.

Mains-operated appliances shall not be provided with more than one means of connection to the supply unless

– the appliance consists of two or more completely independent units built together in one enclosure,
– the relevant circuits are adequately insulated from each other.

Appliances which can be both mains and battery operated shall be provided with a separate means for the connection of the mains and of the battery.

25.7 *Modification:*

Light polyvinyl chloride sheathed cord (code designation 60227 IEC 52) and heat-resistant light polyvinyl chloride sheathed cord (code designation 60227 IEC 56) are allowed regardless of the mass of the appliance.

Addition:

This subclause does not apply to flexible leads or cords used to connect an appliance to a SELV power supply.

25.13 *Addition:*

This subclause does not apply to flexible leads or cords used to connect an appliance to a SELV power supply.

25.23 *Addition:*

For appliances which can be battery operated, if the battery is placed in a separate box, the flexible lead or flexible cord used to connect the box to the appliance is considered to be an **interconnection cord**.

25.101 Appliances which can be battery operated shall have suitable means for connection of the battery.

Appliances shall be provided with terminals or flexible leads, or a flexible cord which, for connection to the battery terminals, may be fitted with clamps or other devices suitable for use with the type of battery marked on the appliance.

Compliance is checked by inspection.

26 Terminals for external conductors

This clause of Part 1 is applicable except as follows.

Addition:

This clause of Part 1 is not applicable to those parts of motor-compressors with facilities for connecting a **supply cord** and complying with the appropriate requirements of IEC 60335-2-34.

26.11 *Addition:*

Terminal devices in an appliance for the connection of the flexible leads or cord with **type X attachment** connecting an external battery or battery box shall be so located or shielded that there is no risk of accidental connection between battery supply terminals.

27 Provision for earthing

This clause of Part 1 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor complies with IEC 60335-2-34.

28 Screws and connections

This clause of Part 1 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor complies with IEC 60335-2-34.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

Addition:

Compliance is not checked on parts related to motor-compressors if the motor-compressor conforms to IEC 60335-2-34. For motor-compressors not conforming to IEC 60335-2-34, the additions and modifications specified in IEC 60335-2-34 are applicable.

29.2 *Addition:*

Unless insulation is enclosed or located so that it is unlikely to be exposed to pollution by condensation due to normal use of the appliance, insulation in **refrigeration appliances** and **ice-makers** is in pollution degree 3 and shall have a CTI value of not less than 250. This requirement is not applicable for **functional insulation** if the **working voltage** does not exceed 50 V.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.1 *Addition:*

Accessible parts of non-metallic material within the food storage compartment are regarded as external parts.

The ball pressure test is not applied to parts related to the motor-compressor if the motor-compressor complies with IEC 60335-2-34.

The temperature rises attained during the test of 19.101 are not taken into account.

Modification:

*For **accessible parts** of non-metallic material within the storage compartment, the temperature of 75 °C ± 2 °C is replaced by 65 °C ± 2 °C.*

30.2 *Addition:*

These tests are not applied to parts related to the motor-compressor if the motor-compressor complies with IEC 60335-2-34 with no ignition.

30.2.2 Not applicable.

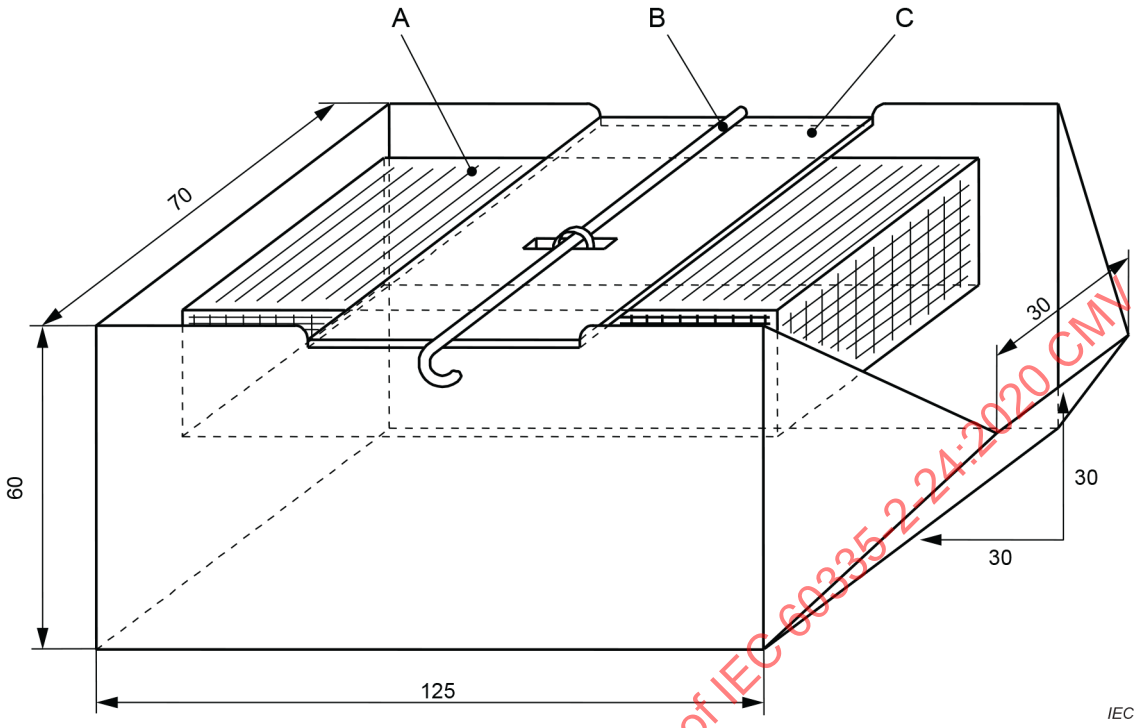
31 Resistance to rusting

This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is not applicable.

Dimensions in millimetres



This displacement block has a volume of 140 ml ± 5 ml and a mass of 200 g ± 10 g.

Its dimensions are approximately 112 mm × 50 mm × 25 mm.

The dimensions of the vessel are inside dimensions and the tolerance is ± 2 mm.

Key

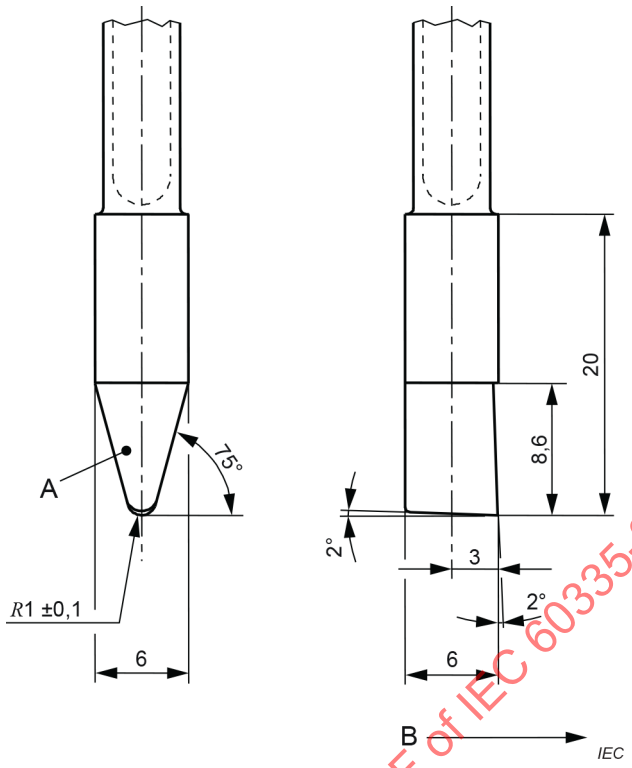
A displacement block

B release pin

C removable bridge support

Figure 101 – Apparatus for spillage test

Dimensions in millimetres



Key

A hard-soldered carbide tip K10

B direction of movement

Figure 102 – Scratching tool tip details

Annexes

The annexes of Part 1 are applicable except as follows.

Annex C
(normative)

Ageing test on motors

Addition:

This annex does not apply to motor-compressors.

Annex D
(normative)

Thermal motor protectors

Addition:

This annex does not apply to motor-compressors or **condenser** fan motors.

Annex P
(informative)

Guidance for the application of this standard to appliances used in tropical climates

This annex of Part 1 is applicable except as follows.

5 General conditions for the tests

5.7 *Modification:*

The ambient temperature of the tests of Clause 10, 11 and 13 is 43 °C ± 1°C as specified for appliances of tropical (T) class in Subclause 5.7.

11 Heating

11.8 *Modification:*

The values of Table 3 are reduced by 18 K.

Annex AA
(normative)

Locked-rotor test of fan motors

The winding of a fan motor shall not reach excessive temperatures if the motor locks or fails to start.

Compliance is checked by the following test.

The fan and its motor are mounted on wood or similar material. The motor´s rotor is locked. Fan blades and motor brackets are not removed.

*The motors are supplied at their supply voltage when the appliance is supplied at **rated voltage** or at the upper limit of the **rated voltage range**. The supply circuit is given in Figure AA.1.*

*The assembly is to operate under these conditions for 15 days (360 h) unless the **protective device**, if any, permanently opens the circuit prior to the expiration of that time. In this case, the test is discontinued.*

If the temperature of the motor windings stays lower than 90 °C, the test is discontinued when steady conditions are established.

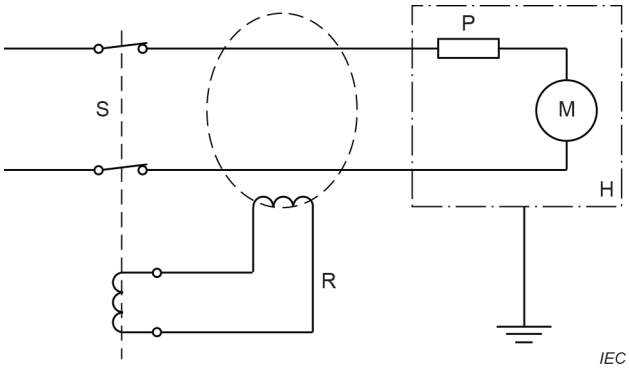
Temperatures are measured under conditions specified in 11.3.

During the test, the winding temperatures shall not exceed the values given in Table 8.

After a period of 72 h from the beginning of the test, the motor shall withstand the electric strength test of 16.3.

For other than DC motors, a residual current device with a rated residual current of 30 mA is connected so as to disconnect the supply in the event of an excessive earth leakage current.

*At the end of the test, the leakage current is measured between the windings and the body at a voltage equal to twice the **rated voltage**. Its value shall not exceed 2 mA.*



Key

S supply source

H housing

R residual current device ($I_{\Delta n}$ = 30 mA)

P thermal motor-protector (external or internal), if fitted

M motor

The circuit is modified for three-phase fan motors. For DC Motors, the RCD is not necessary.

Care has to be taken to complete the earthing system to permit the correct operation of the residual current device (RCCB/RCBO).

Figure AA.1 – Supply circuit for locked-rotor test of a single-phase fan motor

Annex BB
(informative)

Method for accumulation of frost

The accumulation of frost may be produced by the use of a device having a controllable heat source directed on a measured amount of water for the purpose of evaporating this water over a predetermined period with a minimum of extraneous heat loss to the cabinet of the ***refrigerating appliance****.*

A convenient form of the apparatus would comprise a block enclosure of thermally insulating material having a vertical hole at its centre containing a lamp mounted on a bottom plug directly below an evaporating dish with a high thermal conductivity base and low thermal conductivity walls (see Figure BB.1 and Figure BB.2).

The device described above should be mounted at the geometric centre of the cabinet of the ***refrigerating appliance*** *and the electrical connection brought conveniently to the outside so that the voltage applied may be varied and the power input measured with the door of the* ***refrigerating appliance*** *in the closed position.*

Water is then introduced into the evaporating dish at the required rate through a length of small bore tube passing into the cabinet. A continuous flow is not necessary but the water should be injected at appropriate intervals.

Provision should be made (for example in the control of the supply of electrical energy to the device) to ensure that the evaporation of water under normal conditions of use is capable of being maintained at a rate equal to 2 g of water per litre of gross cabinet volume per week.

The electrical energy to the device should not be excessive, but shall be sufficient to ensure the complete evaporation of the water.

The amount of frost to be accumulated prior to the start of the defrosting test should be based on this rate and on the time interval between two successive defrosts in accordance with the instructions.

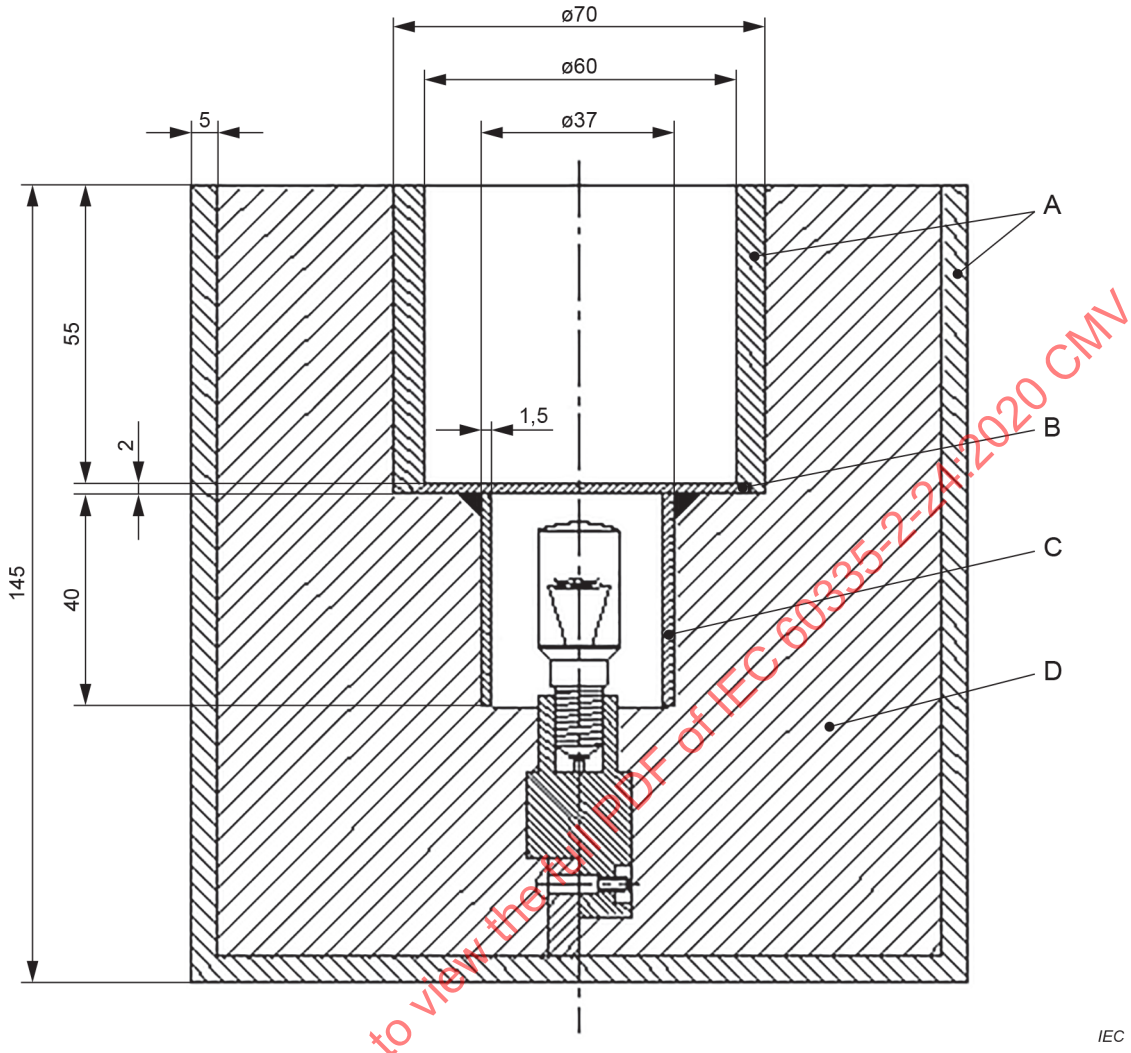
NOTE For example, if the instructions recommend defrosting twice weekly, then a **refrigerating appliance** with a cabinet gross volume of 140 l will require:

$$2\ g \times 140 / 2 = 140\ g \text{ of water}$$

The above rate may be exceeded in certain circumstances.

The apparatus described has a maximum evaporation rate of approximately 2 g/h when operating with an input of 4 W and with the water to be evaporated entering at cabinet temperature.

Dimensions in millimetres



Key

A insulating material

B copper plate

C copper tube

D thermal insulating foam

Figure BB.1 – Diagram of apparatus for water evaporation and for accumulation of frost

Figure BB.2 – Apparatus for water evaporation and for accumulation of frost

Annex CC
(normative)

Non-sparking “n” electrical apparatus and test conditions for “dc” devices

Where reference is made to IEC 60079-15, the following clauses are applicable as modified below.

7 Requirements for non-incendive components

Clause 7 is applicable.

8 Requirements for hermetically sealed devices

Clause 8 is applicable.

9 Requirements for sealed devices

All of the subclauses of Clause 9 are applicable, except 9.1, which is replaced by the following.

9.1 Non-metallic materials

Seals are tested using 11.2.

10 Requirements for restricted-breathing enclosures

Clause 10 is applicable.

Where reference is made to IEC 60079-1, the following clause is applicable as modified below.

15.5.3.1 General

Group IIA: (55 ± 0,5) % hydrogen/air at atmospheric pressure; or

Group IIA: (6,5 ± 0,5) % ethylene/air at atmospheric pressure.

Annex DD
(informative)

Sound manufacturing practice for compression-type appliances which use flammable refrigerant

For **compression-type appliances** which use **flammable refrigerant** in their cooling system, the following recommendations are made concerning the manufacturing process.

All cooling circuits which are embedded in thermal insulation should be subject to a leak test prior to being embedded.

Prior to foaming there should be an inspection to ensure that there is no damage to the parts that are protected against corrosion or to the means provided for the prevention of galvanic coupling between copper and unprotected aluminium pipes.

Annex EE
(normative)

Test for material encasing and in contact with thermal insulation

When testing a material to this annex as required by 22.117, the test is carried out in accordance with the following.

The test shall be carried out using a laboratory burner in accordance with IEC 60695-11-3, Method A.

Two sets of three test specimens shall be taken from the refrigerator finished assembly including the outer encasing material, thermal insulation, and inner encasing material. The test specimen shall measure 150 mm ± 5 mm long by 150 mm ± 5 mm wide.

One set of three test specimens shall be conditioned for a minimum of 48 h in a conditioning chamber maintained at 23 °C ± 2 °C and 50 % ± 10 % relative humidity. Once removed from the conditioning chamber, the test specimens shall be subjected to the flame application test within 30 min.

One set of three test specimens shall be conditioned in an air-circulating oven for 168 h ± 2 h at 70 °C ± 2 °C with the oven providing not less than five air changes per hour. The specimens are then cooled in a desiccator chamber, maintained at 23 °C ± 2 °C at a relative humidity not exceeding 20 %, for at least 4 h. Once removed from the desiccator chamber, the test specimens shall be subjected to the flame application test within 30 min.

For the test, the specimen shall be held by a support stand. The support stand shall have clamps or the equivalent and shall be adjustable for the positioning of the test specimen. The test specimen is supported approximately in the horizontal plane as shown in Figure EE.1. The test specimen shall be oriented with the outer encasing material of the thermal insulation at the bottom of the sample.

The test specimen shall be 300 mm ± 10 mm above a horizontal cotton pad. The cotton pad shall be made of absorbent cotton designated "100 % cotton" or "pure cotton". The cotton pad shall be approximately 150 mm × 150 mm and have a maximum thickness of 6 mm and a maximum mass of 0,72 g. The cotton pad shall be located below the approximate centre of the test specimen.

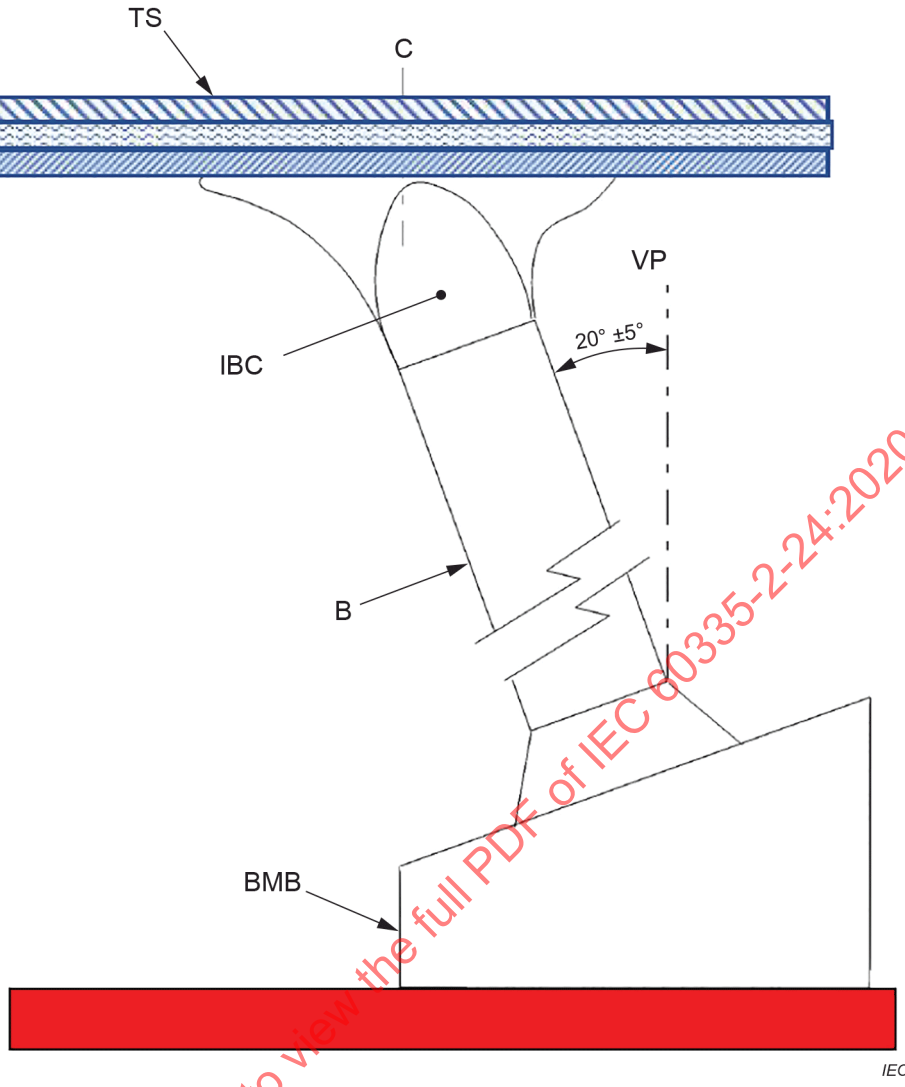
The test is carried out by applying the flame from the laboratory burner to the approximate centre of the bottom surface of the test specimen at an angle of 20° ± 5° from the vertical, so that the tip of the inner blue cone (see Figure EE.1) just touches the surface of the specimen.

The flame is applied for 5 s ± 0,5 s and then removed for 5 s ± 0,5 s. The application cycle is repeated until the test specimen has been subjected to five applications of the test flame. Following each flame application, the laboratory burner is immediately withdrawn to a distance not less than 150 mm so that is has no effect on the test specimen.

During and after the test, there shall be no burn-through and no flaming particles or drops which ignite the cotton pad indicator.

Burn-through shall be considered the production of a hole or crack in the encasing material of the test specimen that exposes thermal insulation such that:

- *visible flame is observed during the test on the thermal insulation or on the surface of the test specimen opposite to the surface to which the test flame is applied; or*
- *any opening or crack is present in the outer encasing material after the test which exposes thermal insulation, when the test specimen has cooled for at least 30 s.*



Key

TS	test specimen		cotton pad
C	centre		inner casing material
VP	vertical plane		thermal insulation
IBC	inner blue cone		outer casing material
B	burner		
BMB	burner mounting block		

Figure EE.1 – Arrangement of the test specimen and burner

Bibliography

The bibliography of Part 1 is applicable, except as follows.

Addition

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60335-2-75, *Household and similar electrical appliances – Safety – Part 2-75: Particular requirements for commercial dispensing appliances and vending machines*

IEC 60335-2-89, *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*

IEC 60335-2-118, *Household and similar electrical appliances – Safety – Part 2-118: Particular requirements for professional ice-cream makers*

IEC 62552 (all parts), *Household refrigerating appliances – Characteristics and test methods*

IEC 62552-1:2015, *Household refrigerating appliances – Characteristics and test methods – Part 1: General requirements*

ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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APPAREILS ÉLECTRODOMESTIQUES ET ANALOGUES – SÉCURITÉ –

Partie 2-24: Exigences particulières pour les appareils de réfrigération, les sorbetières et les fabriques de glace

AVANT-PROPOS

1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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La présente partie de l'IEC 60335 a été établie par le sous-comité 61C: Sécurité des appareils de réfrigération à usage domestique et commercial, du comité d'études 61 de l'IEC: Sécurité des appareils électrodomestiques et analogues.

Cette huitième édition annule et remplace la septième édition parue en 2010, l'Amendement 1:2012 et l'Amendement 2:2017. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

– alignement du texte avec l'IEC 60335-1, Ed. 5.2;

- conversion en texte normatif ou suppression de certaines notes (4, 5.2, 5.7, 7.1, 7.6, 7.10, 7.12, 19.1, 19.101, 19.102, 20.101, 20.102, 20.103, 20.104, 21, 22.7, 22.33, 22.101, 22.102, 22.103, 22.107, 22.108, 22.109, 30.1);
- mise à jour des références normatives et du texte associé (2, 22.108, 22.109, Tableau 102, Annexe CC);
- clarification de la définition de l'espace libre (3.6.104);
- inclusion du mesurage du courant d'entrée des appareils de réfrigération qui utilisent des motocompresseurs entraînés par onduleur (10.2);
- introduction d'essais de compatibilité pour l'isolation des enroulements des motocompresseurs utilisés avec différents types de fluides frigorigènes et d'huiles (22.9);
- mise à jour des exigences relatives aux points de contact intempestifs entre les tuyauteries en aluminium non revêtu et les tuyauteries en cuivre (22.111);
- clarification des essais des panneaux en verre accessibles (22.116);
- pour les appareils de réfrigération, introduction d'exigences relatives aux matériaux qui enveloppent l'isolation thermique et en contact avec celle-ci, et suppression du texte existant en conséquence (22.117, 30.2, 30.2.101, Annexe E);
- mise à jour des exigences relatives aux condensateurs permanents de moteurs (24.5, 24.8);
- clarification de l'essai à rotor bloqué des moteurs de ventilateurs (Annexe AA).

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
61C/861/FDIS	61C/863/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

La version française de la norme n'a pas été soumise au vote.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 60335, publiées sous le titre général *Appareils électrodomestiques et analogues – Sécurité*, peut être consultée sur le site web de l'IEC.

La présente partie 2 doit être utilisée conjointement avec la dernière édition de l'IEC 60335-1 et ses amendements. Elle a été établie sur la base de la cinquième édition (2010) de cette norme.

NOTE 1 L'expression "la Partie 1" utilisée dans la présente norme fait référence à l'IEC 60335-1.

La présente partie 2 complète ou modifie les articles correspondants de l'IEC 60335-1, de façon à transformer cette publication en norme IEC: Exigences de sécurité pour les appareils de réfrigération, les sorbetières et les fabriques de glace.

Lorsqu'un paragraphe particulier de la Partie 1 n'est pas mentionné dans cette partie 2, ce paragraphe s'applique pour autant que cela soit raisonnable. Lorsque la présente norme mentionne "addition", "modification" ou "remplacement", le texte correspondant de la Partie 1 doit être adapté en conséquence.

NOTE 2 Le système de numérotation suivant est utilisé:

– les paragraphes, tableaux et figures qui s'ajoutent à ceux de la Partie 1 sont numérotés à partir de 101;

– à l'exception de celles qui sont dans un nouveau paragraphe ou de celles qui concernent des notes de la Partie 1, les notes sont numérotées à partir de 101, y compris celles des articles ou paragraphes qui sont remplacés;

– les annexes qui sont ajoutées sont désignées AA, BB, etc.

NOTE 3 Les caractères d'imprimerie suivants sont utilisés:

– exigences: caractères romains;

– *modalités d'essais: caractères italiques*;

– notes: petits caractères romains.

Les termes en **gras** dans le texte sont définis à l'Article 3. Lorsqu'une définition concerne un adjectif, l'adjectif et le nom associé figurent également en gras.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

NOTE 4 L'attention des Comités nationaux est attirée sur le fait que les fabricants d'appareils et les organismes d'essai peuvent avoir besoin d'une période transitoire après la publication d'une nouvelle publication IEC, ou d'une publication amendée ou révisée, pour fabriquer des produits conformes aux nouvelles exigences et pour adapter leurs équipements aux nouveaux essais ou aux essais révisés.

Le comité recommande que le contenu de cette publication soit entériné au niveau national au plus tôt 12 mois et au plus tard 36 mois après la date de publication.

Les différences suivantes existent dans les pays indiqués ci-après.

– 22.101 : Les douilles E12 et E17 sont vérifiées comme spécifié pour les douilles E14 et B15. La douille E26 est vérifiée comme spécifié pour les douilles E27 et B22 (Japon).

– 22.110 : Pour les éléments chauffants compris dans des tubes en verre non fermés, les exigences de température sont différentes (Japon).

– 22.117: Seuls les deux premiers tirets du premier alinéa de l'exigence sont admis (Australie et Nouvelle-Zélande).

IMPORTANT – Le logo "*colour inside*" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.

INTRODUCTION

Il a été admis par hypothèse, en établissant la présente Norme internationale, que l'exécution de ses dispositions était confiée à des personnes expérimentées et ayant une qualification appropriée.

La présente norme reconnaît le niveau de protection internationalement accepté contre les dangers électriques, mécaniques, thermiques, liés au feu et au rayonnement des appareils, lorsqu'ils fonctionnent comme en usage normal en tenant compte des instructions du fabricant. Elle couvre également les situations anormales auxquelles on peut s'attendre dans la pratique et prend en considération les phénomènes électromagnétiques qui peuvent affecter le fonctionnement en toute sécurité des appareils.

La présente norme tient compte autant que possible des exigences de l'IEC 60364, de façon à rester compatible avec les règles d'installation quand l'appareil est raccordé au réseau d'alimentation. Cependant, des règles nationales d'installation peuvent être différentes.

Si un appareil compris dans le domaine d'application de la présente norme comporte également des fonctions qui sont couvertes par une autre partie 2 de l'IEC 60335, la partie 2 correspondante est appliquée à chaque fonction séparément, dans la limite du raisonnable. Si cela est applicable, l'influence d'une fonction sur les autres fonctions est prise en compte.

Lorsqu'une partie 2 ne comporte pas d'exigences complémentaires pour couvrir les dangers traités dans la Partie 1, la Partie 1 s'applique.

NOTE 1 Cela signifie que les comités d'études responsables pour les parties 2 ont déterminé qu'il n'était pas nécessaire de spécifier des exigences particulières pour l'appareil en question en plus des exigences générales.

La présente norme est une norme de famille de produits traitant de la sécurité d'appareils et a préséance sur les normes horizontales et génériques couvrant le même sujet.

NOTE 2 Les normes horizontales et génériques couvrant un danger ne sont pas applicables dans la mesure où ont été prises en considération lorsque les exigences générales et particulières ont été étudiées pour la série de normes IEC 60335. Par exemple, dans le cas des exigences de température de surface pour de nombreux appareils, des normes génériques, comme l'ISO 13732-1 pour les surfaces chaudes, ne sont pas applicables en plus de la Partie 1 ou des parties 2.

Un appareil conforme au texte de la présente norme ne sera pas nécessairement jugé conforme aux principes de sécurité de la norme si, lorsqu'il est examiné et soumis aux essais, il apparaît qu'il présente d'autres caractéristiques qui compromettent le niveau de sécurité visé par ces exigences.

Un appareil utilisant des matériaux ou présentant des modes de construction différents de ceux décrits dans les exigences de la présente norme peut être examiné et soumis aux essais en fonction de l'objectif poursuivi par ces exigences et, s'il est jugé pratiquement équivalent, il peut être estimé conforme aux principes de sécurité de la norme.

APPAREILS ÉLECTRODOMESTIQUES ET ANALOGUES – SÉCURITÉ –

Partie 2-24: Exigences particulières pour les appareils de réfrigération, les sorbetières et les fabriques de glace

1 Domaine d'application

L'article de la Partie 1 est remplacé par l'article ci-après.

La présente partie de l'IEC 60335 traite de la sécurité des appareils suivants, leur **tension assignée** n'étant pas supérieure à 250 V pour les appareils monophasés, à 480 V pour les autres appareils et à 24 V en courant continu pour les appareils alimentés par batteries:

– **appareils de réfrigération** pour usages domestiques et analogues;
– **fabriques de glace** comportant un motocompresseur et **fabriques de glace** conçues pour être incorporées dans des compartiments de stockage des denrées congelées;
– **appareils de réfrigération** et **fabriques de glace** à usage de loisir pour le camping, le caravaning ou le bateau.

Ces appareils peuvent être alimentés par le secteur, par une batterie séparée, ou être alimentés à la fois par secteur ou batterie.

La présente norme traite également de la sécurité des **sorbetières** à usage domestique, leur **tension assignée** n'étant pas supérieure à 250 V pour les appareils monophasés et à 480 V pour les autres appareils.

Elle traite également des **appareils à compression** pour usage domestique et analogue, qui utilisent des **fluides frigorigènes inflammables**.

La présente norme ne traite pas des caractéristiques de construction et de fonctionnement d'**appareils de réfrigération** qui font l'objet d'autres normes IEC.

Les **appareils de réfrigération** qui ne sont pas destinés à des usages domestiques normaux, mais qui peuvent néanmoins constituer une source de danger pour le public, tels que:

- les **appareils de réfrigération** utilisés dans les coins cuisines réservés au personnel des magasins, bureaux et autres environnements professionnels;
- les **appareils de réfrigération** utilisés dans les fermes et par les clients des hôtels, motels et autres environnements à caractère résidentiel;
- les **appareils de réfrigération** utilisés dans les environnements de type chambres d'hôtes; et
- les **appareils de réfrigération** utilisés en restauration et autres applications similaires hormis la vente au détail

sont compris dans le domaine d'application de la présente norme.

Dans la mesure du possible, la présente norme traite des dangers ordinaires présentés par les appareils, encourus par tous les individus à l'intérieur et autour de l'habitation. Cependant, elle ne tient en général pas compte:

– des personnes (y compris des enfants) dont:
  - les capacités physiques, sensorielles ou mentales; ou
  - le manque d'expérience et de connaissance

  les empêchent d'utiliser l'appareil en toute sécurité sans surveillance ou instruction;
– de l'utilisation de l'appareil comme jouet par des enfants.

NOTE 1 L'attention est attirée sur le fait que:

– pour les appareils destinés à être utilisés dans des véhicules ou à bord de navires ou d'avions, des exigences supplémentaires peuvent être nécessaires;
– dans de nombreux pays, des exigences supplémentaires sont spécifiées par les organismes nationaux de la santé, par les organismes nationaux responsables de la protection des travailleurs, par les organismes nationaux responsables de l'alimentation en eau et par des organismes similaires.

La présente norme ne s'applique pas:

– aux appareils destinés à être utilisés en plein air;
– aux appareils conçus exclusivement pour des usages industriels;
– aux appareils destinés à être utilisés dans des locaux présentant des conditions particulières, telles que la présence d'une atmosphère corrosive ou explosive (poussière, vapeur ou gaz);
– aux appareils équipés d'une batterie prévue comme source d'alimentation de la fonction de réfrigération;
– aux appareils assemblés sur le site par l'installateur;
– aux appareils avec motocompresseurs à distance;
– aux motocompresseurs (IEC 60335-2-34);
– aux distributeurs commerciaux avec ou sans moyen de paiement (IEC 60335-2-75);
– aux 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);
– aux fabriques de crème glacée à usage professionnel (IEC 60335-2-118).

2 Références normatives

L'article de la Partie 1 est applicable, avec l'exception suivante.

Addition:

IEC 60068-2-11:1981, *Essais fondamentaux climatiques et de robustesse mécanique – Partie 2-11: Essais – Essai kA: Brouillard salin*

IEC 60079-1:2014, *Atmosphères explosives – Partie 1: Protection du matériel par enveloppes antidéflagrantes "d"*

IEC 60079-7:2015, *Atmosphères explosives – Partie 7: Protection du matériel par sécurité augmentée "e"*
IEC 60079-7:2015/AMD1:2017[1]

IEC 60079-15:2017, *Atmosphères explosives – Partie 15: Protection du matériel par mode de protection "n"*

[1] Il existe une édition consolidée 5.1:2017 comprenant l'édition 5 et son amendement 1.

IEC 60252-1:2010, *Condensateurs des moteurs à courant alternatif – Partie 1: Généralités – Caractéristiques fonctionnelles, essais et valeurs assignées – Règles de sécurité – Lignes directrices pour l'installation et l'utilisation*
IEC 60252-1:2010/AMD1:2013

IEC 60335-2-34:2012, *Appareils électrodomestiques et analogues – Sécurité – Partie 2-34: Exigences particulières pour les motocompresseurs*
IEC 60335-2-34:2012/AMD1:2015
IEC 60335-2-34:2012/AMD2:2016[2]

IEC 60598-1:2014, *Luminaires – Partie 1: Exigences générales et essais*
IEC 60598-1:2014/AMD1:2017[3]

IEC 60695-11-3:2012, *Essais relatifs aux risques du feu – Partie 11-3: Flammes d'essai – Flamme de 500 W – Appareillage et méthodes d'essai de vérification*

IEC 60695-11-20:2015, *Essais relatifs aux risques du feu – Partie 11-20: Flammes d'essai – Méthode d'essai à la flamme de 500 W*

IEC 60730-2-6:2015, *Dispositifs de commande électrique automatiques – Exigences particulières pour les dispositifs de commande électrique automatiques sensibles à la pression y compris les exigences mécaniques*
IEC 60730-2-6:2015/AMD1:2019[4]

IEC 60851-4:2016, *Fils de bobinage – Méthodes d'essai – Partie 4: Propriétés chimiques*

ISO 209:2007, *Aluminium et alliages d'aluminium – Composition chimique*

ISO 817:2014, *Fluides frigorigènes – Désignation et classification de sûreté*
ISO 817:2014/AMD1:2017

ISO 4126-2:2018, *Dispositifs de sécurité pour protection contre les pressions excessives – Partie 2: Dispositifs de sûreté à disque de rupture*

ISO 5149-1:2014, *Systèmes frigorifiques et pompes à chaleur – Exigences de sécurité et d'environnement – Partie 1: Définitions, classification et critères de choix*
ISO 5149-1:2014/AMD1:2015

ISO 7010:2019, *Symboles graphiques – Couleurs de sécurité et signaux de sécurité – Signaux de sécurité enregistrés*

3 Termes et définitions

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

3.1 Définitions relatives aux caractéristiques physiques

3.1.9 *Remplacement:*
conditions de fonctionnement normal
fonctionnement de l'appareil dans les conditions spécifiées du 3.1.9.101 au 3.1.9.104

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2 Il existe une édition consolidée 5.2:2016 comprenant l'édition 5 et ses amendements 1 et 2.

3 Il existe une édition consolidée 8.1:2017 comprenant l'édition 8 et son amendement 1.

4 Il existe une édition consolidée 3.1:2019 comprenant l'édition 3 et son amendement 1.

3.1.9.101
conditions de fonctionnement normal d'un appareil de réfrigération
fonctionnement à une température ambiante conforme au 5.7, à vide, les portes et les couvercles étant fermés. Les dispositifs de commande de température réglables par l'utilisateur qui commandent le motocompresseur d'un **appareil à compression** sont court-circuités ou rendus inopérants

3.1.9.102
conditions de fonctionnement normal d'une fabrique de glace
fonctionnement à une température ambiante conforme au 5.7, l'eau d'alimentation étant à une température de 15 °C ± 2 °C

3.1.9.103
conditions de fonctionnement normal d'une fabrique de glace incorporée
fonctionnement à la température normale du compartiment de stockage des denrées congelées, l'eau d'alimentation étant à une température de 15 °C ± 2 °C

3.1.9.104
conditions de fonctionnement normal d'une sorbetière
fonctionnement de l'appareil en utilisant la quantité maximale du mélange d'ingrédients indiquée dans les instructions, le mélange utilisé étant celui qui donne les résultats les plus défavorables et étant à une température initiale de 23 °C ± 2 °C

3.5 Définitions relatives aux types d'appareils

3.5.101
appareil de réfrigération
appareil calorifugé d'un volume approprié à l'usage domestique, refroidi par un dispositif incorporé et possédant un ou plusieurs compartiments destinés à la conservation des denrées alimentaires y compris le refroidissement des boissons

3.5.102
appareil à compression
appareil dans lequel la production de froid résulte de la vaporisation sous basse pression, dans un échangeur thermique (**évaporateur**), d'un fluide frigorigène, les vapeurs ainsi formées étant ramenées à l'état liquide par compression mécanique à une pression plus élevée, suivie d'un refroidissement dans un autre échangeur thermique (**condenseur**)

3.5.103
fabrique de glace
appareil dans lequel la glace est fabriquée en congelant de l'eau à l'aide d'une source d'énergie électrique et qui comporte un compartiment pour le stockage de la glace

3.5.104
fabrique de glace incorporée
fabrique de glace spécialement conçue pour être incorporée dans un compartiment de stockage des denrées congelées et sans dispositif indépendant pour congeler l'eau

3.5.105
appareil à absorption
appareil dans lequel la production de froid résulte de l'évaporation, dans un échangeur thermique (**évaporateur**), d'un fluide frigorigène à l'état liquide, les vapeurs ainsi formées étant absorbées par un agent absorbant, d'où elles sont ensuite chassées à une pression partielle de vapeur plus élevée, par chauffage, et liquéfiées par refroidissement dans un autre échangeur thermique (**condenseur**)

3.5.106
sorbetière
appareil à compression qui est utilisé pour la fabrication de crème glacée

3.6 Définitions relatives aux parties d'un appareil

3.6.101
système chauffant
élément chauffant avec composants associés tels que programmateurs, interrupteurs, **thermostats** et autres organes de commande

3.6.102
condenseur
échangeur thermique dans lequel, après compression, le fluide frigorigène à l'état gazeux est liquéfié en cédant de la chaleur à un agent de refroidissement extérieur

3.6.103
évaporateur
échangeur thermique dans lequel, après réduction de la pression, le fluide frigorigène est évaporé en prélevant de la chaleur dans le milieu à refroidir

3.6.104
espace libre
espace de volume supérieur à 60 l dans lequel un enfant peut être pris au piège et qui est accessible après l'ouverture d'une porte, d'un couvercle ou d'un tiroir et le retrait d'une **partie interne amovible**, y compris les clayettes, les récipients ou les tiroirs amovibles qui sont eux-mêmes accessibles uniquement après l'ouverture d'une porte ou d'un couvercle

Lors du calcul du volume, un espace présentant une dimension ne dépassant pas 150 mm ou deux dimensions orthogonales, dont aucune ne dépasse 200 mm, est ignoré.

Note 1 à l'article: L'évaluation du volume ignoré peut être vérifiée en appliquant, sans force appréciable, une sphère de 150 mm ± 0,5 mm de diamètre ou un carré de 200 ± 0,5 mm de côté. Le volume peut être ignoré si la sphère ou le carré ne peut être contenu dans celui-ci.

3.6.105
système de réfrigération transcritique
système de réfrigération où la pression du côté haute pression est supérieure à la pression critique lorsque les états vapeur et liquide du fluide frigorigène peuvent coexister dans un équilibre thermodynamique

3.6.106
refroidisseur de gaz
échangeur thermique dans lequel, après compression, le fluide frigorigène est refroidi en cédant de la chaleur à un agent de refroidissement extérieur, sans changement d'état

Note 1 à l'article: Un **refroidisseur de gaz** est normalement utilisé dans les **systèmes de réfrigération transcritiques**.

3.7 Définitions relatives aux composants de sécurité

3.7.101
disque de rupture
disque ou lame qui éclate à une pression prédéterminée pour réduire la pression dans un système de réfrigération

3.7.102
soupape de sécurité
dispositif sensible à la pression destiné à réduire automatiquement la pression lorsque la pression à l'intérieur du système de réfrigération dépasse la pression assignée au dispositif

3.8 Définitions relatives à des sujets divers

3.8.101
pression de calcul
DP
pression assignée au côté haute pression d'un **système de réfrigération transcritique**

Note 1 à l'article: L'abréviation "DP" est dérivée du terme anglais développé correspondant "design pressure".

3.8.102
fluide frigorigène inflammable
fluide frigorigène ayant une classification d'inflammabilité de classe A2L, A2 ou A3, conformément à l'ISO 817

Note 1 à l'article: Pour les mélanges de fluides frigorigènes qui ont plus d'une classification d'inflammabilité, la classification la plus défavorable est retenue pour les besoins de la présente définition.

4 Exigences générales

L'article de la Partie 1 est applicable, avec l'exception suivante.

Addition:

L'utilisation de **fluides frigorigènes inflammables** entraîne des dangers supplémentaires qui ne sont pas les mêmes qu'avec les appareils qui utilisent des fluides frigorigènes non inflammables.

La présente norme couvre les dangers dus à l'inflammation des fuites de **fluide frigorigène inflammable** provoquée par les sources potentielles d'inflammation associées à l'appareil.

Le danger dû à l'inflammation des fuites de **fluide frigorigène inflammable** par une source potentielle d'inflammation externe associée avec l'environnement dans lequel l'appareil est installé est compensé par une probabilité d'inflammation faible.

5 Conditions générales d'essais

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

5.2 *Addition:*

Au minimum un échantillon supplémentaire spécialement préparé est exigé pour les essais du 22.107.

A moins que le motocompresseur ne soit conforme à l'IEC 60335-2-34, au minimum un échantillon supplémentaire spécialement préparé est exigé pour l'essai du 19.1.

Au minimum un échantillon supplémentaire de la combinaison moteur de ventilateur et protecteur thermique peut être exigé pour l'essai du 19.1.

L'essai du 22.7 peut être effectué sur des échantillons séparés.

En raison de la nature potentiellement dangereuse des essais des 22.107, 22.108 et 22.109, il peut être nécessaire de prendre des précautions particulières pour effectuer ces essais.

5.3 *Addition:*

Avant de commencer les essais:

– *les **sorbetières**, vides, sont mises en fonctionnement sous la **tension assignée** pendant 1 h ou pendant la durée maximale réglable d'une minuterie incorporée à l'appareil, suivant la durée la plus courte;*

– *les autres **appareils à compression** doivent être mis en fonctionnement sous la **tension assignée** pendant au moins 24 h, puis mis hors tension et laissés ainsi pendant au moins 12 h.*

L'essai du 11.102 est effectué immédiatement après les essais de l'Article 13.

L'essai du 15.105 est effectué immédiatement après l'essai du 11.102.

Les essais des 15.101.1, 15.101.2, 15.103 et 15.104 sont effectués immédiatement après l'essai du 15.2.

5.4 *Remplacement:*

Les essais sont effectués avec chaque source d'énergie (électrique, gaz ou autre combustible) tour à tour. Les appareils à gaz sont alimentés à la pression assignée appropriée.

De plus, les essais sont effectués avec toutes les combinaisons de sources d'énergie simultanément, à moins que des dispositifs de verrouillage n'empêchent ce fonctionnement simultané.

5.7 *Addition:*

*Pour les **sorbetières**, les essais spécifiés aux Articles 10, 11 et 13 sont effectués à une température ambiante de 23 °C ± 2 °C.*

Pour les autres appareils, les essais spécifiés aux Articles 10, 11, 13 et en 19.103 sont effectués à une température ambiante de:

- *32 °C ± 1 °C pour les appareils des classes de température tempérée élargie (SN) et tempérée (N);*
- *38 °C ± 1 °C pour les appareils de la classe de température subtropicale (ST);*
- *43 °C ± 1 °C pour les appareils de la classe de température tropicale (T).*

Avant de commencer ces essais, l'appareil, portes et couvercles ouverts, est porté à la température ambiante spécifiée à 2 K près.

Les appareils donnés pour plusieurs classes climatiques sont soumis aux essais à la température de la classe la plus élevée.

Les autres essais sont effectués à une température ambiante de 20 °C ± 5 °C.

Les conditions de régime sont vues comme étant établies lorsque trois lectures successives de la température, effectuées à des intervalles de 60 min environ et mesurées au même instant d'un cycle de fonctionnement, ne diffèrent pas de plus de 1 K.

5.8.1 *Addition:*

Les appareils qui peuvent être alimentés par batteries sont soumis aux essais avec la polarité la plus défavorable quand les bornes d'alimentation ou les dispositifs de connexion de la batterie ne présentent pas d'indication de polarité.

5.9 *Addition*:

Les appareils qui incorporent une ***fabrique de glace*** *sont soumis aux essais avec la* ***fabrique de glace*** *fonctionnant de manière à donner les résultats les plus défavorables.*

5.10 *Addition:*

Pour les essais des 22.107, 22.108 et 22.109, l'appareil est vide et est installé de la façon décrite ci-dessous.

Les ***appareils à encastrer*** *sont installés conformément aux instructions d'installation.*

Les autres appareils sont placés dans une enceinte d'essai, les parois enfermant l'appareil aussi près que possible de tous ses côtés et du dessus de l'appareil, à moins que le fabricant n'indique dans les instructions d'installation qu'une distance libre au mur ou au plafond doit être respectée, auquel cas cette distance est respectée pendant l'essai.

NOTE 101 Il n'est pas nécessaire de fournir le matériel de fixation couramment disponible, comme les vis et les boulons, avec les appareils installés à poste fixe.

5.101 *Les appareils conçus pour qu'une* ***fabrique de glace*** *puisse être incorporée sont soumis aux essais avec la* ***fabrique de glace*** prévue.

5.102 *Les* ***appareils à compression*** *qui comportent des* ***systèmes chauffants*** *et les appareils à effet Peltier sont soumis aux essais comme des* ***appareils combinés***.

5.103 *Les* ***appareils à compression*** *qui utilisent des* ***fluides frigorigènes inflammables*** *et qui, conformément aux instructions, peuvent être utilisés avec d'autres appareils électriques placés à l'intérieur du compartiment de stockage des denrées sont soumis aux essais avec ces appareils recommandés incorporés et fonctionnant comme en usage normal.*

NOTE Les fabriques de sorbets et les appareils désodorisants sont des exemples de ces appareils électriques.

6 Classification

L'article de la Partie 1 est applicable, avec l'exception suivante.

6.101 Les appareils, autres que les **sorbetières**, doivent être de l'une ou de plusieurs des classes climatiques suivantes:

– appareils de classe tempérée élargie (SN);
– appareils de classe tempérée (N);
– appareils de classe subtropicale (ST);
– appareils de classe tropicale (T).

La vérification est effectuée par examen.

NOTE Les classes climatiques sont spécifiées dans l'IEC 62552-1:2015.

7 Marquages et instructions

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

7.1 *Addition:*

Les appareils doivent également porter les marquages suivants:

– la puissance des **systèmes chauffants**, en watts, si elle est supérieure à 100 W;
– la puissance de dégivrage, en watts, si elle est supérieure à la puissance correspondant à la **puissance assignée**;
– la **puissance assignée**, en watts, ou le **courant assigné**, en ampères, à l'exception des **appareils à compression**, autres que les **sorbetières**, qui doivent porter le marquage du **courant assigné**, en ampères;
– les lettres SN, N, ST ou T indiquant la classe climatique de l'appareil;
– la puissance assignée maximale des lampes, en watts (ne s'applique pas si les lampes ne peuvent être remplacées que par le fabricant ou son service après-vente, avec une partie de l'appareil);
– la masse totale du fluide frigorigène;
– pour un fluide frigorigène ayant un composant unique, au moins un des marquages suivants:
  - le nom chimique;
  - la formule chimique;
  - le numéro du fluide frigorigène;
– pour un mélange de fluides frigorigènes, au moins un des marquages suivants:
  - le nom chimique et la proportion nominale de chacun des composants;
  - la formule chimique et la proportion nominale de chacun des composants;
  - le numéro du fluide frigorigène et la proportion nominale de chacun des composants;
  - le numéro du mélange;
– le nom chimique ou le numéro du fluide frigorigène du principal composant de l'agent moussant de l'isolation.

Les numéros des fluides frigorigènes sont donnés dans l'ISO 817.

Pour les **appareils à compression**, la puissance de dégivrage, en watts, doit être marquée séparément si le courant correspondant à la puissance de dégivrage est supérieur au **courant assigné** de l'appareil.

Les appareils qui peuvent être alimentés à la fois par secteur et par batteries doivent porter l'indication de la tension de la batterie.

Les appareils qui peuvent être alimentés par batteries doivent porter l'indication du type de batterie, rechargeable ou non rechargeable, à moins que cela ne soit pas nécessaire pour le fonctionnement de l'appareil.

Les dispositifs prévus pour le raccordement d'une alimentation électrique supplémentaire doivent porter les indications de la tension et de la nature du courant.

Les appareils prévus pour accueillir une **fabrique de glace incorporée** doivent porter l'indication de la puissance maximale pour une **fabrique de glace incorporée**, si cette puissance est supérieure à 100 W.

Les **fabriques de glace** qui n'ont pas de commande automatique du niveau d'eau doivent porter l'indication du niveau d'eau maximal admissible.

Les appareils doivent porter le marquage détaillé des sources d'énergie autres qu'électriques, s'il y a lieu.

Pour les **systèmes de réfrigération à compression**, l'appareil doit aussi porter l'indication de la masse de fluide frigorigène pour chaque circuit de fluide frigorigène individuel.

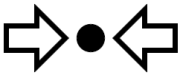
Les **appareils à compression** qui utilisent des **fluides frigorigènes inflammables** doivent porter le symbole ISO 7010 W021 (2019-07).

Les appareils qui utilisent du R-744 dans un **système de réfrigération transcritique** doivent porter le marquage, en substance, de la mise en garde suivante:

> AVERTISSEMENT: Le système contient un fluide frigorigène sous haute pression. Ne pas toucher au système. L'entretien doit être effectué uniquement par des personnes qualifiées.

Les appareils qui utilisent du R-744 dans un **système de réfrigération transcritique** doivent porter le symbole ISO 7000- 1701 (2004-01).

7.6 *Addition:*

	[symbole IEC 60417-5005 (2002-10)]	Plus; Polarité positive
	[symbole IEC 60417-5006 (2002-10)]	Moins; Polarité négative
	[symbole ISO 7010 W021 (2019-07)]	Danger; Risque d'incendie/ Matières inflammables
	[symbole ISO 7000-1701 (2004-01)]	Pression

7.12 *Addition:*

Les instructions des **appareils de réfrigération** et des **fabriques de glace** pour le camping ou usage analogue doivent comporter, en substance, les indications suivantes:

– cet appareil est adapté au camping;
– cet appareil peut être raccordé à plusieurs sources d'énergie (ne s'applique pas aux appareils qui sont conçus pour être alimentés uniquement à l'électricité);
– cet appareil ne doit pas être exposé à la pluie (ne s'applique pas aux appareils qui ont un degré de protection contre les effets nuisibles dus à la pénétration de l'eau d'au moins IPX4).

Pour les **fabriques de glace** non destinées à être raccordées au réseau d'alimentation en eau, les instructions doivent comporter, en substance, la mise en garde suivante:

AVERTISSEMENT: Remplir uniquement avec de l'eau potable.

Pour les **appareils à compression** qui utilisent des **fluides frigorigènes inflammables**, les instructions doivent également comporter des informations pour l'installation, la manipulation, l'entretien et la mise au rebut de l'appareil.

Les instructions des **appareils à compression** qui utilisent des **fluides frigorigènes inflammables** doivent en plus comporter, en substance, les mises en garde suivantes:

– AVERTISSEMENT: Maintenir dégagées les ouvertures de ventilation dans l'enceinte de l'appareil ou dans la structure d'encastrement.

– AVERTISSEMENT: Ne pas utiliser de dispositifs mécaniques ou autres moyens pour accélérer le processus de dégivrage autres que ceux recommandés par le fabricant.

– AVERTISSEMENT: Ne pas endommager le circuit de fluide frigorigène.

Cet avertissement ne s'applique qu'aux appareils dont les circuits de réfrigération sont accessibles à l'utilisateur.

– AVERTISSEMENT: Ne pas utiliser d'appareils électriques à l'intérieur des compartiments de stockage des denrées, à moins qu'ils ne soient du type recommandé par le fabricant.

Pour les appareils qui utilisent des agents moussants inflammables, les instructions doivent comporter des informations relatives à la mise au rebut de l'appareil.

Les instructions des **sorbetières** doivent inclure les ingrédients et la quantité maximale des mélanges qui peuvent être utilisés dans l'appareil.

Les instructions doivent comporter, en substance, l'indication suivante:

Ne pas stocker dans cet appareil des substances explosives telles que des aérosols contenant des gaz propulseurs inflammables.

Si le symbole ISO 7000-1701 (2004-01) est utilisé, sa signification doit être explicitée.

Les instructions doivent comporter, en substance, l'indication suivante:

Cet appareil est destiné à être utilisé dans des applications domestiques et analogues telles que:

– les coins cuisines réservés au personnel des magasins, bureaux et autres environnements professionnels;
– les fermes et l'utilisation par les clients des hôtels, motels et autres environnements à caractère résidentiel;
– les environnements de type chambres d'hôtes;
– la restauration et autres applications similaires hormis la vente au détail.

Si l'utilisation de l'appareil est volontairement limitée par rapport aux applications ci-dessus, le fabricant doit l'indiquer clairement dans les instructions.

Si le symbole ISO 7010 W021 (2019-07) est utilisé, sa signification doit être explicitée.

Les instructions des **appareils de réfrigération** et des **fabriques de glace** doivent comporter, en substance, les mises en garde suivantes:

AVERTISSEMENT: Lors du positionnement de l'appareil, s'assurer que le câble d'alimentation n'est pas coincé ni endommagé.

AVERTISSEMENT: Ne pas placer de socles mobiles de prises multiples ni de blocs d'alimentation portables à l'arrière de l'appareil.

7.12.1 *Addition:*

Les instructions doivent inclure la méthode pour remplacer les lampes d'éclairage, si les lampes peuvent être remplacées par l'utilisateur.

Pour les appareils conçus pour incorporer des **fabriques de glace**, les instructions doivent comporter les types de **fabriques de glace** qui peuvent être incorporées.

Les instructions doivent comporter des informations pour l'installation des **fabriques de glace incorporées** qui sont disponibles comme accessoires en option et qui sont prévues pour être installées par l'utilisateur. Si les **fabriques de glace incorporées** doivent être installées uniquement par le fabricant ou son service après-vente, cela doit être indiqué.

Pour les **fabriques de glace** destinées à être raccordées au réseau d'alimentation en eau, les instructions doivent comporter, en substance, la mise en garde suivante:

AVERTISSEMENT: Raccorder uniquement à un réseau d'alimentation en eau potable.

Les instructions des **appareils installés à poste fixe** doivent comporter, en substance, la mise en garde suivante:

AVERTISSEMENT: Pour éviter tout danger dû à l'instabilité de l'appareil, celui-ci doit être fixé conformément aux instructions.

Les instructions des appareils qui utilisent du R-744 dans un **système de réfrigération transcritique** doivent comporter, en substance, la mise en garde suivante:

AVERTISSEMENT: Le système de réfrigération est sous haute pression. Ne pas y toucher. Contacter des services d'entretien qualifiés avant la mise au rebut.

7.12.4 *Modification:*

Ce paragraphe est également applicable aux **appareils installés à poste fixe**.

7.14 *Addition:*

La hauteur du triangle du symbole ISO 7010 W021 (2019-07) doit être d'au moins 15 mm.

La hauteur des lettres utilisées pour le marquage du type d'agent moussant inflammable doit être d'au moins 40 mm.

7.15 *Addition:*

Le marquage de la puissance maximale assignée des lampes d'éclairage qui peuvent être remplacées par l'utilisateur doit être facilement repérable pendant le remplacement de la lampe.

Pour les **appareils à compression**, le marquage du type de **fluide frigorigène inflammable** et de l'agent moussant inflammable, ainsi que le symbole ISO 7010 W021 (2019-07), doivent être visibles lors de l'accès aux motocompresseurs.

Pour les autres appareils, le marquage du type d'agent moussant inflammable doit se trouver sur l'enveloppe extérieure.

7.101 Pour les appareils qui peuvent être alimentés par batteries, les bornes d'alimentation ou les dispositifs de connexion de la batterie doivent être clairement indiqués par des symboles.

La borne positive doit être indiquée par le symbole IEC 60417-5005 (2002-10) et la borne négative doit être indiquée par le symbole IEC 60417-5006 (2002-10).

La vérification est effectuée par examen.

8 Protection contre l'accès aux parties actives

L'article de la Partie 1 est applicable, avec l'exception suivante.

8.1.1 *Modification*:

Remplacer le deuxième alinéa de la spécification d'essai par ce qui suit:

*Les lampes ne sont pas enlevées, à condition que l'appareil puisse être isolé de l'alimentation au moyen d'une prise de courant ou d'un interrupteur omnipolaire. Toutefois, lors de l'introduction ou de l'enlèvement des lampes, la protection contre les contacts avec des **parties actives** du culot doit être assurée.*

9 Démarrage des appareils à moteur

L'article de la Partie 1 n'est pas applicable.

10 Puissance et courant

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

10.1 *Modification:*

Remplacer le troisième tiret du premier alinéa de la spécification d'essai par ce qui suit:

– *l'appareil fonctionnant dans les **conditions de fonctionnement normal**, les dispositifs de commande de température réglables par l'utilisateur étant toutefois réglés pour donner la température la plus basse.*

Addition:

La puissance est estimée stable quand les conditions de régime sont établies ou lorsque toute minuterie incorporée fonctionne, suivant ce qui intervient en premier.

*Une période représentative est une période comprise entre la fermeture et l'ouverture du dispositif de commande de température, ou entre la valeur la plus élevée et la valeur la plus basse de la puissance mesurée, en excluant la puissance au démarrage, mais en incluant la puissance de la **fabrique de glace incorporée**, s'il y a lieu.*

NOTE 101 La puissance d'un système de dégivrage qui est marquée séparément sur l'appareil n'est pas prise en considération pendant cet essai.

10.2 *Modification*:

Remplacer le troisième tiret du premier alinéa de la spécification d'essai par ce qui suit:

– *l'appareil fonctionnant dans les **conditions de fonctionnement normal**, les dispositifs de commande de température réglables par l'utilisateur étant toutefois réglés pour donner la température la plus basse.*

Addition:

*Pour les **appareils de réfrigération** qui utilisent des motocompresseurs entraînés par onduleur, l'appareil doit être mis en fonctionnement pendant 6 h ou pendant la durée maximale réglable d'une minuterie incorporée, suivant la durée la plus courte. Les cycles de dégivrage sont exclus, le cas échéant. Les autres appareils sont mis en fonctionnement pendant 1 h ou pendant la durée maximale réglable d'une minuterie incorporée, suivant la durée la plus courte. Le courant de démarrage étant exclu, la valeur maximale du courant moyen sur une durée de 5 min est obtenue. L'intervalle entre les mesures du courant ne doit pas dépasser 30 s.*

NOTE 101 Le courant de démarrage est vu comme exclu si la première mesure du courant est effectuée environ 1 min après le démarrage.

10.101 La puissance du système de dégivrage ne doit pas différer de la puissance de dégivrage indiquée sur l'appareil de plus de la valeur de la tolérance donnée dans le Tableau 1.

*La vérification est effectuée en faisant fonctionner l'appareil sous la **tension assignée** et en mesurant la puissance du système de dégivrage lorsque la puissance est stabilisée.*

10.102 La puissance de tout **système chauffant** ne doit pas différer de la puissance de ces systèmes indiquée sur l'appareil de plus de la valeur de la tolérance donnée dans le Tableau 1.

*La vérification est effectuée en faisant fonctionner l'appareil sous la **tension assignée** et en mesurant la puissance du **système chauffant** lorsque la puissance est stabilisée.*

11 Echauffements

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

11.1 *Modification*:

La vérification est effectuée en déterminant l'échauffement des différentes parties dans les conditions spécifiées du 11.2 au 11.7.

Si les températures des enroulements des motocompresseurs dépassent les valeurs indiquées dans le Tableau 101, la vérification est effectuée par l'essai du 11.101.

Les températures des enroulements des motocompresseurs conformes à l'IEC 60335-2-34 (y compris son Annexe AA) ne sont pas mesurées.

11.2 *Remplacement:*

*Les **appareils à encastrer** sont installés conformément aux instructions d'installation.*

*Les **sorbetières** sont placées aussi près que possible des parois du coin d'essai, sauf si le fabricant indique dans les instructions d'utilisation qu'une distance libre doit être respectée par rapport aux murs, auquel cas cette distance est respectée pendant l'essai. Si des dispositifs de ventilation sont fournis par le fabricant, ils sont montés comme prévu.*

Les autres appareils sont placés dans une enceinte d'essai. Les parois enferment l'appareil aussi près que possible de tous ses côtés et du dessus, sauf si le fabricant indique dans les instructions d'installation qu'une distance libre doit être respectée par rapport aux murs ou au plafond, auquel cas cette distance est respectée pendant l'essai.

Un contre-plaqué peint en noir mat de 20 mm d'épaisseur environ est utilisé pour le coin d'essai, les supports, l'installation des ***appareils à encastrer*** *et pour l'enceinte d'essai des autres appareils.*

11.7 *Remplacement:*

L'appareil est mis en fonctionnement jusqu'à l'établissement des conditions de régime.

11.8 *Modification:*

Remplacer le texte situé au-dessus du Tableau 3 par ce qui suit:

Pendant l'essai, les ***dispositifs de protection*** *autres que les protecteurs thermiques à réarmement automatique des moteurs des motocompresseurs ne doivent pas fonctionner. Lorsque les conditions de régime sont établies, les protecteurs thermiques à réarmement automatique des moteurs des motocompresseurs ne doivent pas fonctionner.*

Pendant l'essai, la matière de remplissage éventuelle ne doit pas couler.

Pendant l'essai, les échauffements sont surveillés continuellement.

Pour les appareils de classe tempérée élargie (SN) ou tempérée (N), les échauffements ne doivent pas dépasser les valeurs indiquées dans le Tableau 3.

Pour les appareils de classe subtropicale (ST) ou tropicale (T), les échauffements ne doivent pas dépasser les valeurs indiquées dans le Tableau 3, réduites de 7 K.

Addition:

Pour les motocompresseurs non conformes à l'IEC 60335-2-34 (y compris son Annexe AA), les températures:

– *des enveloppes des motocompresseurs; et*
– *des enroulements des motocompresseurs*

ne doivent pas dépasser les valeurs indiquées dans le Tableau 101.

Pour les motocompresseurs conformes à l'IEC 60335-2-34 (y compris son Annexe AA), les températures:

– *des enveloppes des motocompresseurs;*
– *des enroulements des motocompresseurs; et*
– *des autres parties, telles que leurs systèmes de protection et leurs systèmes de commande, et de tous les autres composants qui ont été soumis à l'essai conjointement avec les motocompresseurs pendant les essais de l'IEC 60335-2-34 et de son Annexe AA*

ne sont pas mesurées.

L'entrée du Tableau 3 relative à l'échauffement de l'enveloppe extérieure des **appareils à moteur** *est applicable à tous les appareils couverts par la présente norme. Toutefois, elle n'est pas applicable aux parties de l'enveloppe extérieure qui:*

– *pour les **appareils à encastrer**, ne sont pas des **parties accessibles** après installation conformément aux instructions d'installation;*

– *pour les autres appareils, sont situées sur la partie de l'appareil qui, conformément aux instructions d'installation, est destinée à être placée contre un mur à une distance libre ne dépassant pas 75 mm.*

Tableau 101 – Températures maximales pour les motocompresseurs

Parties du motocompresseur	***Température °C***
Enroulements avec	
– isolation synthétique	*140*
– isolation cellulosique ou similaire	*130*
Enveloppe	*150*

Les températures des enroulements des ballasts et de leur câblage associé ne doivent pas dépasser les valeurs spécifiées en 12.4 de l'IEC 60598-1:2014/AMD1:2017, *lorsqu'elles sont mesurées dans les conditions indiquées.*

11.101 *Si les températures des enroulements des motocompresseurs autres que ceux qui sont conformes à l'IEC 60335-2-34, y compris son Annexe AA, sont supérieures aux valeurs limites indiquées dans le Tableau 101, l'essai est répété en réglant le **thermostat** ou un dispositif de commande similaire sur la température la plus basse et en retirant le court-circuit du dispositif de commande de température réglable par l'utilisateur.*

Les températures des enroulements sont mesurées à la fin d'un cycle de fonctionnement.

Les températures ne doivent pas être supérieures aux valeurs limites indiquées dans le Tableau 101.

11.102 Les systèmes de dégivrage ne doivent pas provoquer de températures excessives.

La vérification est effectuée par l'essai suivant.

*L'appareil est alimenté sous la tension la plus défavorable comprise entre 0,94 fois et 1,06 fois la **tension assignée**:*

– *pour les appareils dont le dégivrage est commandé manuellement, jusqu'à ce que l'**évaporateur** soit recouvert d'une couche de givre;*

– *pour les appareils dont le dégivrage est commandé automatiquement ou semi-automatiquement, jusqu'à ce que l'**évaporateur** soit recouvert d'une couche de givre. Toutefois, cette couche ne doit pas être plus épaisse que celle qui apparaît, en usage normal, pendant les intervalles entre les opérations successives de dégivrage automatique, ou, pour le dégivrage semi-automatique, pendant les intervalles entre les opérations de dégivrage éventuelles recommandées par le fabricant.*

NOTE 1 Une méthode de formation de givre pour les **appareils de réfrigération** est donnée à l'Annexe BB.

Avec le système de dégivrage en fonctionnement:

– pour les ***appareils à absorption*** et pour les ***appareils à compression*** dont le système de dégivrage peut être mis en fonctionnement alors que le reste de l'appareil n'est pas alimenté, la tension d'alimentation est celle spécifiée en 11.4;

– pour les autres ***appareils à compression***, la tension d'alimentation est celle spécifiée en 11.6.

NOTE 2 Le système de dégivrage est vu comme étant indépendant s'il peut être mis sous tension sans l'aide d'un **outil**.

Si le temps de dégivrage est commandé par un dispositif réglable, le dispositif est réglé sur le temps recommandé par le fabricant. S'il est fait usage d'un dispositif de commande pour arrêter le dégivrage à une température ou une pression donnée, la période de dégivrage est automatiquement interrompue lorsque ce dispositif fonctionne.

Pour les systèmes de dégivrage commandés manuellement, l'essai est poursuivi jusqu'à l'établissement des conditions de régime; autrement, l'essai est poursuivi jusqu'à ce que la période de dégivrage soit interrompue automatiquement par un dispositif de commande.

Les températures des matériaux combustibles et des composants électriques susceptibles d'être influencés par l'opération de dégivrage sont mesurées à l'aide de thermocouples.

Les températures et les échauffements ne doivent pas dépasser les valeurs indiquées en 11.8.

NOTE 3 Pendant la période de repos après le dégivrage, les protecteurs thermiques des motocompresseurs peuvent fonctionner.

11.103 Les **systèmes chauffants**, autres que les systèmes de dégivrage, incorporés dans un appareil ne doivent pas provoquer de températures excessives.

La vérification est effectuée par l'essai suivant.

*Les **systèmes chauffants**, autres que les systèmes de dégivrage, sont mis en fonctionnement de la manière suivante:*

– *pour les **appareils à absorption** et pour les **appareils à compression** dont le **système chauffant** peut être mis en fonctionnement alors que le reste de l'appareil n'est pas alimenté, la tension d'alimentation est celle spécifiée en 11.4;*
– *pour les autres **appareils à compression**, la tension d'alimentation est celle spécifiée en 11.6.*

NOTE Le système de dégivrage est vu comme étant indépendant s'il peut être mis sous tension sans l'aide d'un **outil**.

L'essai est poursuivi jusqu'à l'établissement des conditions de régime.

*Les échauffements sont mesurés à l'aide de thermocouples fixés sur la surface extérieure de l'isolation des **systèmes chauffants**.*

Les échauffements ne doivent pas dépasser les valeurs indiquées en 11.8.

12 Vacant

13 Courant de fuite et rigidité diélectrique à la température de régime

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

13.1 *Addition:*

L'essai du 13.2 n'est pas applicable aux circuits de batteries.

13.2 *Modification:*

*A la place des valeurs spécifiées pour les **appareils de la classe 0I** et pour les différents types d'**appareils de la classe I**, les valeurs suivantes s'appliquent:*

– *pour les **appareils de la classe 0I***	*0,75 mA;*
– *pour les **appareils de réfrigération de la classe I***	*les valeurs spécifiées pour les différents types d'**appareils** fixes **de la classe I**;*
– *pour les autres **appareils de la classe I***	*1,5 mA.*

13.3 *Addition*:

*La tension d'essai spécifiée dans le Tableau 4 pour l'**isolation renforcée** est appliquée entre circuits indépendants pour fonctionnement sur batteries et pour fonctionnement sur secteur.*

14 Surtensions transitoires

L'article de la Partie 1 est applicable.

15 Résistance à l'humidité

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

15.2 *Addition:*

Les capots des lampes ne sont pas retirés.

15.101 Les appareils qui sont exposés aux débordements de liquides provenant de récipients, sur les parois internes de l'enceinte ou d'un compartiment, doivent être construits de façon telle que le débordement n'affecte pas leur isolation électrique.

La vérification est effectuée par les essais appropriés du 15.101.1 et du 15.101.2 au moyen de la solution de déversement spécifiée en 15.2.

15.101.1 *L'appareillage, représenté à la Figure 101 est rempli avec la solution de déversement jusqu'au niveau de déversement, et la pièce mobile est maintenue juste au-dessus du niveau de la solution au moyen de tout mécanisme de soutien approprié et d'une plaque amovible.*

*Tous les récipients et clayettes qui peuvent être enlevés sans l'aide d'un **outil** sont retirés et l'appareil est déconnecté de l'alimentation. Les capots des lampes ne sont pas retirés.*

L'appareillage est maintenu horizontalement et placé à un endroit et à une hauteur de façon telle que, lorsque le mécanisme de soutien de la pièce mobile est libéré, la solution se déverse de la manière la plus défavorable sur l'arrière et sur les parois internes latérales de l'enceinte ou du compartiment ainsi que sur les composants électriques éventuels montés sur ces parois. L'essai n'est effectué qu'une fois dans chaque position de l'appareillage, mais peut être répété autant de fois qu'il est nécessaire, dans des positions différentes, à condition qu'il ne reste pas de solution sur les parties arrosées lors d'un essai précédent.

*Immédiatement après l'essai, l'appareil doit satisfaire à l'essai de rigidité diélectrique du 16.3 et l'examen ne doit révéler aucune trace de solution sur l'isolation pouvant entraîner une réduction des **lignes de fuite** et **distances dans l'air** au-dessous des valeurs spécifiées à l'Article 29.*

De plus, si l'examen montre que la solution est en contact avec l'élément chauffant de dégivrage ou son isolation, alors l'élément chauffant complet doit satisfaire à l'essai du 22.102.

15.101.2 *Un récipient rectangulaire ayant des dimensions de 200 mm x 110 mm et une hauteur de 50 mm est rempli avec 0,5 l de solution de déversement.*

Le récipient est placé de sorte que sa paroi latérale la plus longue soit parallèle à la paroi à soumettre à l'essai, sur la clayette la plus haute capable de l'accueillir; la clayette doit avoir une distance dans l'air au plafond du compartiment au moins égale à 130 mm. Tous les autres récipients et clayettes qui peuvent être enlevés sans l'aide d'un ***outil*** *sont retirés. Les capots des lampes ne sont pas retirés.*

L'appareil est déconnecté de l'alimentation et la solution du récipient est déversée sur l'arrière et les parois internes latérales de l'enceinte ou du compartiment ainsi que sur les composants électriques éventuels montés sur ces parois, de la manière la plus défavorable, pendant une durée de 2 s. L'essai n'est effectué qu'une fois dans chaque position du récipient, mais peut être répété autant de fois qu'il est nécessaire, dans des positions différentes, à condition qu'il ne reste pas de solution sur les parties arrosées lors d'un essai précédent.

Immédiatement après l'essai, l'appareil doit satisfaire à l'essai de rigidité diélectrique du 16.3 et l'examen ne doit révéler aucune trace de solution sur l'isolation pouvant entraîner une réduction des ***lignes de fuite*** *et* ***distances dans l'air*** *au-dessous des valeurs spécifiées à l'Article 29.*

De plus, si l'examen montre que la solution est en contact avec l'élément chauffant de dégivrage ou son isolation, alors l'élément chauffant complet doit satisfaire à l'essai du 22.102.

15.102 Les appareils exposés aux débordements de liquide sur la partie supérieure de l'enceinte doivent être construits de façon telle que ce débordement n'affecte pas leur isolation électrique.

La vérification est effectuée par les essais appropriés du 15.103 et du 15.104. La solution de déversement spécifiée en 15.2 est utilisée pour l'essai du 15.103.

15.103 *Les appareils, autres que les* ***appareils à encastrer****, les* ***fabriques de glace*** *et les* ***sorbetières*** *sont inclinés de 2° par rapport à la position normale d'emploi, dans la direction susceptible d'être la plus défavorable pour cet essai. Un demi-litre de solution de déversement est versé uniformément sur le dessus de l'appareil pendant environ 60 s, à l'endroit le plus défavorable, et d'une hauteur de 50 mm environ, les dispositifs de commande étant dans la position "marche" et l'appareil étant déconnecté de son alimentation.*

Immédiatement après l'essai, l'appareil doit satisfaire à l'essai de rigidité diélectrique du 16.3 et l'examen ne doit révéler aucune trace de solution sur l'isolation pouvant entraîner une réduction des ***lignes de fuite*** *et* ***distances dans l'air*** *au-dessous des valeurs spécifiées à l'Article 29.*

15.104 *Pour les* ***fabriques de glace*** *directement reliées au réseau d'alimentation en eau, le récipient, ou la partie de l'appareil qui sert de récipient, est rempli d'eau comme en usage normal. La vanne d'arrivée d'eau est alors maintenue ouverte et le remplissage continue pendant 1 min après le début du débordement.*

Si aucun débordement ne se produit à cause du fonctionnement d'un dispositif empêchant un tel débordement, la vanne d'arrivée est maintenue ouverte pendant 5 min supplémentaires après l'intervention du dispositif.

*Immédiatement après l'essai, l'appareil doit satisfaire à l'essai de rigidité diélectrique du 16.3 et l'examen ne doit révéler aucune trace d'eau sur l'isolation pouvant entraîner une réduction des **lignes de fuite** et **distances dans l'air** au-dessous des valeurs spécifiées à l'Article 29.*

15.105 Le fonctionnement d'un système de dégivrage ne doit pas affecter l'isolation électrique des éléments chauffants de dégivrage.

La vérification est effectuée par l'essai suivant.

*Immédiatement après l'essai du 11.102, l'appareil doit satisfaire à l'essai de rigidité diélectrique du 16.3 et l'examen ne doit révéler aucune trace d'eau sur l'isolation pouvant entraîner une réduction des **lignes de fuite** et **distances dans l'air** au-dessous des valeurs spécifiées à l'Article 29.*

De plus, si l'examen montre que de l'eau est en contact avec l'élément chauffant de dégivrage ou son isolation, alors l'appareil doit satisfaire à l'essai du 22.102.

16 Courant de fuite et rigidité diélectrique

L'article de la Partie 1 est applicable, avec les exceptions suivantes.

16.1 *Addition:*

L'essai du 16.2 n'est pas applicable aux circuits de batteries.

16.2 *Modification:*

*A la place des valeurs spécifiées pour les **appareils de la classe 0I** et pour les différents types d'**appareils de la classe I**, les valeurs suivantes s'appliquent:*

– *pour les **appareils de la classe 0I***	*0,75 mA;*
– *pour les **appareils de réfrigération de la classe I***	*les valeurs spécifiées pour les différents types d'**appareils** fixes **de la classe I**;*
– *pour les autres **appareils de la classe I***	*1,5 mA.*

16.3 *Addition:*

La tension d'essai spécifiée dans le Tableau 7 pour l'isolation renforcée est appliquée entre circuits indépendants pour fonctionnement sur batteries et pour fonctionnement sur secteur.

17 Protection contre la surcharge des transformateurs et des circuits associés

L'article de la Partie 1 est applicable.

18 Endurance

L'article de la Partie 1 n'est pas applicable.

19 Fonctionnement anormal

L'article de la Partie 1 est applicable, avec les exceptions suivantes.