UL 60335-2-24

STANDARD FOR SAFETY

Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers

UL Standard for Safety for Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers, UL 60335-2-24

Third Edition, Dated July 29, 2022

Summary of Topics

This new edition of ANSI/UL 60335-2-24 dated July 29, 2022 is an adoption of IEC 60335-2-24, Edition 8 issued by the IEC September 2020. Please note that the National Difference document incorporates all the U.S. national differences.

This new edition includes replacement of the ISO 7010 W021 flammable refrigerant label with the United Nations GHS red diamond flame symbol in all HVAC/R standards.

The requirements are substantially in accordance with Proposal(s) on this subject dated November 5, 2021 and March 18, 2022.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

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CSA Group
CSA C22.2 No. 60335-2-24:22
Third Edition
(IEC 60335-2-24:2020, MOD)

Underwriters Laboratories Inc.
UL 60335-2-24
Third Edition

Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers

July 29, 2022

This national standard is based on IEC 60335-2-24, eighth edition (2020).

ANSI/UL 60335-2-24-2022

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as "CSA Group") and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. The technical content of IEC and ISO publications is kept under constant review by IEC and ISO. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the Third Edition. The most recent designation of ANSI/UL 60335-2-24 as an American National Standard (ANSI) occurred on July 29, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

To purchase UL Standards, visit UL's Standards Sales Site at http://www.shopulstandards.com/HowToOrder.aspx or call toll-free 1-888-853-3503.

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PREFACE

This is the harmonized CSA Group and UL standard for Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers. It is the third edition of CSA C22.2 No. 60335-2-24 and the third edition of UL 60335-2-24. This edition of CSA C22.2 No. 60335-2-24 supersedes the previous edition published in 2017 as CAN/CSA-C22.2 No. 60335-2-24 (adopted IEC 60335-2-24:2010+A1:2012). This edition of UL 60335-2-24 supersedes the previous edition(s) published on February 27, 2020.

This harmonized standard is based on IEC Publication 60335-2-24, Eighth Edition, Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers, issued September 2020. IEC 60335-2-24 is copyrighted by the IEC.

This harmonized Standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the appliance manufacturing industry are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This Standard was reviewed by the CSA Subcommittee on Household Appliances for Refrigeration under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This Standard was also reviewed and approved by UL's Standards Technical Panel for Household Refrigerators and Freezers, STP 60335-2-24. This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

CSA C22.2 No. 60335-2-24 is intended to be used in conjunction with the second edition of CAN/CSA-C22.2 No. 60335-1. The requirements for refrigerating appliances, ice-cream appliances and ice makers are contained in this Part 2 Standard and CAN/CSA-C22.2 No. 60335-1. Requirements of this Part 2 Standard, where stated, amend the requirements of CAN/CSA-C22.2 No. 60335-1. Where a particular subclause of CAN/CSA-C22.2 No. 60335-1 is not mentioned in CSA C22.2 No. 60335-2-24, the CAN/CSA-C22.2 No. 60335-1 subclause applies.

UL 60335-2-24 is to be used in conjunction with the sixth edition of UL 60335-1. The requirements for refrigerating appliances, ice-cream appliances and ice makers are contained in this Part 2 Standard and UL 60335-1. Requirements of this Part 2 Standard, where stated, amend the requirements of UL 60335-1. Where a particular subclause of UL 60335-1 is not mentioned in UL 60335-2-24, the UL 60335-1 subclause applies.

Level of Harmonization

This standard adopts the IEC text with national differences.

This standard is published as an equivalent standard for CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

Reasons for Differences From IEC

National differences from the IEC are being added in order to address safety and regulatory situations present in the US and Canada.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

IEC Copyright

For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication 60335-2-24, Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers, copyright 2020, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword and Introduction are not a part of the requirements of this standard but are included for information purposes only.

NATIONAL DIFFERENCES

National Differences from the text of International Electrotechnical Commission (IEC) Publication 60335-2-24, Household and similar electrical appliances – Safety – Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers, copyright 2020, are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY – Part 2–24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers

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

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

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5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

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

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.

101DV D2 ***Modify the 8th paragraph after Item 9) and Note 1 of the Part 2 IEC Foreword by replacing them with the following:***

This Part 2-24 is intended to be used in conjunction with the CSA/UL harmonized standard of the second edition of CAN/CSA-C22.2 No. 60335-1 and the sixth edition of UL 60335-1

dated October 31, 2016. This harmonized standard is an adoption of IEC 60335-1, Household and Similar Electrical Appliances – Safety – Part 1: General Requirements, (Edition 5.1, Issued by the IEC April 2014.) All references in this Standard to IEC 60335-1 shall be replaced by reference to this CSA/UL harmonized standard.

102DV DE *Modify the paragraph following Note 3 in the Part 2 IEC Foreword by replacing it with the following:*

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

103DV DE *Modification by adding the following text at the end of the Part 2 IEC Foreword:*

The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.

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.

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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 International Standard 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 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).

1DV.1 D2 *Modification to add the following to Clause 1 of the Part 2:*

This part of UL/CSA 60335 applies to products that are intended to be installed or used in accordance with

– CSA C22.1, Canadian Electrical Code, Part I, in Canada;

– NFPA 70, National Electrical Code, in the United States.

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]

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

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]

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

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

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

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]

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

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*

2DV.1 DC *Modification to add the following to Clause 2 of the Part 2:*

16 CFR Part 1500, *Hazardous Substances and Articles; Administration and Enforcement Regulations*

ANSI Z97.1, *Safety Glazing Materials Used In Buildings – Safety Performance Specifications and Methods of Test*

ASHRAE 15, *Safety Standard for Refrigeration Systems*

ASHRAE 34, *Designation and Safety Classification of Refrigerants*

ASTM B344, *Standard Specification for Drawn or Rolled Nickel-Chromium and Nickel-Chromium-Iron Alloys for Electrical Heating Elements*

ASTM E162, *Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source*

ASTM B603, *Standard Specification for Drawn or Rolled Iron-Chromium-Aluminum Alloys for Electrical Heating Elements*

CSA B52, *Mechanical Refrigeration Code*

CSA C22.1, *Canadian Electrical Code, Part I*

CSA C22.2 No. 0, *General requirements – Canadian Electrical Code, Part II*

CSA C22.2 No. 0.3, *Test methods for electrical wires and cables*

CAN/CSA-C22.2 No. 0.17, *Evaluation of properties of polymeric materials*

CSA C22.2 No. 21, *Cord sets and power-supply cords*

CSA C22.2 No. 197, *PVC insulating tape*

CSA C22.2 No. 198.1, *Extruded insulating tubing*

CSA C22.2 No. 2556, *Wire and cable test methods*

CAN/CSA-C22.2 No. 60335-1, *Household and similar electrical appliances – Safety – Part 1: General requirements*

CAN/CSA-C22.2 No. 61058-1, *Switches for appliances – Part 1: General requirements*

IEC 60695-11-10, *Fire hazard Testing – Part 11-10: Test Flames – 50 W horizontal and vertical flame test methods*

UL 94, *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 224, *Extruded Insulating Tubing*

UL 510, *Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape*

UL 817, *Cord Sets and Power-Supply Cords*

UL 1441, *Coated Electrical Sleeving*

UL 1581, *Electrical Wire, Cables, and Flexible Cords*

UL 1694, *Tests for Flammability of Small Polymeric Component Materials*

UL 60335-1, *Household and Similar Electrical Appliances – Safety – Part 1: General Requirements*

UL 61058-1, *Switches for Appliances – Part 1: General Requirements*

United Nations GHS, *Globally Harmonized System of Classification and Labelling of Chemicals (GHS)*

2DV.2 DC *Modification to add the following to Clause 2 of the Part 2 (US only):*

16 CFR Part 1750, *Devices to Permit the Opening of Household Refrigerator Doors from the Inside*

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

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.

3.6.104DV DR *Modification of Clause 3.6.104 of the Part 2 by replacing "60 l" with "56,6 l (2 ft^3)".*

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

3.7.103DV DE *Add the following definition to Clause 3.7 of the Part 2 as follows:*

ACCESSORY
an optional electrical device, such as an INCORPORATED ICE-MAKER, intended for installation in or connection to a refrigerator for the purpose of modifying or supplementing the functions of the refrigerator. It can be factory installed or intended for installation by the user or service personnel

3.7.104DV DE ***Add the following definition to Clause 3.7 of the Part 2 as follows:***

ELECTRICAL CONNECTION
the physical interface between two points in a circuit such as spade terminals, pin terminals, micro switch contacts, relay contacts, timer contacts, crimped connections, and connections that are welded or soldered

3.7.105DV DE ***Add the following definition to Clause 3.7 of the Part 2 as follows:***

ICE DISPENSING SYSTEM
the parts of a refrigerator used in moving ice, including the motor, auger, ice bucket, and mechanical parts used to move or modify ice

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.

3.8.102DV DR ***Modification of Clause 3.8.102 of the Part 2 by replacing "ISO 817" with "ASHRAE 34 or CSA B52".***

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.

5.2DV D2 *Modification to add the following to Clause 5.2 of the Part 2:*

The tests of Clauses 15 (except Clause 15.3), 21.103DV, 21.104DV, and 27, and the tests of the Annexes of this Standard may be performed on separate appliances.

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.

5.7DV D1 *Modification of Clause 5.7 of the Part 2 by replacing the second paragraph and three bulleted items as follows:*

For other appliances, tests specified in Clauses 10, 11, 13, and 19.103 are carried out at an ambient temperature of 43 °C ±1 °C (109,4 °F ±1,8 °F).

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.

6.1DV D1 *Modification to replace Clause 6.1DV of the Part 1 with the following:*

Class 0 and Class 0I appliances are not allowed.

6.2DV D2 *Modification by adding the following to Clause 6.2 of the Part 1:*

Appliances or parts of appliances intended for outdoor use shall meet the requirements of at least IPX4.

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.

6.101DV D2 *Delete Clause 6.101 of the Part 2:*

This clause of the Part 2 is not applicable.

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).

7.1DV.1 D2 ***Modification of Clause 7.1 of the Part 2 by deleting the fourth dashed item of the first paragraph:***

This item does not apply.

7.1DV.2 D2 ***Modification of Clause 7.1 of the Part 2 by adding the following (US only):***

Appliances shall also be marked with the date of manufacture that will enable the product to be identified as being manufactured within a consecutive 3-month period. This information may be in code and shall be located on or near the nameplate. A date code marking shall be such that it does not repeat in less than 10 years.

7.1DV.3 D2 ***Modification of Clause 7.1 of the Part 2 by adding the following:***

If a manufacturer produces appliances at more than one factory, each unit shall have a permanent distinctive marking to identify it as the product of a particular factory.

7.1DV.4 DR ***Modification of Clause 7.1 of the Part 2 by adding the following:***

7.1DV.4.1 The following markings, or the equivalent, shall be provided and shall be permanent when a FLAMMABLE REFRIGERANT is used:

a) "DANGER – Risk of fire or explosion. Flammable refrigerant used. Do not use mechanical devices to defrost refrigerator. Do not puncture refrigerant tubing." This marking shall be located on or near any evaporator that can be contacted by the user.

b) "DANGER – Risk of fire or explosion. Flammable refrigerant used. To be repaired only by trained service personnel. Use only manufacturer-authorized service parts. Any repair equipment used must be designed for flammable refrigerants. Follow all manufacturer repair instructions. Do not puncture refrigerant tubing." This marking shall be located near the machine compartment.

c) "CAUTION – Risk of fire or explosion. Dispose of refrigerator properly in accordance with the applicable federal or local regulations. Flammable refrigerant used." This marking shall be located on the exterior of the refrigerator.

d) "CAUTION – Risk of fire or explosion due to puncture of refrigerant tubing; follow handling instructions carefully. Flammable refrigerant used." This marking shall be located near all exposed refrigerant tubing.

NOTE Wherever the word "CAUTION" is required, it may be substituted with the word "WARNING."

7.1DV.4.2 The markings of Clause 7.1DV.4.1 shall be in letters no less than 3,2-mm (1/8-in) high, except for the signal words, "DANGER", "WARNING", and "CAUTION", which shall be no less than 5,0 mm (0,2 in) high and shall be in all capital letters.

Note: Letter height requirements are based on the height of capital letters.

7.1DV.4.3 For COMPRESSION-TYPE APPLIANCES which use FLAMMABLE REFRIGERANTS, the serviced shall be painted or colored red. This color shall be present at all places where service puncturing or otherwise creating an opening in the refrigerant circuit might be expected. In the case of a process tube on a compressor, the color mark shall extend at least 2,5 cm (1 in) from the compressor. The requirement for color marking is waived if the markings of clause 7.1DV.4.1(b) along with the symbol ISO 7010 W021 are visible while gaining access to the process tube.

7.1DV.5 DR *Modification of Clause 7.1 of the Part 2 by adding the following:*

Appliances intended for outdoor use shall be marked with "Suitable for Outdoor Use".

7.1DV.6 DR *Modification of Clause 7.1 of the Part 2 by adding the following:*

Permanently connected equipment shall be marked with the individual electrical loads, the minimum circuit ampacity, and the maximum current rating of the supply circuit overcurrent protection. The minimum circuit ampacity is equal to 125 % of the highest motor, heater, or compressor current rating plus the sum of all other current ratings of concurrent loads. The maximum overcurrent protection is equal to 225 % of the highest motor or compressor current rating plus the sum of all other current ratings of concurrent loads.

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

su2198c

7.6DV.1 D2 ***Modification of Clause 7.6 of the Part 2 by adding the following:***

Replace the ISO 7010-W021 symbol for "Warning; risk of fire/flammable materials" with the United Nations Global Harmonized System (GHS) symbol or a combination of the United Nations GHS and ISO 7010-W021 symbols as shown below:

or

su4470

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.

7.12DV D2 *Modification of Clause 7.12 of the Part 2 by adding the following:*

If the United Nations GHS red diamond flame symbol is used, its meaning shall be explained.

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.

7.12.1DV D2 *Modification of Clause 7.12.1 of the Part 2 by adding the following:*

Accessories that involve the modification of or addition of electrical components to circuits not powered by a LIMITED POWER SOURCE shall be provided with installation instructions for installing line-voltage electrical accessories. These instructions shall be provided on or with each accessory. A statement shall be included in the instructions warning the installer that the refrigerator must be disconnected from the source of electrical supply before attempting the installation. The instructions shall also include information regarding the refrigerators the accessory is designed to be used with.

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.

7.14DV D2 *Modification of Clause 7.14 of the Part 2 by adding the following:*

The height of the United Nations GHS red diamond flame symbol shall be at least 15 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.

7.15DV D2 *Modification of Clause 7.15 of the Part 2 by replacing the second paragraph with the following:*

For COMPRESSION-TYPE APPLIANCES, the marking of the type of FLAMMABLE REFRIGERANT and of the flammable insulation blowing gas, as well as the United Nations GHS red diamond flame symbol, shall be visible when gaining access to the motor-compressors.

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.

7.102DV D1 *Addition of Clauses 7.102DV.1 and 7.102DV.2 to the Part 2:*

7.102DV.1 A lock key shall be permanently marked with the word "CAUTION" and with the following or equivalent statement: "To Prevent A Child From Being Entrapped, Keep Out Of Reach Of Children And Not In The Vicinity Of Freezer (Or Refrigerator)."

7.102DV.2 A marking calling attention to the notice of Clause 7.102DV.1 shall be placed over the key slot of the lock or immediately adjacent to it. This marking may be removable.

7.103DV D1 *Addition of the following clause to the Part 2:*

A child entrapment warning statement shall be included in either the operating instructions or in a use and care manual provided with each refrigerator and shall include the following or equivalent wording:

WARNING: Risk of child entrapment. Before you throw away your old refrigerator or freezer:

*** Take off the doors.**

*** Leave the shelves in place so that children may not easily climb inside.**

7.104DV D2 *Addition of the following clause to the Part 2:*

The appliance shall be visibly marked for proper operating CLEARANCES. This marking is not required for a BUILT-IN APPLIANCE or when the unit has been evaluated and tested with zero CLEARANCES.

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.

10.103DV DR *Addition of Clause 10.103DV to the Part 2:*

For a cyclic ICE-MAKER, the marked current shall be based on the input current measured 5 min after the start of the third freezing cycle. With reference to the above, the harvest cycle of some types of ICE-MAKERS imposes a load that is greater than the load measured during the freezing cycle. The harvest cycle load need not be indicated on the nameplate of the ICE-MAKER if it:

a) Does not exceed 125 % of the nameplate rating;

b) Does not occur more than twice an hour; and

c) Is not more than 5 min in duration.

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.

11.1DV D2 *Modification of Clause 11.1 of the Part 2 by adding the following after the last sentence:*

Winding temperatures of motor compressors are not required to be measured when the case housing temperature (with a thermocouple at the most unfavorable location) does not exceed 150 °C (302 °F).

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.

11.8DV D2 *Modification of Clause 11.8 of the Part 2 by replacing the sixth paragraph with the following:*

Temperature rises shall not exceed the values given in Table 3 of the Part 1 reduced by 7 K.

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.

15.106DV D1 ***Addition of Clause 15.106DV.1 to the Part 2:***

15.106DV.1 Component washing test

15.106DV.1.1 A lampholder, switch, or other electrical component shall be located so that leakage current resulting from cleaning in and around food storage compartments of a refrigerator does not exceed 0,5 mA.

15.106DV.1.2 The appliance shall be isolated from the earth ground circuit by disconnecting the PROTECTIVE EARTHING CONDUCTOR. The appliance shall be connected so that the component to be tested is on the ungrounded side of the supply. Control knobs, guards, panels, food storage components, and similar components that are located in the area shall be cleaned, and components that are removable without the use of TOOLS shall be removed. Lamps shall be left in place.

15.106DV.1.3 The refrigerator shall be energized as indicated in Clause 5 and with the refrigeration system not operating. The measurement circuit for leakage current shall be as shown in Clause 13 except that the leakage current is only measured at normal polarity. The meter used for measurement of leakage current shall have the characteristics defined in Clause 13. The meter shall be connected between a metal backing on a cellulose sponge and the grounded conductor of the power supply.

15.106DV.1.4 The sponge shall be 40 mm by 75 mm by 125 mm (1-5/8 by 3 by 5 in), be capable of retaining from 75 g to 100 g (2,6 oz to 3,5 oz) of solution, and have a metal backing on one of the 75 mm by 125 mm (3 by 5 in) faces.

15.106DV.1.5 The sponge shall be saturated in a solution consisting of 10 ml (2 Tbsp) of sodium bicarbonate and 4,5 g (0,16 oz) of chip soap or soap flakes, in 0,95 L (1 qt) of water at 25 ±5 °C (77 ±9 °F).

15.106DV.1.6 The saturated sponge shall be wiped six times with a pressure of 8,9 N to 13,4 N (2 to 3 lbf) applied to the metal-backed side, over the exposed mounting surfaces, including any operating devices of the electrical components. The sponge shall be resaturated in the test cleaning solution after the third wipe.

15.106DV.1.7 The test shall be conducted with manually-operable switch contacts, integral to the refrigerator, in the open and closed positions. An equal number of wipes shall be applied at each position of the switch or control such that the total is six (three wipes at each position for a 2-position switch; two wipes at each position for a 3-position switch).

15.107DV D1 ***Addition of Clause 15.107DV.1 to the Part 2:***

15.107DV.1 Overflow test

15.107DV.1.1 Condensate disposal means, such as a pan, trough, or the like, shall be constructed and located so that overflow will not wet uninsulated LIVE PARTS or result in a reduction of CLEARANCES and CREEPAGE DISTANCES.

15.107DV.1.2 With reference to Clause 15.107DV.1.1, compliance is checked by the following test. The condensate disposal means, such as a pan, trough, or the like, shall be overflowed at a rate of 30 ml/s for a minimum of 30 s.

15.107DV.1.3 Immediately after the test in Clause 15.107DV.1.2, the appliance shall withstand the electric strength test of Clause 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.

15.107DV.1.4 For appliances which are directly connected to the water supply, a blocked drain shall not result in the wetting of uninsulated LIVE PARTS or in a reduction of CLEARANCES and CREEPAGE DISTANCES.

15.107DV.1.5 With reference to Clause 15.107DV.1.4, compliance is checked by the following test. The drain shall be blocked and be overflowed at a rate of 30 ml/s (1,0 oz/s) for a minimum of 30 s.

15.107DV.1.6 Immediately after the test in Clause 15.107DV.1.5, the appliance shall withstand the electric strength test of Clause 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.

15.107DV.1.7 For appliances which are directly connected to the water supply, any leakage from a water line connection shall not result in the wetting of uninsulated LIVE PARTS or in a reduction of CLEARANCES and CREEPAGE DISTANCES.

15.107DV.1.8 With reference to Clause 15.107DV.1.7, compliance is checked by the following test. The water line connections shall be fully and/or partially disconnected such that the leakage is directed toward electrical components. Flow water through the water tubing for a minimum of 5 min. Water pressure shall be maintained at a gauge pressure of 275 kPa – 415 kPa (40 psi – 60 psi).

15.107DV.1.9 Immediately after the test in Clause 15.107DV.1.8, the appliance shall withstand the electric strength test of Clause 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.

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 shortcircuited, 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.

19.102DV.1 D2 *Modification of Clause 19.102 by replacing "IEC standard" with "UL and CSA standards" in the fourth paragraph.*

19.102DV.2 D2 *Modification of Clause 19.102 by replacing "IEC 61058-1" with "UL 61058-1 and CAN/CSA-C22.2 No. 61058-1" in the fifth paragraph.*

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.

20.2DV.1 D1 *Modification of Clause 20.2 of the Part 1 to add the following after the first paragraph:*

Clause 101.DVA.1 shall be applied for assessment of mechanical hazards.

20.2DV.2 D1 *Modification of Clause 20.2 of the Part 1 to add the following after the fourth paragraph:*

For openings with a minor dimension equal to or greater than 34,9 mm (1-3/8 in), compliance shall be checked by inspection and by applying the test probes of Annex 101.DVA with a force of 11,1 N (2,5 lb). The probes shall be rotated or angled to any possible position before, during, or after insertion through the opening, and if necessary, the probe configuration shall be changed after the probe has been inserted through the opening. See Annex 101.DVF.

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.

20.101DV D1 *Modification of Clauses 20.101 to 20.104 by replacing them with Clauses 20.101DV.1 and 20.101DV.2:*

20.101DV.1 A refrigerator shall be stable when tested in accordance with Clause 20.101DV.2. This requirement does not apply to BUILT-IN APPLIANCES and refrigerators where

both the width and depth dimensions of the supporting base are greater than the height of the refrigerator.

20.101DV.2 The refrigerator shall be supported by the legs, leveling screws, rollers, or the like, provided in the base of the unit, and installed in accordance with the manufacturer's instructions. Plumbing or conduit connections shall not be relied on for the purpose of the test. The refrigerator shall not overturn under the conditions specified in Items a) and b):

a) An empty refrigerator, with doors, covers, and panels closed, shall be placed on a plane surface inclined at an angle of 10° from the horizontal. Accessories that are intended for use with the refrigerator shall be installed. Swivel-type casters, if any, shall be oriented so that the tendency to overturn is maximum. The refrigerator shall be restrained if necessary to prevent it from sliding or rolling. Or an empty refrigerator, with accessories installed, that has a mass of 22,7 kg (50 lbs) or more shall be placed on a horizontal surface. If leveling screws are provided, they shall be adjusted equally to raise the refrigerator to the maximum adjustable level, but not more than 25,4 mm (1 in) above floor level. The refrigerator shall be restrained, if necessary, to prevent it from sliding or rolling. The refrigerator shall be loaded with one-third of the total food-storage load determined in accordance with Clause 21.103DV.1.6. This load shall be distributed over each food-supporting component and located approximately at the center of the component. If swivel-type casters are provided, they shall be oriented so that the tendency to overturn is maximum. All doors shall be closed. A force equal to one-fifth the weight of the empty refrigerator, but not more than 222,5 N (50 lbf) shall be applied horizontally at the vertical centerline of any side of the refrigerator at the highest point, not to exceed 1,5 m (5 ft) above floor level; and

b) An empty refrigerator, with accessories installed, that has a mass of 22,7 kg (50 lbs) or more shall be placed on a horizontal surface. If leveling screws are provided, they shall be adjusted equally to raise the refrigerator to the maximum adjustable level, but not more than 25,4 mm (1 in) above floor level. The refrigerator shall be restrained, if necessary, to prevent it from sliding or rolling. The refrigerator shall be loaded with one-third of the total food-storage load determined in accordance with Clause 21.103DV.1.6. This load shall be distributed over each food-supporting component and located approximately at the center of the component. If swivel-type casters are provided, they shall be oriented so that the tendency to overturn is maximum. A force equal to one-fifth the weight of the empty refrigerator, but not more than 222,5 N (50 lbf), shall be applied vertically downward at the edge of the widest exterior door farthest from the hinges, with the door opened at an angle of 90° to the cabinet. All other doors shall be closed. Shelves, drawers, and other food storage components shall be in their normal storage position. This test shall not be conducted on chest-type units.

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.

20.105DV D1 *Addition of the following clause to the Part 2:*

Ice dispensers shall be designed and constructed such that in normal use pieces are not broken off and dispensed along with the ice. Compliance shall be checked by the tests of Annex 101.DVB.

20.106DV D1 *Addition of the following clause to the Part 2:*

Horizontally-hinged doors that provide access to the food storage compartment(s) of chest-type units shall be counterweighted, spring loaded, or provided with an automatic latch to retain them in the open position. Action members, such as springs and latches, shall be enclosed or guarded.

20.107DV D1 *Addition of the following clause to the Part 2:*

The hinges of a horizontally swinging exterior refrigerator door shall not separate from the cabinet or door when tested in accordance with Annex 101.DVC.

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.

21.1DV.2 D1 *Modification of Clause 21.1DV.2 of the Part 1 by adding the following:*

The impact energy shall be 6,8 J (5 ft·lbf) for enclosures of uninsulated LIVE PARTS that are not protected within the confines of the refrigerator.

For nonmetallic enclosures used within a freezer compartment, samples shall be subjected to a temperature of minus 18 °C ±1,4 °C (0 ±2,5 °F) for a period of 3 h and impacted while still cold.

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.

21.102DV D2 *Modification of Clause 21.102 in the Part 2 by replacing "Lamps" with "Glass lamps" in the first paragraph.*

21.103DV D1 *Addition of Clause 21.103DV.1 to the Part 2:*

21.103DV.1 Shelf and drawer impact and static load

21.103DV.1.1 A food storage component shall remain in position and comply with Clause 21.103DV.1.5 after being subjected to three impacts from a spherical shaped bag filled with No. 9 to No. 6 (2 – 2,8 mm diameter) lead or steel shot dropped in the center of the component under the following conditions:

a) The release from a height of 101,6 mm (4 in) as measured from the bottom of a bag containing lead or steel shot equal to one-half the mass of the test load specified by Clause 21.103DV.1.6 and not exceeding 10 kg (22 lbs); or

b) When the maximum loading height of the component is less than 254 mm (10 in), the bag of lead or steel shot shall be released from a height equal to the maximum loading height minus 152,4 mm (6 in).

21.103DV.1.2 This requirement does not apply to refrigerators having a storage capacity of 60 l (2,1 ft^3) or less.

21.103DV.1.3 This requirement does not apply to food storage components in chest-type units.

21.103DV.1.4 This requirement does not apply to a cover that forms a shelf over a drawer, or a drawer that has a CLEARANCE of 50,8 mm (2 in) or less from a compartment bottom below it.

21.103DV.1.5 A food storage compartment shall remain in position and retain the test load described in Clause 21.103DV.1.6 applied for 1 h.

21.103DV.1.6 The test load shall consist of the maximum number of solid steel cylinders, each with a mass of 1 kg (2,2 lbs) with a diameter of 80 mm (3,15 in), that can be placed in a single tier, axis vertical, on the food storage component without overhanging the front edge of the component; when the loading height is less than 150 mm (5,9 in), cylinder weight may be reduced to 500 g (1,1 lb). Equivalent loading means are not prohibited.

21.103DV.1.7 When shelving does not accommodate cylinders as identified in Clause 21.103DV.1.6, the diameter may be reduced in increments of 5 mm (0,197 in); however, the mass must be retained.

21.103DV.1.8 When more than one food storage component is supported by a bracket, rail, or pilaster, the assembly shall remain in position when all support components are simultaneously loaded. Adjustable food storage components shall be equally spaced during this test.

21.103DV.1.9 The tests in Clauses 21.103DV.1.1 and 21.103DV.1.5 shall be conducted with the most unfavorable arrangement or removal of food-storage components. Any food-storage component or its structural support parts that are located in a freezer compartment and constructed of polymeric materials shall be subjected to a temperature of minus 18 °C ±1,4 °C (0 ±2,5 °F) for a period of 24 h and tested while still cold.

21.104DV D1 *Addition of Clause 21.104DV.1 to the Part 2:*

21.104DV.1 Component restraint

21.104DV.1.1 A slide-out food storage component shall be retained by its supporting means when a horizontal pull force equal to the weight of the component loaded in accordance with Clause 21.103DV.1.6 and not greater than 133 N (30 lbs) force is applied at the center of the leading edge. The food storage component shall be loaded in accordance with Clause 21.103DV.1.6 during this test.

21.104DV.1.2 The types of components specified in Items a) to e) need not be restrained:

a) A pan, tray, or similar container that rests freely on a shelf or on the storage compartment bottom;

b) a component that when loaded as specified in Clause 21.103DV.1.6 has a mass not exceeding 4,5 kg (10 lbs);

c) A shelf or container located so that the bottom of the shelf or container is not more than 508 mm (20 in) above the floor, with levelers, if provided, adjusted to raise the refrigerator to its maximum elevation above the floor but not more than 25,4 mm (1 in);

d) A condensate tray not exceeding a 76,2-mm (3-in) depth or not intended for food storage; and

e) Food storage components in refrigerators having a storage capacity of 60 l (2,1 ft^3) or less.

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.

22.101DV.1 DC *Modification of Clause 22.101 of the Part 2 by adding the following at the end of the second paragraph:*

E12 and E17 lamp holders are checked as specified for E14 and B15 lamp holders. E26 lamp holders are checked as specified for E27 and B22 lamp holders.

22.101DV.2 D1 *Modification of Clause 22.101 of the Part 2 by adding the following after the last sentence:*

For appliances rated at 150 V or less, a lampholder with a screw-shell base shall be wired so that the screw-shell is connected to the grounded (identified) conductor of the power supply circuit.

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.

22.102DV D1 *Modification of Clause 22.102 of the Part 2 by adding the following subclauses:*

22.102DV.1 Compliance with Clause 22.102 shall also be checked by cycling the heater assembly or terminal seal in an atmosphere of not less than 98 % relative humidity at any convenient temperature above 0 °C (32 °F). The heater shall be energized at its RATED VOLTAGE and operated for 1 000 cycles at a rate of 1,5 min on and 13,5 min off.

22.102DV.2 Immediately after the test, the heater assembly shall withstand the electric strength test of Clause 16.3.

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.

Table 102DV D1 *Modification of Table 102 of the Part 2 by replacing it with the following:*

Table 102DV
Refrigerant flammability parameters

Refrigerant number	Refrigerant name	Refrigerant formula	Refrigerant ignition temperature [a c] °C	Refrigerant lower explosive limit [b c d e] % V/V
R50	**Methane**	**CH_4**	**600**	**4,4**
R290	**Propane**	**$CH_3CH_2CH_3$**	**450**	**1,7**
R600	**n-Butane**	**$CH_3CH_2CH_2CH_3$**	**372**	**1,4**
R600a	**Isobutane**	**$CH(CH_3)_3$**	**460**	**1,8**

[a] Values for other FLAMMABLE REFRIGERANTS can be obtained from IEC 60079-20-1 and ISO 5149-1.

[b] 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.

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.

22.112DV DR *Modification of Clause 22.112 of the Part 2 to replace paragraphs three through six and the notes with Clause 22.112DV.1:*

22.112DV.1 Door latch release test

NOTE For the US, reference 16 CFR Part 1750.

22.112DV.1.1 A door-latching device shall permit the door to open with a force of 66,7 N (15 lbf) or less applied at the rate of 13 – 18 N/s (3 – 4 lbf/s). This test shall be conducted before and after the conditioning specified in Clause 22.112DV.1.5.

22.112DV.1.2 A magnetic door gasket shall be considered a door-latching device, although not a self-latching lock.

22.112DV.1.3 When the test in Clause 22.112DV.1.1 is applied to a door with an adjustable spring closing or counterbalancing mechanism, the mechanism shall be adjusted to the position requiring maximum opening force.

22.112DV.1.4 The release force measurements shall be made by means of a force gauge at three points on the inside ACCESSIBLE door or door liner edge on the side opposite the hinges. One point shall be near the top of the door, one point near the bottom of the door,

and one point midway between these two points. The test shall be conducted with the entire refrigerator in any convenient ambient temperature. The force measurements shall be made at points on the outer door surface corresponding to the three internal points.

22.112DV.1.5 A refrigerator or combination refrigerator-freezer door shall be subjected to 300 000 cycles of door operation. A freezer door shall be subjected to 150 000 cycles of operation. The door shall be opened sufficiently on each cycle to provide a complete cycle of operation of the latch mechanism. At the conclusion of this test, the latch release device shall comply with the requirements of Clause 22.112DV.1.1.

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.

22.114DV D1 *Modification of Clause 22.114 of the Part 2 by adding the following:*

A refrigerator or combination refrigerator-freezer drawer shall be subjected to 300 000 cycles of drawer operation. A freezer drawer shall be subjected to 150 000 cycles of operation. The drawer shall be opened sufficiently on each cycle to provide a complete cycle of operation of the latch mechanism. At the conclusion of this test, the latch release device shall comply with the requirements of Clause 22.114.

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.

22.115DV D1 *Modification of Clause 22.115 of the Part 2 by replacing the second paragraph and the Note with Clauses 22.115DV.1 and 22.115DV.2:*

22.115DV.1 The key slot of a key operated lock shall be spring loaded or equivalent so that the key must be manually held in the lock in any position of the lock. The key slot shall be marked as indicated in Clause 7.102DV.2.

22.115DV.2 The key of a key operated lock shall be permanently marked as indicated in Clause 7.102DV.1.

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.

22.116DV D2 *Modification of Clause 22.116 of the Part 2 by adding the following:*

If the ACCESSIBLE GLASS PANELS comply with ANSI Z97.1, then Clause 22.116 does not apply.

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.

22.118DV D2 *Addition of Clause 22.118DV.1 to the Part 2:*

22.118DV.1 Separation of circuits

22.118DV.1.1 Unless provided with insulation rated for the maximum required voltage of any conductor involved, insulated conductors of different circuits (internal wiring including wires in a wiring compartment) shall be separated by barriers or shall be segregated, and shall, in any case, be so separated or segregated from uninsulated LIVE PARTS connected to different circuits.

22.118DV.1.2 Segregation of insulated conductors shall be accomplished by clamping, routing, or other means that assure permanent separation from insulated or uninsulated LIVE PARTS of a different circuit.

22.118DV.1.3 Where a barrier is used to provide separation between the wiring of different circuits, it shall be of metal or of a rigid insulating material secured in place.

22.119DV D2 *Addition of Clauses 22.119DV.1 and 22.119DV.2 to the Part 2:*

22.119DV.1 Refrigerant tubing on a refrigerator employing a flammable refrigerant shall be protected or enclosed to avoid mechanical damage and damage that could occur during moving of the product.

22.119DV.1.1 Refrigerant tubing located within the confines of the cabinet and tubing that does not protrude from the compressor compartment are considered to be protected from mechanical damage.

22.119DV.1.2 A static condenser coil mounted on the outside of a refrigerator is considered to be protected against mechanical damage if it complies with all of the following in either Item a) or b):

a) The return bends of the condenser shall be covered such that they cannot be grasped or handled during moving of the product. The return bends are considered to be adequately covered if they cannot be grasped with test probe B applied with a force of 20 N.

1) The other edges of the condenser shall be covered or secured to prevent damage during moving of the product. They are considered adequately secured if they meet the pull force requirements of Clause 22.11 without deformation of the tubing or loosening of the condenser from the refrigerator.

2) All other tubing in the condenser shall be adequately protected by the fill wire. The tubing is considered adequately protected if any single tube cannot be grasped with test probe B applied with a force of 20 N.

b) The appliance shall be rigidly supported and one blow, having an impact energy of 6.8 J, shall be applied to every point of the static condenser coil that is likely to cause a leak of a flammable refrigerant. (See Clause 21.1DV.2.)

1) A force of 50 N shall be applied without jerks for 10 s in the most unfavorable position to any area of the static condenser that is likely to cause a leak of a flammable refrigerant. (See Clause 22.11.)

2) Compliance is checked by inspection. There shall be no cracks or breaks of static condenser tubing.

22.119DV.1.3 A static evaporator coil mounted as shelving on the inside of a food storage compartment is considered to be protected against mechanical damage if it complies with all of the following:

a) The shelf shall comply with Clauses 22.11, 21.103DV.1.1, 21.103DV.1.6 and 21.104DV.1 with no permanent deformation or damage resulting in a refrigerant leak, kinked refrigerant tubing, or loosening of the tubing from the refrigerator.

b) The tubing shall comply with the scratch test of Clause 22.107.2.

22.119DV.2 All joints in a refrigeration system containing a FLAMMABLE REFRIGERANT shall be brazed or welded. Joining methods other than brazing or welding that have been evaluated with respect to corrosion resistance, mechanical stress, leak rates, and similar methods shall be considered to comply.

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.

23.3DV D1 *Modification to replace the second paragraph of Clause 23.3 of the Part 2 with the following:*

The number of flexings for conductors flexed during normal use is increased to 150 000 for each freezer door/drawer and 300 000 for each refrigerator door/drawer. The rate of flexing shall be consistent with normal use.

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.

24.1DV.5 DC *Delete Clause 24.1DV.5 of the Part 1:*

This Clause does not apply.

24.1DV.6 DC *Modification of Clause 24.1DV.6 of the Part 1 by replacing it with the following:*

Components that have not been previously tested and shown to comply with the standard for the relevant component in Annex DVA shall be tested according to the requirements of Clause 30.2 of this Standard.

24.1DV.7 DC *Modification of Clause 24.1DV.7 of the Part 1 by replacing it with the following:*

Components that have been previously tested and shown to comply with the resistance to fire requirements in the standard for the relevant component in Annex DVA need not be evaluated according to the requirements of 30.2 of this Standard.

24.1DV.8 DC *Delete Clause 24.1DV.8 of the Part 1:*

This Clause does not apply.

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	
• for automatic operation:	*30 000*
• for manual reset	*300*

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.

24.1.4DV D1 *Modification of Clause 24.1.4 of the Part 2 to add the following before the dashed items:*

The number of cycles of operation declared for Clauses 6.10 and 6.11 of IEC 60730-1 shall not be less than the following:

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.

24.8DV D2 *Modification of Clause 24.8 of the Part 2 by adding the following:*

Motor running capacitors shall be marked “Internally Protected” or “Protected” according to UL 810.

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.

24.103DV DR *Add Clause 24.103DV.1 to the Part 2:*

24.103DV.1 Switches and controllers

24.103DV.1.1 A cord-connected refrigerator shall be provided with a manually operable controller that de-energizes all loads or any motor load exceeding 127 V or 7,2 A.

24.103DV.1.2 Such a controller shall have a marked OFF position (the use of the international symbol "0" is not prohibited), and when the controller does not de-energize all loads, the refrigerator shall be marked to indicate which loads are controlled. The controller shall be ACCESSIBLE without the use of TOOLS and shall disconnect all ungrounded conductors of the controlled loads.

24.103DV.1.3 The attachment plug and receptacle may serve as the controller when the rating of the unit or motor load does not exceed 127 V or 7,2 A.

24.103DV.1.4 A THERMOSTAT (cold control) having a marked OFF position is not required to de-energize small loads such as an interior light, an ICE-MAKER, a water dispenser, or the like, nor be marked to indicate the load controlled when the rating of the unit does not exceed 127 V or 7,2 A.

24.103DV.1.5 A manually operated switch with a marked OFF position that controls a hermetic refrigerant motor compressor with or without other loads shall have a current rating that is at least 115 % of the sum of the motor-compressor's rated load current as determined during the input test in Clause 10.

24.103DV.1.6 A switch that controls a motor of other than the clock-motor type shall have a horsepower rating or an equivalent locked rotor ampere rating not less than that of the motor to be controlled.

24.103DV.1.7 When a switching device controls a compressor motor and fan motor and/or other load it shall have a current interrupting capacity not less than the locked-rotor load of the compressor motor plus the full load current of the fan motor and/or other load.

24.103DV.1.8 A switch provided as an interlock shall be endurance tested for 100 000 cycles of operation at not less than the load it controls. The tests shall be conducted as specified in the applicable Standards.

NOTE An ac general-use snap switch (not an ac-dc general-use snap switch) may be used to control a motor load not exceeding 80 % of the ampere rating of the switch at its RATED VOLTAGE.

24.104DV D1 *Add the following Clause to the Part 2:*

The appliance shall be designed so that the field installation of ACCESSORIES shall:

a) Be by the means of receptacles, plug-in connectors, wiring terminals, or insulated wire connectors;

b) Not require drilling, cutting, soldering, or rearrangement of existing components;

c) Prevent stress from being transmitted to the appliance wiring or terminals; and

d) Reduce the likelihood that the auxiliary device will be incorrectly installed.

24.105DV DR *Add Clauses 24.105DV.1 to 24.105DV.3 to the Part 2:*

24.105DV.1 Motor running capacitors in appliances for which Clause 30.2.3 is applicable and that are permanently connected in series with a motor winding shall not cause a hazard in the event of a capacitor failure.

24.105DV.2 With reference to Clause 24.105DV.1, the requirement is considered to be met if the capacitors are of class of safety protection S2 or S3 according to IEC 60252-1 or are marked "Internally Protected" or "Protected" according to UL 810.

24.105DV.3 With reference to Clause 24.105DV.2, compliance shall be checked by inspection.

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.

25.1ADV DR *Add Clauses 25.1ADV.1 to 25.1ADV.3 to the Part 1:*

25.1ADV.1 The rating of the attachment plug shall be not less than 125 % of the marked rating of the refrigerator and not less than the total input measured during the heating tests of Clause 11. The total input shall include all concurrent loads, including the loads drawn by ACCESSORIES intended for use with the refrigerator.

25.1ADV.2 ICE-MAKERS of the following types shall have provision for permanent connection to the power supply:

a) Units that have a rated load current exceeding 40 A. The largest sum of concurrent loads shown on the nameplate shall be used to determine the rating;

b) Units rated in excess of 250 V; and

c) Remote ICE-MAKERS and split-system ICE-MAKERS.

25.1ADV.3 A remote ice dispensing head that along with an outdoor condensing unit comprises a remote ICE-MAKER and that is intended to be moved for cleaning purposes shall have the option of being either permanently connected or cord connected to the power supply. The remote ice dispensing head shall not be electrically connected to the condensing unit unless the wiring is in a Class 2 circuit.

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.

25.7DV DC *Modification of Clause 25.7 of the Part 2 by adding the following:*

25.7DV.1 A cord-connected refrigerator shall employ at least a hard or junior hard usage type power SUPPLY CORD (example S, SE, SO, SOO, ST, STO, STOO, SJ, SJO, SJOO, SJT, SJTO, SJTOO, or SPT-3) having a voltage rating not less than that of the refrigerator.

NOTE SJE, SP-3, and SPE-3 apply to the United States only.

25.7DV.2 A SUPPLY CORD used on an appliance intended for outdoor use shall comply with the requirements for outdoor-use cord sets in accordance with UL 817 and CSA C22.2 No. 21. Such cords are identified by the letters "W" or "W-A" following the cord type designation marked on the jacket.

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.

25.102DV DR *Addition of Clauses 25.102DV.1 and 25.102DV.2 to the Part 2:*

25.102DV.1 The length of a power SUPPLY CORD shall be not less than 1,5 m (5 ft) or more than 3,0 m (10 ft). The length shall be measured between the attachment plug and any point at which the cord exits the refrigerator cabinet or the last strain relief, whichever is shorter.

25.102DV.2 For BUILT-IN refrigerators, the power SUPPLY CORD may be less than 1,5 m (5 ft) long when:

a) The bottom of the machine compartment or condensing unit is at least 1,7 m (5,58 ft) above the floor;

b) The installation instructions indicate the location of the electrical outlet in the alcove for the refrigerator so as to accommodate the shorter length of power SUPPLY CORD; and

c) The power SUPPLY CORD can be connected and disconnected from the front without requiring the refrigerator being moved, or if a disconnect switch is provided.

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.

27.1DV D2 *Modification of Clause 27.1 of the Part 1 by replacing "ACCESSIBLE METAL PARTS" with "ACCESSIBLE METAL PARTS and metal parts that are capable of being contacted by service personnel while the refrigerator is energized" in the first paragraph.*

27.5DV.3 DR *Modification to replace Clauses 27.5DV.1, 27.5DV.2, and Table 27DV.1 of the Part 1 with the following:*

The requirements of Clause 27.5 apply, except that the test duration shall be 2 minutes.

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.

28.101DV D1 *Clauses 28.101DV.1 – 28.101DV.3 to the Part 2 (US only):*

28.101DV.1 All splices and connections shall be mechanically secured and electrically bonded. A soldered connection shall be made mechanically secure before being soldered.

28.101DV.2 Splices shall be located within the unit enclosure. They shall be secured to a fixed member or located in a separate enclosure if they are subject to flexing, motion, or vibration resulting from air movement, or are likely to be moved during service operations, such as replacing fuses, resetting manual-reset devices, or oiling motors.

28.101DV.3 A splice shall be provided with electrical insulation equivalent to that of the conductors when permanence of spacing between the splice and other metal parts is not maintained. Thermoplastic tape wrapped over the sharp ends of the wires shall not be used.

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.

30DV D2 *Modification to add the following note to Clause 30:*

NOTE 101DV IEC and ISO references to flammability designations are equivalent to the same designations in CAN/CSA-C22.2 No. 0.17 and UL 94.

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.

30.1DV.3 D2 *Modification of Clause 30.1 of the Part 1 by replacing "External parts of non-metallic material," with "Non-metallic parts that are enclosures of uninsulated live parts, basic insulation, or hazardous moving parts," in the first paragraph.*

30.1DV.4 D2 *Modification of Clause 30.1 of the Part 1 by replacing "external parts" with "non-metallic parts that are enclosures of uninsulated live parts, basic insulation, or hazardous moving parts" in the first dashed item.*

30.1DV.5 D2 *Modification to add the following note to Clause 30.1 of the Part 1:*

Note 4DV These requirements do not apply to parts such as shelves, drawers, bins, handles, water filters, or ice buckets which do not enclose or support live parts, basic insulation, or hazardous moving parts.

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.

30.2.1DV D2 *Modification to replace the third paragraph of the Part 1 with the following:*

The glow-wire test is also not carried out on parts of material classified at least HB according to UL 94 or CAN/CSA-C22.2 No. 0.17 provided that the test sample used for the classification was no thicker than the relevant part of the appliance.

30.2.2 Not applicable.

30.101DV D1 ***Add the following to Clause 30 of the Part 2:***

Appliances must comply with the additional requirements of Annex 101.DVD.

31 Resistance to rusting

This clause of Part 1 is applicable.

31.101DV D2 ***Addition of Clauses 31.101DV.1 and 31.101DV.2 to the Part 2:***

31.101DV.1 If an appliance is intended for outdoor use, sheet steel structural parts such as cabinets and enclosures shall be protected from corrosion.

Compliance shall be checked by the salt mist test of IEC 60068-2-52, severity 2 being applicable.

Before the test, coatings shall be scratched by means of a hardened steel pin, the end of which has the form of a cone with an angle of 40°. Its tip shall be rounded with a radius of 0,25 mm ±0,02 mm (0,0098 in ±0,00078 in). The pin shall be loaded so that the force exerted along its axis is 10 N ±0,5 N. The scratches shall be made by drawing the pin along the surface of the coating at a speed of approximately 20 mm/s (0,087 in/s). Five scratches shall be made at least 5 mm (0,196 in) apart and at least 5 mm (0,196 in) from the edges.

After the salt mist test, the appliance shall not have deteriorated to such an extent that compliance with this Standard, in particular with Clauses 8 and 27, is impaired. The coating shall not be broken and shall not have loosened from the metal surface.

31.101DV.2 As an alternative to Clause 31.101DV.1, sheet steel structural parts, such as cabinets and enclosures that are intended for outdoor use, may be protected against corrosion with a coating designation G90 in accordance with ASTM A653/A653M or by other metallic or non-metallic coatings that provide equivalent protection.

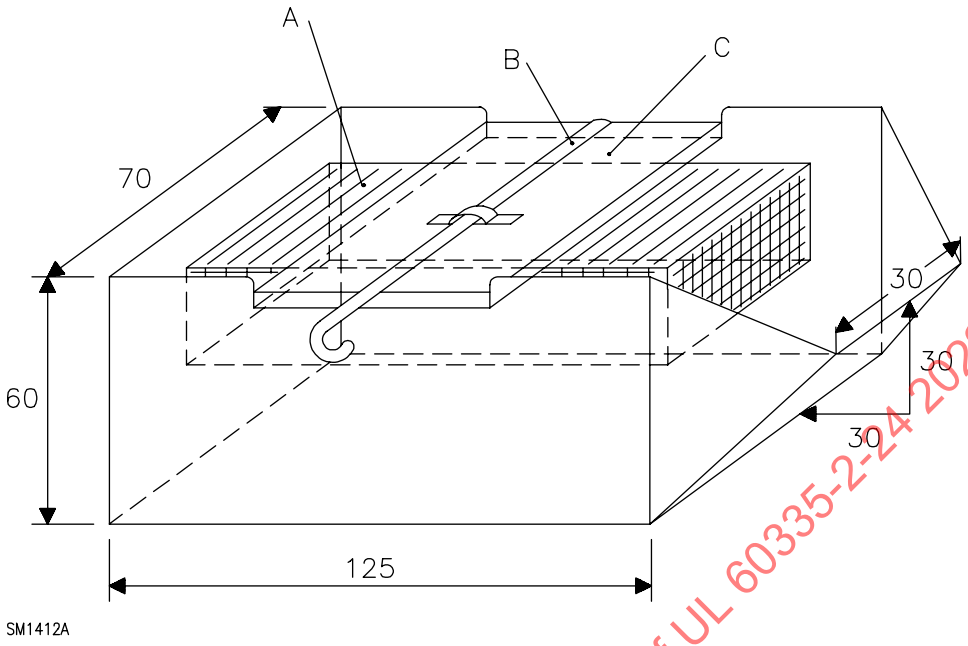
32 Radiation, toxicity and similar hazards

This clause of Part 1 is not applicable.

32.101DV D1 ***Addition to Clause 32 of the Part 2 as follows:***

The type and quantity of refrigerant employed in the system shall comply with ASHRAE 15 and CSA B52.

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

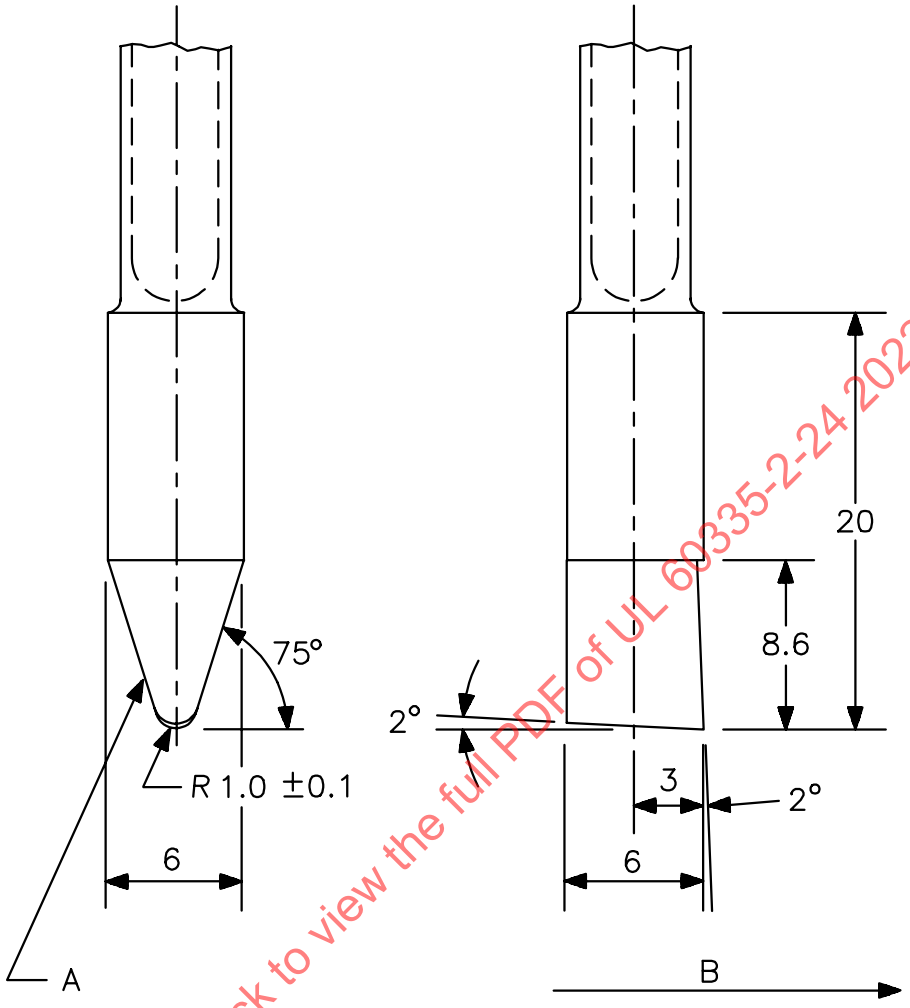
B release pin

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 A
(informative)

Routine tests

A.101DV D1 ***Addition of Clause A.101DV.1 after Clause A.3 of the Part 1:***

A.101DV.1 Refrigerant leakage test

A.101DV.1.1 Each refrigerator that employs a FLAMMABLE REFRIGERANT shall be tested and proved tight at not less than the saturation pressure of the refrigerant at the following temperatures:

a) 20 °C (68 °F) for low sides; and

b) 70 °C (158 °F) for high sides.

A.101DV.1.2 A method other than the pressure testing at the above pressures may be employed if it can be demonstrated that the alternate test method produces results that are at least equivalent to the pressure test method.

A.101DV.1.3 If the final assembly is completed with telescoped tubing joints that are sealed with silver solder, brazing, or the equivalent, the pressure test of the complete system may be at the low-side test pressure provided that the high-side parts are individually tested by the refrigerator manufacturer or by the manufacturer of the part at not less than the high-side test pressure.

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.

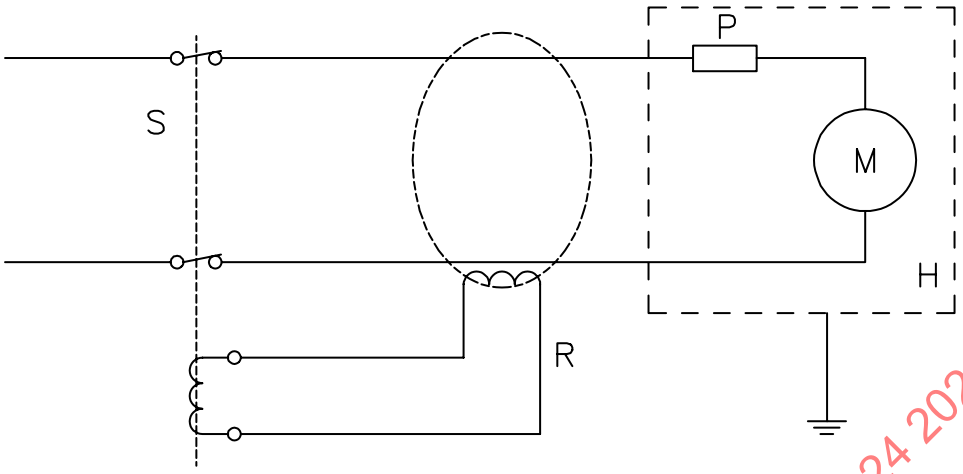
Temperatures are measured under conditions specified in 11.3.

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.



SM1411

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.

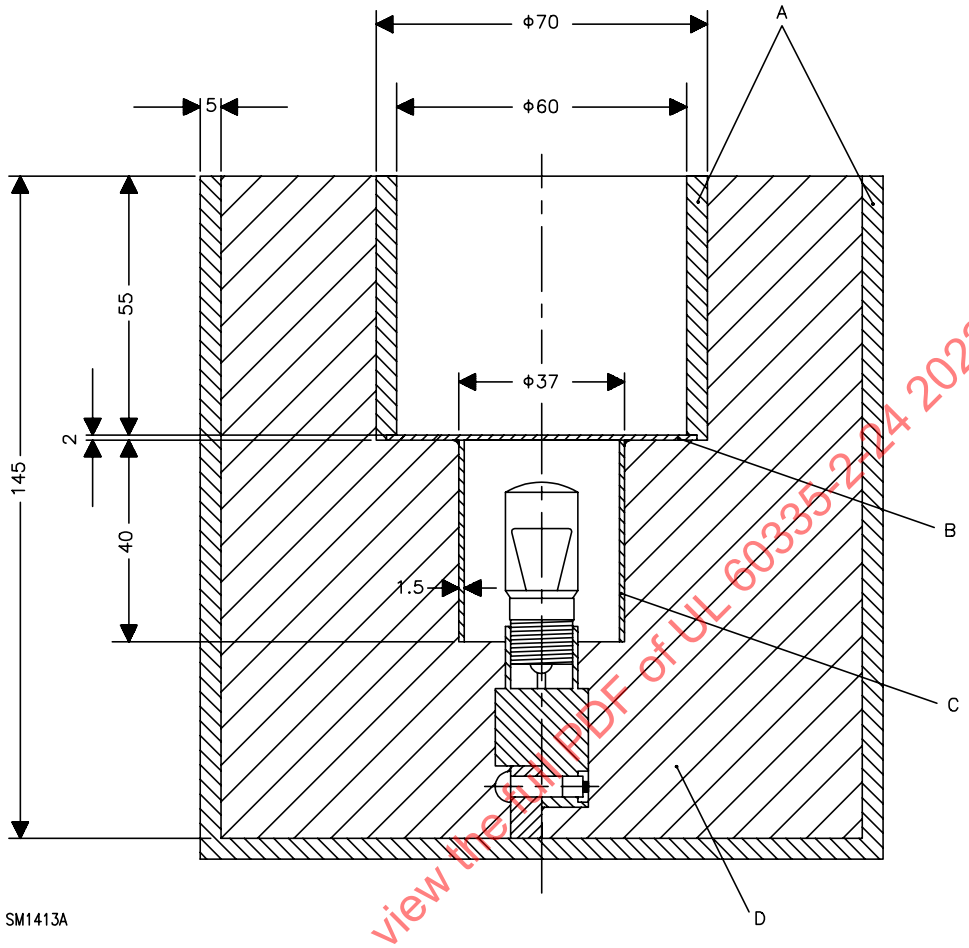
NOTE For example, if the instructions recommend defrosting twice weekly, then a REFRIGERATING APPLIANCE with a cabinet gross volume of 140 l will require:

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

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

su2199

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.