UL 60335-2-40

STANDARD FOR SAFETY

Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers

UL Standard for Safety for Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, UL 60335-2-40

Fourth Edition, Dated December 15, 2022

Summary of Topics

This new fourth edition ANSI/UL 60335-2-40 dated December 15, 2022 is an adoption of IEC 60335-2-40, Edition 6.0 issued by the IEC January 2017. Please note that the National Difference document incorporates all of the national differences for UL 60335-2-40.

The new requirements are substantially in accordance with Proposal(s) on this subject dated December 31, 2021 and June 17, 2022.

No Text on This Page

CSA Group
CSA C22.2 No. 60335-2-40:22
Fourth Edition

Underwriters Laboratories Inc.
UL 60335-2-40
Fourth Edition

Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers

December 15, 2022

This national standard is based on publication IEC 60335-2-40, edition 6.0 (2018).

Approved American National Standard

ANSI/UL 60335-2-40-2022

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.

ISBN 978-1-4883-4375-9 © 2022 Canadian Standards Association

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.

To purchase CSA Group Standards and related publications, visit CSA Group’s Online Store at www.csagroup.org/store/ or call toll-free 1-800-463-6727 or 416-747-4044.

This ANSI/UL Standard for Safety consists of the Fourth Edition.

The most recent designation of ANSI/UL 60335-2-40 as an American National Standard (ANSI) occurred on December 15, 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.

CONTENTS

Annex EE (normative) Pressure tests

Annex FF (normative) Leak simulation tests

Annex GG (normative) Charge limits, ventilation requirements and requirements for secondary circuits

PREFACE

This is the harmonized CSA Group and UL standard for Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers. It is the fourth edition of CSA C22.2 No. 60335-2-40, and the fourth edition of UL 60335-2-40. This edition of CSA C22.2 No. 60335-2-40 supersedes the previous edition published November 1, 2019. This edition of UL 60335-2-40 supersedes the previous edition(s) published on November 1, 2019.

This harmonized standard is based on IEC Publication 60335-2-40: edition 6.0, Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers issued January 2018. IEC publication 60035-2-40 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Subcommittee on Air-Conditioning and Refrigeration (THSC 61D WG10) of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA) 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 Appliances for Air-Conditioning for Household and Similar Purposes, 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 Heating and Cooling Equipment – Heat Pumps, Air-Conditioners and Dehumidifiers, STP 60335-2-40. 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. 60335-2-40 is to be used in conjunction with the second edition of CAN/CSA-C22.2 No. 60335-1. The requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers 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. 60335-2-40, the CAN/CSA-C22.2 No. 60335-1 subclause applies.

UL Standard 60335-2-40 is to be used in conjunction with the sixth edition of UL 60335-1. The requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers 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 60335-2-40, 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

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 60335-2-40, Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, copyright 2018, 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 60335-2-40, Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers, copyright 2018, 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.

No Text on This Page

FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

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

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.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

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.

International Standard IEC 60335-2-40 has been prepared by subcommittee 61D: Appliances for air-conditioning for household and similar purposes, of IEC technical committee 61: Safety of household and similar electrical appliances.

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

FDIS	Report on voting
61D/386/FDIS	61D/391/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 sixth edition cancels and replaces the fifth edition published in 2013 and its Amendment 1:2016. This edition constitutes a technical revision.

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

– Clause 1 – limiting A2L refrigerants to those of a molar mass of more than or equal to 42 kg/kmol;
– Clause 7 – added requirements for A2L refrigerants,
– Clause 7 – added requirement for pre-charge pipe sets, detection systems, ventilation and the resulting charge;
– Clause 7 – added requirements for UV-C systems;
– Clause 7 – added requirements for transcritical refrigerating systems;
– Subclause 19.7 – amended text to match the intention of the subclause;
– Clause 21 – added requirements for transcritical refrigerating systems;
– Subclause 22 – added requirements for A2L refrigerants;
– Subclause 22– added detection systems;
– Subclause 22 – added new requirements for enhanced tightness refrigerating systems;
– Subclause 22 – added new requirements for UV-C;
– Clause 23 – added new requirements for UV-C;Clause
– Clause 24 – added requirements for transcritical refrigerating systems;
– Subclause 24 – added requirements for detection systems and airflow;
– Clause 32 added new requirements for UV-C;
– Annex BB – revised to add surface temperatures;
– Annex DD – added requirements for A2L refrigerants and amended requirements for flammable refrigerants to exempt A2L refrigerants;
– Annex GG – added requirements for A2L refrigerants;
– Annex GG.1 – amended Table GG.1 and related wording
– Annex GG.7 – added requirement to test;
– Annex GG.8 to GG.13 – new coverage for A2L refrigerants;
– Annex HH – revised to take into account A2L refrigerants;
– Annex JJ – new coverage of allowable opening of relays and similar components to prevent ignition of A2L refrigerants;
– Annex KK – new coverage of test method for hot surface ignition temperature for A2L;
– Annex LL – new coverage of refrigerant detection systems for A2L Refrigerants;
– Annex MM – new coverage of refrigerant sensor location confirmation test;
– Annex NN – new coverage of flame arrest enclosure verification test for A2L refrigerants;
– Annex OO – new coverage of UV radiation conditioning
– Bibliography – added new references.

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

This part 2-40 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of IEC 60335-1:2010, its Amendment 1:2013 and its Amendment 2:2016.

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

This part 2-40 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for electrical heat pumps, air-conditioners and dehumidifiers.

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 associated noun are also in bold.

The following differences exist in the countries indicated below:

• 6.1: Class 0I appliances are allowed (Japan).

• 11.8: The temperature of the wooden walls in the test casing is limited to 85 °C (Sweden).

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

The committee has decided that the contents of this 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.

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 first sentence of the 7th paragraph after item 9 in the Part 2 IEC Foreword by replacing it with the following paragraph:***

This Part 2-40 is intended to be used in conjunction with the second edition of CAN/CSA-C22.2 No. 60335-1 and the sixth edition of UL 60335-1. All references in this standard to IEC 60335-1 shall be replaced by the second edition of CAN/CSA-C22.2 No. 60335-1 and the sixth edition of UL 60335-1.

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 ***Modify by adding the following text at the end of the Part 2 IEC Foreword:***

The numbering system in this 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 instructions. It also covers abnormal situations that can be expected in practice.

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.

No Text on This Page

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of electric HEAT PUMPS, including SANITARY HOT WATER HEAT PUMPS, AIR CONDITIONERS, and DEHUMIDIFIERS incorporating motor-compressors and HYDRONIC FAN COILS UNITS, their maximum RATED VOLTAGES being not more than 250 V for single phase appliances and 600 V for all other appliances. PARTIAL UNITS are within the scope of this International Standard.

Appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as appliances intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard.

The appliances referenced above may consist of one or more factory-made assemblies. If provided in more than one assembly, the separate assemblies are to be used together, and the requirements are based on the use of matched assemblies.

NOTE 101 A definition of 'motor-compressor' is given in IEC 60335-2-34, which includes the statement that the term motor-compressor is used to designate either a hermetic motor-compressor or semi-hermetic motor-compressor.

NOTE 102 Requirements for refrigerating safety are covered by ISO 5149-1, ISO 5149-2, and ISO 5149-3. Requirements for containers intended for storage of the heated water included in sanitary hot water heat pumps are, in addition, covered by IEC 60335-2-21.

This standard does not take into account refrigerants other than group A1, A2L, A2 and A3 as defined by ISO 817 classification, A2L REFRIGERANTS are limited to those of a molar mass of more than or equal to 42 kg/kmol based on WCF – Worst Case Formulation as specified in ISO 817.

This standard specifies particular requirements for the use of FLAMMABLE REFRIGERANTS. Unless specifications are covered by this standard, including the annexes, requirements for refrigerating safety are covered by ISO 5149.

The parts of ISO 5149 of particular concern to this standard are as follows:

• ISO 5149-1:2014, Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Definitions, classification and selection criteria.

• ISO 5149-2, Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation;

• ISO 5149-3:2014, Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site.

SUPPLEMENTARY HEATERS, or a provision for their separate installation, are within the scope of this standard, but only heaters which are designed as a part of the appliance package, the controls being incorporated in the appliance.

NOTE 103 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;

• for appliances subjected to pressure, additional requirements may be necessary;

• in many countries, additional requirements are specified, for example, by the national health authorities responsible for the protection of labour and the national authorities responsible for storage, transportation, building constructions and installations.

NOTE 104 This standard does not apply to

• humidifiers intended for use with heating and cooling equipment (IEC 60335-2-88);

• appliances designed exclusively for industrial processing;

• 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).

1DV.1 DR *Modification by replacing the second paragraph of Clause 1 as follows:*

This part of IEC 60335 deals with the safety of electric heat pumps, including hot water heat pumps, air conditioners, and dehumidifiers incorporating motor-compressors, and hydronic fan coils units, their maximum rated voltages being not more than 300 V for single phase appliances and 15 000 V for all other appliances. Partial units are within the scope of this Standard.

1DV.2 D1 *Modification of the sixth paragraph of this Part 2 by replacing it with the following:*

This standard does not take into account refrigerants other than refrigerant safety groups as defined by ISO 817 or ANSI/ASHRAE 34 as follows:

a) A1; and

b) B1, B2L, B2, B3 [(for use in appliances installed in machinery rooms as defined in accordance with ANSI/ASHRAE 15 (USA) or CSA B52 (Canada), or outdoors only)]; and

c) A2L, A2, and A3, refrigerants with a molar mass not less than 42 kg/kmol based on nominal composition.

1DV.3 DR *Modification of the eighth paragraph of Clause 1 as follows:*

Replace “ISO 5149” with “ANSI/ASHRAE 15 (USA) and CSA B52 (Canada)”.

1DV.4 DR *Modification of Clause 1 of the Part 2 by adding the following paragraph:*

All references to ISO 817 in this Part 2 also apply to ANSI/ASHRAE 34. ANSI/ASHRAE 34 shall take precedence over ISO 817.

1DV.5 D1 ***Modification of NOTE 104 of Clause 1 of the Part 2 by deleting the 2nd bullet point.***

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60068-2-52, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

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

IEC 60335-2-34:2012, *Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors*

IEC 60335-2-51, *Household and similar electrical appliances – Safety – Part 2-51: Particular requirements for stationary circulation pumps for heating and service water installations*

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

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 62471:2006, *Photobiological safety of lamps and lamp systems*

ISO 817, *Refrigerants – Designation and safety classification*

ISO 1302, *Geometrical Product Specifications (GPS) – Indication of surface texture in technical product documentation*

ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 4892-4, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame carbon-arc lamps*

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

ISO 5149-2, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation*

ISO 5149-3:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site*

ISO 5151, *Non-ducted air conditioners and heat pumps – Testing and rating for performance*

ISO 7010:2011, *Graphic symbols – Safety colours and safety signs – Registered safety signs*

ISO 13253, *Ducted air-conditioners and air-to-air heat pumps – Testing and rating for performance*

ISO 13256 (all parts), *Water-source heat pumps – Testing and rating for performance*

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

ISO 15042, *Multiple split-system air-conditioners and air-to-air heat pumps – Testing and rating for performance*

ASTM D4728-06:2012, *Standard Test Method for Random Vibration Testing of Shipping Containers*

CAN/CSA-C22.2 No. 0.17, *Evaluation of Properties of Polymeric Materials*

UL 746A, *Standard for Polymeric Materials – Short Term Property Evaluations*

UL 746B, *Standard for Polymeric Materials – Long Term Property Evaluations*

2DV DR *Modification of Clause 2 in the Part 2 to add the following references:*

UL 60335-1 6th Edition / CAN/CSA-C22.2 No. 60335-1:16, *Safety of Household and Similar Appliances – Part 1: General Requirements*

AHRI 210/240, *Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment*

AHRI 340/360, *Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*

AHRI 700, *Specifications for Refrigerants*

AHRI 13256, *Water-source heat pumps – Testing and rating for performance – Part 1: Water-to-air and brine-to-air heat pumps*

AHRI 1230, *Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment*

ANSI/ASHRAE 15, *Safety Standard for Refrigeration Systems*

ANSI/ASHRAE 34, *Designation and safety classification of refrigerants*

ANSI/ASHRAE 62.1, *Ventilation for Acceptable Indoor Air Quality*

ANSI/NEMA WD 6, *Wiring Devices – Dimensional Specifications*

ANSI/NFPA 70, *National Electrical Code*

ANSI/NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*

ANSI/NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*

ANSI S12.31, ***Precision Methods for the Determination of Sound Power Levels of Broad-Band Noise Sources in Reverberation Rooms***

ANSI S12.31, ***Precision Methods for the determination of Discrete-Frequency and Narrow-Band Noise Sources in Reverberation Rooms***

ASME VIII, ***Unfired Pressure Vessel Code***

ASTM A90/A90M, ***Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings***

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

ASTM D56, ***Standard Test Method for Flash Point by Tag Closed Cup Tester***

ASTM D93, ***Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester***

ASTM D6668, ***Standard Test Method for Discrimination Between Flammability Ratings of F = 0 and F = 1***

ASTM D8211, ***Standard Test Method for Hot Surface Ignition Temperature of Gases on Flat Surface***

ANSI Z83.11 • CSA 1.8, ***Gas food service equipment***

CSA B51, ***Boiler, pressure vessel, and pressure piping code***

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***

CSA C22.2 No. 0.8, ***Safety functions incorporating electronic technology***

CSA C22.2 No. 14, ***Industrial control equipment***

CSA C22.2 No. 29, ***Panelboards and enclosed panelboards***

CSA C22.2 No. 41, ***Grounding and Bonding Equipment***

CSA C22.2 No. 42, ***General use receptacles, attachment plugs, and similar wiring devices***

CSA C22.2 No. 55, ***Special use switches***

CSA C22.2 No. 66.1, ***Low voltage transformers – Part 1: General requirements***

CSA C22.2 No. 66.3, ***Low voltage transformers – Part 3: Class 2 and Class 3 transformers***

CSA C22.2 No. 77, ***Motors with inherent overheating protection***

CSA C22.2 No. 100, ***Motors and generators***

CSA C22.2 No. 107.1, ***Power conversion equipment***

CSA C22.2 No. 110, ***Construction and test of electric storage-tank water***

CSA C22.2 No. 140.3, ***Refrigerant-containing components for use in electrical equipment***

CSA C22.2 No. 144.1, ***Ground-fault circuit-interrupters***

CSA C22.2 No. 155, ***Electric duct heaters***

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

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

CSA C22.2 No. 203.1, ***Manufactured wiring systems***

CSA C22.2 No. 236, ***Heating and cooling equipment***

CSA C22.2 No. 250.0, ***Luminaires***

CSA C22.2 No. 274, ***Adjustable speed drives***

CSA C22.2 No. 286, ***Industrial control panels and assemblies***

CSA C22.2 No. 292, ***DC arc fault protection for photovoltaic applications***

CSA C22.2 No. 330, ***Photovoltaic rapid shutdown systems***

CAN/CSA-C22.2 No. 60335-2-34, ***Safety of household and similar electrical appliances – Part 2-34: Particular requirements for motor-compressors***

CSA C22.2 No. 60947-4-1, ***Low-voltage switchgear and control gear – Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters***

CSA C22.2 No. 61730-1, ***Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction***

CSA C22.2 No. 61730-2, ***Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing***

CSA C22.2 No. 62109-1, ***Safety of power converters for use in photovoltaic power systems – Part 1: General requirements***

CSA C22.2 No. 62109-2, ***Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters***

CSA E60730-1, ***Automatic electrical controls – Part 1: General requirements***

IAPMO, ***Uniform Mechanical Code***

ICC, ***International Mechanical Code***

IEC 60695-1-10, ***Fire hazard testing – Part 1-10: Guidance for assessing the fire hazard of electrotechnical products – General guidelines***

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

IEC 60990:2016, ***Methods of measurement of touch current and protective conductor current***

ISO 1043-1, ***Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics***

UL 67, ***Panelboards***

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

UL 174, ***Household Electric Storage Tank Water Heaters***

UL 183, ***Manufactured Wiring Systems***

UL 207, ***Refrigerant-Containing Components and Accessories, Nonelectrical***

UL 224, ***Extruded Insulating Tubing***

UL 353, ***Limit Controls***

UL 429, ***Electrically Operated Valves***

UL 498, ***Attachment Plugs and Receptacles***

UL 508, ***Industrial Control Equipment***

UL 508A, ***Industrial Control Panels***

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

UL 723, ***Test for Surface Burning Characteristics of Building Materials***

UL 746C, ***Polymeric Materials – Use in Electrical Equipment Evaluations***

UL 867, ***Electrostatic Air Cleaners***

UL 900, ***Air Filter Units***

UL 943, ***Ground-Fault Circuit-Interrupters***

UL 1310, ***Class 2 Power Units***

UL 1004-9, ***Form Wound and Medium Voltage Rotating Electrical Machines***

UL 1441, ***Coated Electrical Sleeving***

UL 1453, ***Electric Booster and Commercial Storage Tank Water Heaters***

UL 1581, ***Reference Standard for Electrical Wires, Cables, and Flexible Cords***

UL 1598, ***Luminaires***

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

UL 1699B, ***Photovoltaic (PV) DC Arc-Fault Circuit Protection***

UL 1703, ***Flat-Plate Photovoltaic Modules and Panels***

UL 1741, ***Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources***

UL 1995, ***Heating and Cooling Equipment***

UL 1996, ***Electric Duct Heaters***

UL 2043, ***Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces***

UL 2395, ***Adhesives for Use in Heating and Cooling Appliances to Secure Thermal Insulation Materials***

UL 2703, ***Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels***

UL 5085-1, ***Low Voltage Transformers – Part 1: General Requirements***

UL 5085-3, ***Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers***

UL 9703, ***Outline of Investigation for Distributed Generation Wiring Harnesses***

UL 60079-2, ***Explosive Atmospheres – Part 2: Equipment Protection by Pressurized Enclosure***

UL 60730-1, ***Automatic Electrical Controls – Part 1: General Requirements***

UL 60730-2-6, ***Automatic Electrical Controls – Part 2-6: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements***

UL 60730-2-9, ***Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls***

UL 60947-4-1, ***Low-Voltage Switchgear and Controlgear – Part 4-1: Contactors and Motor-Starters – Electromechanical Contactors and Motor-Starters***

UL 60950-1, ***Information Technology Equipment – Safety – Part 1: General Requirements***

UL 61800-5-1, ***Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy***

UL 61800-5-2, ***Adjustable Speed Electrical Power Drive Systems – Part 5-2: Safety Requirements – Functional***

UL 61730-1, ***Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements For Construction***

UL 61730-2, ***Photovoltaic (PV) Module Safety Qualification – Part 2: Requirements For Testing***

UL 62109-1, ***Power Converters for use in Photovoltaic Power Systems – Part 1: General Requirements***

UL 62109-2, ***Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters***

UL 62368-1, ***Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements***

UL 121201, ***Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations***

ULC/ORD C1703, ***Flat-plate photovoltaic modules and panels***

CAN/ULC-S102, ***Standard method of test for surface burning characteristics of building materials and assemblies***

CAN/ULC-S111, ***Standard method of fire tests for air filter units***

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1.4 *Addition:*

Note 101 to entry: If the appliance comprises electrical accessories, including fans, the RATED POWER INPUT is based upon the total maximum ELECTRICAL POWER INPUT with all accessories energized, when operating continuously under the appropriate environmental conditions. If the HEAT PUMP can be operated in the heating or cooling mode, the RATED POWER INPUT is based upon the input in the heating or in the cooling mode, whichever is the greater.

3.1.9 *Replacement:*

NORMAL OPERATION
conditions that apply when the appliance is mounted as in normal use and is operating under the most severe operating conditions specified by the manufacturer

3.4.2DV D1 ***Modification by replacing Clause 3.4.2DV in the Part 1 with the following:***

SAFETY EXTRA-LOW VOLTAGE
(SELV)
Voltage between any accessible part and earth, not exceeding 30 V AC (RMS), 42,4 V AC (peak), or 60 V DC (ripple free) under normal and single-fault conditions, which is provided by an independent source (such as safety isolating transformers, motor generators, and batteries) or, when obtained from higher voltage, is obtained by a safety isolating transformer or a converter with separate windings providing equivalent insulation (USA Only)

NOTE 1DV to entry: For equipment NOT ACCESSIBLE TO THE GENERAL PUBLIC, see Annex 101.DVH.

NOTE 2DV to entry: NFPA 70, Article 725 (NEC), class 2 meets this requirement.

3.5.4DV D1 ***Modify Clause 3.5.4 in the Part 1 by adding the following NOTE:***

Note 101 to entry: Appliances connected to water pipes or refrigerant pipes are also fixed appliances.

3.8.101DV D1 ***Add the following definition to Clause 3.8 in the Part 1:***

PARTICLE FOAM MATERIAL
closed cell material moulded from thermoplastic particles (e.g., beads) with an expanding agent

3.101
HEAT PUMP
appliance which takes up heat at a certain temperature and releases heat at a higher temperature

Note 1 to entry: When operated to provide heat (e.g., for space heating or water heating), the appliance is said to operate in the heating mode; when operated to remove heat (for example, for space cooling), it is said to operate in the cooling mode.

Note 2 to entry: A HEAT PUMP can contain a combination of CONDENSING UNIT OR CONDENSER UNIT and an EVAPORATING UNIT or EVAPORATOR UNIT and can be equipped to operate in a reverse cycle mode.

3.102
SANITARY HOT WATER HEAT PUMP
HEAT PUMP intended to transfer heat to water suitable for human consumption

3.103
AIR CONDITIONER
encased assembly or assemblies designed as an appliance to provide delivery of conditioned air to an enclosed space, room or zone

Note 1 to entry: It includes an electrically operated REFRIGERATING SYSTEM for cooling and possibly dehumidifying the air.

Note 2 to entry: It may have means for heating, circulating, cleaning and humidifying the air.

Note 3 to entry: An AIR CONDITIONER can contain a combination of CONDENSING UNIT or CONDENSER UNIT and an EVAPORATING UNIT or EVAPORATOR UNIT.

3.104
DEHUMIDIFIER
encased assembly designed to remove moisture from its surrounding atmosphere

Note 1 to entry: It includes an electrically operated REFRIGERATING SYSTEM and the means to circulate air. It also includes a drain arrangement for collecting and storing and/or disposing of the condensate.

3.108
WET-BULB TEMPERATURE
WB
temperature indicated when the temperature-sensitive element in a wetted wick has reached a state of constant temperature (evaporative equilibrium)

3.109
DRY-BULB TEMPERATURE
DB
temperature indicated by a dry, temperature-sensitive element shielded from the effects of radiation

3.110
EVAPORATOR
HEAT EXCHANGER in which refrigerant liquid is vaporized by absorption of heat

3.111
HEAT EXCHANGER
device specifically designed to transfer heat between two physically separated fluids

3.112
INDOOR HEAT EXCHANGER
HEAT EXCHANGER designed to transfer heat to the indoor parts of the building or to the indoor hot water supplies (e.g. sanitary water) or to remove heat therefrom

3.113
OUTDOOR HEAT EXCHANGER
HEAT EXCHANGER designed to remove or release heat from the heat source (for example, ground water, outdoor air, exhaust air, water or brine)

3.114
SUPPLEMENTARY HEATER
electric heater provided as part of the appliance to supplement or replace the output of the refrigerant circuit of the appliance by operation in conjunction with, or instead of, the refrigerating circuit

3.114ADV D1 ***Add the following definitions to Clause 3 of the Part 2:***

3.114ADV.1
ELECTRIC HEATER
heater provided as part of the appliance for the purpose of conditioning air or water

3.114ADV.2
SUPPLEMENTARY WATER HEATER
heater provided specifically for the purpose of heating water

3.114ADV.3
SUPPLEMENTARY AIR HEATER
heater provided specifically for the purpose of heating air by operation in conjunction with, or instead of, the refrigerating circuit

3.114ADV.4
CENTRAL WARM AIR FURNACE
heating appliance that consists of an electric heating element or elements with an air-circulating fan or blower, is provided with appropriate integral operating and temperature-limiting controls, and is housed in an enclosure designed to be connected to ductwork for the distribution of the heated air

3.114ADV.5
ADD-ON ELECTRIC HEATER KIT
auxiliary electric heat assembly comprised of electric resistance heating elements with integral operating and temperature-limiting controls for attachment in the field to an enclosure with an air-circulating fan designed to be connected to ductwork for the distribution of the heated air

3.115
PRESSURE-LIMITING DEVICE
mechanism that automatically responds to a predetermined pressure by stopping the operation of the pressure-imposing element

3.116
PRESSURE-RELIEF DEVICE
pressure actuated valve or rupture member which functions to relieve excessive pressure automatically

3.116DV D1 ***Modification by adding the following note to Clause 3.116 of the Part 2:***

Note 1DV to entry: A hermetic compressor's internal pressure-relief valve (bypass valve) is not considered a pressure relief device.

3.117
APPLIANCES ACCESSIBLE TO THE GENERAL PUBLIC
appliances intended to be located in residential buildings or in commercial buildings

3.118
APPLIANCES NOT ACCESSIBLE TO THE GENERAL PUBLIC
appliances which are located either in a secured location with restricted access (e.g. machine rooms, rooftop and the like) or at a level not less than 2,5 m or in secured rooftop areas

3.119
HYDRONIC FAN COIL UNIT
factory-made assembly which provides the function of forced circulation of air for heating and/or cooling, which may also include the function of DEHUMIDIFICATION and/or filtering of air, but which does not include the source of cooling or heating

Note 1 to entry: HYDRONIC FAN COIL UNITS can include provision for electric resistance heating. HEAT EXCHANGER coils are intended for hydronic heating and cooling only.

3.120
FLAMMABLE REFRIGERANT
refrigerant classified as class A2L, A2 or A3 according to ISO 817

3.120DV D1 ***Modification of Clause 3.120 of the Part 2 by replacing it with the following:***

FLAMMABLE REFRIGERANT
refrigerant classified as safety group A2L, A2 or A3 according to ANSI/ASHRAE 34 or ISO 817

3.121
REFRIGERATING SYSTEM
combination of interconnected refrigerant containing parts constituting one closed refrigerant circuit in which refrigerant is circulated for the purpose of extracting heat at the low temperature side to reject heat at the high temperature side by changing the state of the refrigerant

3.122
MAXIMUM ALLOWABLE PRESSURE
limit to the REFRIGERATING SYSTEM operating pressure, generally the maximum pressure for which the equipment is designed, as specified by the manufacturer

Note 1 to entry: MAXIMUM ALLOWABLE PRESSURE constitutes a limit to the operating pressure whether the equipment is working or not, see Clause 21.

3.123
LOW-PRESSURE SIDE
part(s) of a REFRIGERATING SYSTEM operating at the EVAPORATOR pressure

3.124
HIGH-PRESSURE SIDE
part(s) of a REFRIGERATING SYSTEM operating at the CONDENSER pressure

3.125
SERVICE PORT
means to access the refrigerant in a REFRIGERATING SYSTEM for the purpose of charging or servicing the system, typically a valve, tube extension or entry location

3.125DV D1 ***Modification of Clause 3.125 of this Part 2 by deleting "typically a valve, tube extension or entry location"***

3.126
FACTORY SEALED SINGLE PACKAGE UNIT
factory assembly of components of REFRIGERATING SYSTEM fixed on a common mounting to form a discrete unit in which all REFRIGERATING SYSTEM parts have been sealed tight by welding, brazing or a similar permanent connection during the manufacturing process

3.126DV D1 ***Modification of Clause 3.126 of this Part 2 by adding the following at the end of the sentence:***

“and does not include service ports, other than appliances with A1 and A2L refrigerants”

3.127
PRE-CHARGED PIPE SETS
interconnecting refrigerant lines which are supplied with the unit and supplied with a REFRIGERANT CHARGE for the purpose of completing the REFRIGERATING SYSTEM in the field for appliances that are made up of more than one subassembly and are assembled in the field to complete the REFRIGERATING SYSTEM

3.128
CONDENSER
HEAT EXCHANGER in which refrigerant vapour is condensed by removal of heat

3.129
CONDENSING UNIT
factory-made assembly that includes one or more motor-compressors, CONDENSER in cooling mode and motor-driven fan, blower or pump to circulate the heat transfer fluid through the CONDENSER with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to an EVAPORATOR UNIT. A CONDENSING UNIT can also be equipped to operate in the reverse cycle mode. A CONDENSING UNIT can include expansion device(s).

3.130
CONDENSER UNIT
factory-made assembly that includes one or more CONDENSERS in cooling mode and motordriven fan, blower or pump to circulate the heat transfer fluid through the CONDENSER with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to an EVAPORATING UNIT. A CONDENSER UNIT can also be equipped to operate in the reverse cycle mode.

Note 2 to entry: A CONDENSER UNIT does not include a motor compressor or expansion device.

3.131
EVAPORATING UNIT
factory-made assembly that includes one or more motor-compressors, EVAPORATOR in cooling mode, expansion device(s), and motor-driven fan, blower or pump to circulate fluid through the EVAPORATOR with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to a CONDENSER UNIT. An EVAPORATING UNIT can also be equipped to operate in the reverse cycle mode and can include provision for electric resistance heating or similar sources of auxiliary heat.

3.132
EVAPORATOR UNIT
factory-made assembly that includes one or more EVAPORATORS in cooling mode, and may include a motor-driven fan, blower or pump to circulate fluid through the EVAPORATOR with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to a CONDENSING UNIT. An EVAPORATOR UNIT can also be equipped to operate in the reverse cycle mode and can include provision for electric resistance heating or similar sources of auxiliary heat. An EVAPORATOR UNIT can include expansion device(s).

Note 2 to entry: An EVAPORATOR UNIT does not include a motor compressor.

3.133
PARTIAL UNIT
CONDENSING UNIT, EVAPORATING UNIT, CONDENSER UNIT, or EVAPORATOR UNIT which are part of a total assembly of a heat pump, air-conditioner, or SANITARY HOT WATER HEAT PUMPS where not all assemblies to create the complete REFRIGERATING SYSTEM are specified by the manufacturer

Note 1 to entry: PARTIAL UNITS are evaluated for safety as stand-alone.

3.134
INSTALLED HEIGHT
h_{inst}
height of the bottom of the appliance relative to the floor of the room after installation

Note 1 to entry: The INSTALLED HEIGHT is given in meters.

3.135
RELEASE OFFSET
h_{rel}
distance from the bottom of the appliance to an opening where refrigerant can leave the appliance in the event of a refrigerant leak

Note 1 to entry: The RELEASE OFFSET is given in meters.

3.136
REFRIGERANT CHARGE
m_c
actual REFRIGERANT CHARGE of a single REFRIGERATING SYSTEM

Note 1 to entry: The REFRIGERANT CHARGE is expressed in kg.

3.137
MAXIMUM REFRIGERANT CHARGE
m_{max}
MAXIMUM REFRIGERANT CHARGE for a single REFRIGERATING SYSTEM as result from a calculation for room area or similar

Note 1 to entry: The MAXIMUM REFRIGERANT CHARGE is expressed in kg.

3.138
REFRIGERANT DETECTION SYSTEM
sensing system which responds to a pre-set concentration of refrigerant in the environment

Note 1 to entry: A REFRIGERANT DETECTION SYSTEM may have multiple sensing elements.

3.138DV D1 ***Modification Clause 3.138 of the Part 2 by replacing it with the following:***

REFRIGERANT DETECTION SYSTEM
sensing system with one or more REFRIGERANT SENSORS interconnected with electronic circuitry that determines if a SYSTEM RESPONSE is required based on a comparison of a sensed refrigerant gas concentration to the DETECTION THRESHOLD LIMIT VALUE

3.139
AUTO IGNITION TEMPERATURE
AIT
lowest temperature at or above which a chemical can spontaneously ignite in a normal atmosphere, without an external source of ignition, such as a flame or spark

[SOURCE: ISO 5149-1:2014, definition 3.7.7]

3.140
HOT SURFACE IGNITION TEMPERATURE
HSIT
highest temperature at which a refrigerant does not ignite when tested in accordance with Annex KK

3.140DV D1 ***Modification of Clause 3.140 of the Part 2 by adding "or ASTM D8211" after "Annex KK"***

3.141
A2L REFRIGERANT
refrigerant classed as A2L according to ISO 817

3.141DV DR ***Modification of Clause 3.141 of the Part 2 by replacing it with the following:***

A2L REFRIGERANT
refrigerant classified as safety group A2L according to Clause 1DV.2 of this standard

Note 1 to entry: Safety group is listed in Annex BB.

3.142
LOWER FLAMMABILITY LIMIT
LFL
LOWER FLAMMABILITY LIMIT according to ISO 817

3.143
ENHANCED TIGHTNESS REFRIGERATING SYSTEM
REFRIGERATING SYSTEM in which the indoor units are designed and fabricated to ensure a high level of confidence that large refrigerant leak rates will not occur in normal and abnormal operation

3.144
REFRIGERANT DISTRIBUTION ASSEMBLY
separate refrigerant assembly which is installed in the interconnecting refrigerant lines for the purpose of distributing refrigerant flow to one or more indoor units

3.145
POTENTIAL IGNITION SOURCE
PIS
hot surfaces, flames and current carrying devices which can be the source of arcing or sparking

Note 1 to entry: Examples of POTENTIAL IGNITION SOURCES are UV lights, electric heaters, pilot flames, brushed motors and similar devices.

3.146
CIRCULATION AIRFLOW
mechanically induced airflow movement within the space or duct connected spaces

3.146DV D1 ***Modification of Clause 3.146 of the Part 2 by adding the following note:***

Note 1DV to entry: Circulation airflow is not ventilation. Ventilation is the act of supplying airflow to a space or duct connected spaces from an outside source or a separate room and exhausting air from the space.

3.147
ULTRAVIOLET RADIATION
OPTICAL RADIATION for which the wavelengths are shorter than those for VISIBLE RADIATION

Note 1 to entry: For ultraviolet (UV) radiation, the range between 100 nm and 400 nm is commonly subdivided into: UV-A, from 315 nm to 400 nm; UV-B, from 280 nm to 315 nm; and UV-C, from 100 nm to 280 nm.

[SOURCE: IEC 60050-845:1987, 845-01-05]

3.148
OPTICAL RADIATION
electromagnetic radiation at wavelengths between the region of transition to X-rays (λ ≈ 1 nm) and the region of transition to radio waves (λ ≈ 1 mm)

[SOURCE: IEC 60050-845:1987, 845-01-02]

3.149
VISIBLE RADIATION
any OPTICAL RADIATION capable of causing a visual sensation directly

Note 1 to entry: There are no precise limits for the spectral range of VISIBLE RADIATION since they depend upon the amount of radiant power reaching the retina and the responsivity of the observer. The lower limit is generally taken between 360 nm and 400 nm and the upper limit between 760 nm and 830 nm.

[SOURCE: IEC 60050-845:1987, 845-01-03]

3.150
UV-C LAMP
source made to produce OPTICAL RADIATION for which the wavelengths are shorter than those for VISIBLE RADIATION and in the range of 100 nm to 280 nm wavelengths including GERMICIDAL LAMPS

Note 1 to entry: There are several types of such lamps used for photobiological, photochemical and biomedical purposes

3.150DV D1 ***Modification of Clause 3.150 of the Part 2 by replacing "100 nm" with "200 nm"***

3.151
GERMICIDAL LAMP
low pressure mercury vapour lamp with a bulb which transmits the bactericidal ultraviolet-C radiation

[SOURCE: IEC 60050-845:1987, 845-07-53]

3.151DV D1 ***Modification of Clause 3.151 of the Part 2 by replacing it with the following:***

low pressure mercury vapor lamp or a LED array which transmits the bactericidal ultraviolet-C radiation

[SOURCE: Adapted from IEC 60050-845:1987, 845-07-53]

3.152
UV-C GERMICIDAL LAMP SYSTEM
auxiliary device which utilizes GERMICIDAL LAMPS that directly generate UV-C germicidal ULTRAVIOLET RADIATION typically used to supplement the normal unit air filters for enhanced air purification and surface cleaning of the EVAPORATOR coil and surrounding area

3.153
UV-C SPECTRAL IRRADIANCE
measured electromagnetic radiation power density at a particular wavelength of 254 nm at a specified distance

Note 1 to entry: The spectral irradiance E_{254} is measured in $\mu W/cm^2$

3.153DV D1 ***Modification of Clause 3.153 of the Part 2 by deleting "at a particular wavelength of 254 nm"***

3.154
UV-C BARRIER
additional guard or shield that prevents UV-C light from exiting the unit or damaging internal non-metallic materials

3.155
TRANSCRITICAL REFRIGERATING SYSTEM
REFRIGERATING SYSTEM where evaporation occurs below the critical point and heat rejection may occur above the critical point of the refrigerant (e.g. R744)

3.156DV D1 ***Add the following definitions to Clause 3 of the Part 2:***

3.156DV
AFCI (ARC FAULT CIRCUIT INTERRUPTER)
a device intended to mitigate the effects of arcing faults by functioning to de-energize the circuit where an arc fault is detected

3.157DV
LCDI (LEAKAGE CURRENT DETECTION INTERRUPTER)
a device provided in a power supply cord that senses leakage current flowing between or from the integral cord conductors and interrupts the circuit at a predetermined level of leakage current

3.158DV
ADD ON HEAT PUMP
a heat pump that normally consists of an outdoor section, one or more indoor sections (without circulating fan), and related control devices

Note 1 to entry: Add on heat pumps include cooling only and heating only appliances.

3.159DV
EXTRA HARD USAGE CORD
a cord intended for use with heavy equipment, classified as the highest grade in mechanical serviceability

3.160DV
HARD USAGE CORD
a cord intended for use with moderately heavy equipment, classified as the medium grade in mechanical serviceability

3.161DV
TAPPED CONTROL CIRCUIT
a control circuit that is tapped within the equipment from the load side of the overcurrent device for the controlled load

3.162DV
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

3.163DV
MULTI-SPLIT SYSTEM
a split system air conditioner or heat pump having two or more independently controlled indoor units on a single refrigeration system

3.164DV
SAFETY SHUT-OFF VALVE
an automatically controlled refrigerant valve for the purpose of limiting the amount of refrigerant released into a space when a refrigerant leak is detected

3.165DV
RELEASABLE CHARGE (m_{REL})
the mass of refrigerant that can be released into the indoor space from a refrigerating system in the event of a leak

Note 1 to entry: The part of the refrigerant charge that leaks to the outdoors is excluded from the releasable charge.

3.166DV
PRESSURE-RELIEF VALVE
a pressure-actuated valve held shut by a spring or other means and designed to relieve excessive pressure automatically under abnormal conditions

3.167DV
FACTORY SEALED APPLIANCE
a factory charged appliance in which all refrigerating system parts have been sealed tight by welding, brazing, or a similar permanent connection during the manufacturing process and does not include service ports

3.168DV
THERMOELECTRIC HEAT PUMP
a solid-state heat pump, activated by an electric current, that takes in heat at a certain temperature and releases heat at a higher temperature

Note 1 to entry: A Peltier element is an example of such technology.

3.169DV
FUSIBLE PLUG
a fitting made with a metal of a known low melting temperature; it is used as safety device to release pressures in case of fire

3.170DV
INTERLOCK
a control to prove the physical state of a required condition, and to furnish that proof to a primary safety-control circuit

3.171DV
HOT WATER HEAT PUMP
a heat pump intended to transfer heat to water

3.172DV
HEAT RECOVERY UNIT
a system used in conjunction with air conditioning or refrigeration equipment for the purpose of extracting heat from the refrigerant to heat water

Note 1 to entry: These products include a heat exchanger and water temperature control components, and can also include additional components such as hot water storage tanks, electric heaters, and water circulating pumps.

3.173DV
HEAT PUMP POOL HEATER
a hot water heat pump intended to transfer heat to pool or spa water

3.174DV
SANITARY WATER
water suitable for human consumption

3.175DV
NON-INTEGRAL UV-C GERMICIDAL LAMP SYSTEM
an unspecified, field installed UV-C germicidal lamp system intended for installation external to the appliance in the connected ductwork and which is not specified by the appliance manufacturer for use with the appliance

3.176DV
FIELD INSTALLATION ACCESSORY
a packaged assembly of all components, instructions, warning labels, and wiring diagrams needed for field installation of an accessory or option

3.177DV
LEAK DETECTION SYSTEM
a sensing system that responds to refrigerant leaking from a refrigerating system

Note 1 to entry: A leak detection system may include gas sensing, ultrasonic, or other such methods demonstrated to be sufficiently effective.

Note 2 to entry: A refrigerant detection system is an example of a leak detection system.

3.178DV
PHOTOVOLTAIC CELL
the basic photovoltaic device that generates electricity when exposed to sunlight

3.179DV
CONVERTER
a device that accepts ac or dc power input and converts it to another form of ac or dc power

3.180DV
PHOTOVOLTAIC MODULE
a complete, environmentally protected unit consisting of solar cells, optics, and other components, exclusive of a solar tracker mechanism, designed to generate dc power when exposed to sunlight

3.181DV
SOLAR PHOTOVOLTAIC SYSTEM
the total components and subsystems that, in combination, convert solar energy into electric energy suitable for connection to a utilization load

3.182DV
STAND-ALONE SOLAR PHOTOVOLTAIC SYSTEM
a solar photovoltaic system that supplies power only to electric loads within the appliance and is not exporting to the electrical utility distribution network

3.183DV
UTILITY-INTERACTIVE SOLAR PHOTOVOLTAIC SYSTEM
a solar photovoltaic system providing power to a utilization load and operating in parallel with, and that can deliver power to, an electrical production and distribution network

3.184DV
PHOTOVOLTAIC CIRCUIT COMBINER
a product that connects the outputs of multiple photovoltaic source circuits into a combined output circuit or circuits

Note 1 to entry: These devices are commonly referred to as a "PV combiner box" or "PV string combiners". These products will be referred to as "combiner unit(s)" to minimize text.

3.185DV
INVERTER
an electronic device that changes dc power to ac power

3.186DV
PHOTOVOLTAIC RAPID SHUTDOWN EQUIPMENT (PVRSE)
equipment intended to be used in a PHOTOVOLTAIC RAPID SHUTDOWN SYSTEM to initiate, disconnect, isolate, or attenuate the controlled conductors of a SOLAR PHOTOVOLTAIC SYSTEM

3.187DV
PHOTOVOLTAIC RAPID SHUTDOWN SYSTEM (PVRSS)
a system consisting of PHOTOVOLTAIC RAPID SHUTDOWN EQUIPMENT intended to initiate, in addition to disconnect, isolate, or attenuate, the controlled conductors of a SOLAR PHOTOVOLTAIC SYSTEM

3.188DV
SENSING ELEMENT
a part of the refrigerant sensor that varies electronically or otherwise based on the presence of a concentration of the gas or vapor to be measured

3.189DV
REFRIGERANT SENSOR
a SENSING ELEMENT, combined with electronic circuitry, that provides a digital output or an analog signal output that corresponds to the sensed refrigerant gas concentration

3.190DV
LIMITED LIFE REFRIGERANT SENSOR
a REFRIGERANT SENSOR which has a known end of life from its date of manufacture and is expected to be replaced within the expected life of the appliance

Note 1 to entry: The REFRIGERANT SENSOR functions as an open sensor when the end of life has been reached.

3.191DV
NON-FIXED FACTORY SEALED SINGLE PACKAGE UNIT
a FACTORY SEALED SINGLE PACKAGE UNIT that is not intended to be used while fastened to a support or while secured in a specific location

NOTE 1 to entry: Portable appliances and cord-connected appliances that may be periodically or seasonally relocated by the end user are types of NON-FIXED FACTORY SEALED SINGLE PACKAGE UNITS.

3.192DV
DETECTION THRESHOLD LIMIT VALUE
the minimum refrigerant gas concentration that results in the REFRIGERANT DETECTION SYSTEM initiating a SYSTEM RESPONSE

3.193DV
SYSTEM RESPONSE
one or more actions initiated either by the REFRIGERANT DETECTION SYSTEM when the refrigerant gas concentration is above the DETECTION THRESHOLD LIMIT VALUE, or by a LEAK DETECTION SYSTEM when responding to refrigerant leaking from a REFRIGERATING SYSTEM

3.194DV
MECHANICAL VENTILATION
external air, delivered to a space via mechanical methods, that is intended to dilute released refrigerant

3.195DV
COMPUTER ROOM
a room or portions of a building serving an ITE load less than or equal to 10 kW, or 215 W/m^2 (20 W/ft^2) or less of conditioned floor area

3.196DV
DATA CENTER
a room or building, or portions thereof, including computer rooms, being served by the data center systems, serving a total ITE load greater than 10 kW and 215 W/m^2 (20 W/ft^2) of conditioned floor area

3.197DV
INFORMATION TECHNOLOGY EQUIPMENT (ITE)
equipment that includes computers, data storage, servers, and network/communication equipment

3.198DV
INFORMATION TECHNOLOGY EQUIPMENT FACILITIES (ITEF)
data centers and computer rooms used primarily to house information technology equipment

3.199DV
GROUP CONTROLLER or GROUP CONTROL
an electrical or electronic control system that monitors and responds to multiple distinct inputs from more than one appliance or unit

3.200DV
PRESSURE VESSEL
any refrigerant-containing receptacle in a refrigerating system. This does not include evaporators where each separate evaporator section does not exceed 0.014 m^3 (0.5 ft^3) of refrigerant-containing volume, regardless of the maximum inside dimension. This also does not include evaporator coils, compressors, condenser coils, controls, headers, pumps, and piping

3.201DV
WARM-UP TIME
the time interval, with the equipment in a stated atmosphere, between the time when the equipment is switched on and the time when the indication or output reaches and remains within the stated tolerances to the indication or output expected for the atmosphere

Note 1 to entry: The stated atmosphere may be clean air or a test gas with known volume fraction.

Note 2 to entry: The stated tolerances include the calibration accuracy for shift and drift.

3.202DV
ITE AREA
an area of a building consisting of one or more rooms where the ITE is located, including support rooms served by the same special air-conditioning/air handling equipment as an ITE ROOM

3.203DV
ITE ROOM
a room within the ITE AREA that contains the ITE

3.204DV
ITE ENCLOSURE
a rack, cabinet, or chassis that is designed to mount and enable appropriate ventilation of ITE

3.205DV
ITE COOLING APPLIANCE or SYSTEM
an appliance or equipment that is designed specifically for the cooling of ITE, ITE ROOMS, and ITE AREAS such as DATACENTERS or COMPUTER ROOMS. An ITE COOLING APPLIANCE may be considered a PARTIAL UNIT if it is configured with refrigerant-containing components (other than piping) and does not encompass a complete refrigerant system

3.206DV
EFFECTIVE DISPERSAL VOLUME
the volume of the space or connected spaces in which leaked refrigerant will disperse

3.207DV
MAXIMUM RATED CURRENT (MRC)
the current resulting when a hermetic refrigerant motor-compressor and an ELECTRONIC CIRCUIT are operated under any conditions such as maximum speed/maximum load, maximum speed/minimum load, minimum speed/minimum load, and minimum speed/maximum load, including locked-rotor, such that current to the motor-compressor and ELECTRONIC CIRCUIT is at a maximum. The MRC is the current at the output of the ELECTRONIC CIRCUIT controlling device

3.208DV
TOUCH CURRENT
the electric current through a human body or through an animal body when it touches one or more accessible parts of an installation or of equipment

[SOURCE: IEC 60050-195, 195-05-21]

3.209DV
POTENTIAL LEAK POINT
any point in the REFRIGERATING SYSTEM that can be a weak point due to manufacturing processes, exposure to damage, sharpness of a bend, or similar stresses

Note 1 to entry: POTENTIAL LEAK POINTS can include parts under stress or vibration.

3.210DV
CONTROL PANEL ENCLOSURE
a surrounding case for electrical components constructed to provide a degree of protection to personnel against access to hazardous parts, and to provide a degree of protection to the enclosed equipment against specified environmental conditions

4 General requirement

This clause of Part 1 is applicable.

4DV.1 D2 *Modification of Clause 4 of this Part 2 by addition of the following:*

References to "REFRIGERANT DETECTION SYSTEM" in this Part 2 shall be replaced with "LEAK DETECTION SYSTEM", unless the context is specific to REFRIGERANT DETECTION SYSTEMS.

Alternative technologies for leak detection may be applied in place of REFRIGERANT DETECTION SYSTEMS if shown to provide equivalent performance relative to safety.

All references to *LFL* in this standard shall be taken as *LFL* at sea level, unadjusted for altitude

***LFL* and molar mass (M) for refrigerant blends shall be based on the worst case of formulation for flammability (WCF) composition. Data for *LFL* and molar mass (M) shall be as published in ANSI/ASHRAE 34 and addenda, or if not available in ANSI/ASHRAE 34, then as published in ISO 817 and amendments. If not available in either, then the data shall be as determined per tests in accordance with ANSI/ASHRAE 34.**

Note: Data are listed in Annex BB.

The refrigerant used for all tests shall meet the purity and composition specifications of AHRI 700. Any refrigerant blends used for tests shall be within the composition tolerances from the nominal composition as published in ANSI/ASHRAE 34 and addenda, or if not available in ANSI/ASHRAE 34, then as published in ISO 817 and amendments.

All references to "water" in a secondary loop system shall include all types of heat transfer liquids.

4DV.2 DC *Modification of Clause 4 in the Part 2 by adding the following:*

In Canada, general requirements applicable to these products are provided in CSA C22.2 No. 0.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.2 *Addition:*

The testing of Clause 21 may be carried out on separate samples. The testing of Clauses 11, 19 and 21 shall require that pressure measurements be made at various points in the REFRIGERATING SYSTEM.

At least one additional specially prepared sample is required for the tests of Annex FF (Leak simulation tests), if that test option is selected.

The temperatures on the refrigerant piping should be measured during the test of Clause 11.

If the tests of Annex LL are carried out, at least two additional sensors are needed.

If the test of Annex NN has to be carried out, an additional appliance may be used.

Due to the potentially hazardous nature of the tests of Clause 21 and Annexes EE and FF, special precautions need to be taken when carrying out the tests.

5.2DV D2 *Modification of Clause 5.2 in Part 1 by adding the following:*

The tests of Clauses 15 and 16 may be conducted on separate samples.

The tests shall be carried out in the order of the clauses. However, the tests of Clauses 15 and 16 may be carried out at any time.

The tests of Clause 21 may be carried out on separate samples. The tests of Clauses 11, 19 and 21 shall require that pressure measurements be made at various points in the refrigerating system.

NOTE 1DV For reference purposes, the temperatures on the refrigerant piping can be measured during the test of Clause 11.

If the tests of Annex FF (leak simulation tests) and Annex 101.DVQ (test method for determining releasable charge) are carried out, at least one additional specially prepared sample is required.

If the tests of Annex LL are carried out, additional refrigerant sensors are needed.

If the test of Annex NN has to be carried out, an additional appliance may be used

The test of Clauses 19.104 may be run in any sequence within Clause 19.

5.3DV D2 *Modification of Clause 5.3 in the Part 1 by adding the following:*

The test of Clauses 19.101 through 19.105DV may be run in any sequence within Clause 19.

5.6 *Addition:*

Any controls which regulate the temperature or humidity of the conditioned space are rendered inoperative during the test.

5.7 *Replacement:*

The tests and test conditions of Clauses 10 and 11 are carried out under the most severe operating conditions within the operating temperature range specified by the manufacturer. Annex AA provides examples of such temperature conditions.

5.7ADV D1 *Add Clause 5.7ADV.1 to Clause 5.7 of the Part 2:*

5.7ADV.1 See normative Annex 101.DVA for the minimum test conditions.

5.10 *Addition:*

For split-package units, the refrigerant lines shall be installed in accordance with the installation instructions. The length of pipe shall be between 5 m and 7,5 m. The thermal insulation of the refrigerant lines shall be applied in accordance with the installation instructions.

5.10DV D2 ***Modification by replacing the second sentence of Clause 5.10 of this Part 2 with the following:***

The line length shall be not less than 5 m but may be greater than 7,5 m. Where the installation instructions specify a maximum pipe length of less than 5 m, the length of pipe shall be the maximum length specified in the installation instructions. Where the installation instructions specify a minimum pipe length of more than 7,5 m, the length of pipe shall be the minimum length specified in the installation instructions.

5.101 *Motor-compressors are also subjected to the relevant test of Clause 19 of IEC 60335-2-34:2012, unless the motor-compressor complies with that standard, in which case it is not necessary to repeat these tests.*

5.101DV D1 ***Modification of Clause 5.101 of this Part 2 as follows:***

Replace "IEC 60335-2-34:2012" with "UL 60335-2-34:2017 and CAN/CSA 60335-2-34:17".

5.102 *Motor compressors that are tested and comply with IEC 60335-2-34 need not be additionally tested for Clause 21.*

5.102DV D1 ***Modification of Clause 5.102 of this Part 2 as follows:***

Replace "IEC 60335-2-34" with "UL 60335-2-34 and CAN/CSA 60335-2-34".

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 *Modification:*

Appliance shall be of CLASS I, CLASS II or CLASS III.

6.2 *Addition:*

Appliances shall be classified according to degree of protection against harmful ingress of water in accordance with IEC 60529:

• appliances or parts of appliances intended for outdoor use shall be at least IPX4;

• appliances intended only for indoor use (excluding laundry rooms) may be IPX0;

• appliances intended to be used in laundry rooms shall be at least IPX1.

6.2DV D1 ***Modification of the first bullet point in Clause 6.2 of the Part 2 by adding "or classified "For Outdoor Use" according to Annex 101.DVO."***

6.101 Appliances shall be classified according to the accessibility either as APPLIANCE ACCESSIBLE TO THE GENERAL PUBLIC or as APPLIANCE NOT ACCESSIBLE TO THE GENERAL PUBLIC.

Compliance is checked by inspection and the relevant tests.

6.102DV D1 ***Add the following subclause to Clause 6 of the Part 2:***

Appliances shall be classified according to the methods of shipping.

The method of shipping can be utilized for testing in Clause 21.2DV.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Modification:*

Replace the second dash by:

– symbol for nature of supply including number of phases, unless for single phase operation;

Addition:

– RATED FREQUENCY;

– REFRIGERANT CHARGE for each REFRIGERATING SYSTEM;

– refrigerant number in accordance with ISO 817;

– permissible excessive operating pressure for the storage tank (for SANITARY HOT WATER HEAT PUMPS);

– MAXIMUM ALLOWABLE PRESSURE in the water and/or brine circuit for the HEAT EXCHANGER for HYDRONIC FAN COIL UNITS;

– MAXIMUM ALLOWABLE PRESSURE for the refrigerant circuit; if the permissible excessive operating pressure for the suction and discharge side differ, a separate indication is required;

– for PRE-CHARGED PIPE SETS

- refrigerant number in accordance with ISO 817;
- the REFRIGERANT CHARGE in the line set;
- MAXIMUM ALLOWABLE PRESSURE;

– ratings in watts and voltage of a UV-C GERMICIDAL LAMP SYSTEM if employed.

Appliances shall be marked with all of the designations and the rated inputs of the SUPPLEMENTARY HEATERS for which they are intended to be used, and shall have provision for identifying the actual heater that is field installed.

Unless it is evident from the design, the enclosure of the appliance shall be marked, by words or by symbols, with the direction of the fluid flow.

For appliances using FLAMMABLE REFRIGERANTS, the flame symbol ISO 7010-W021 (2011-05) and the operator's manual symbol described in 7.6 shall be visible when viewing the appliance after it has been installed. The marking may be behind a detachable part that has to be detached before maintenance or repair work. The perpendicular height of the triangle used for the symbol shall be at least 30 mm. For appliances that are not single packaged units, the required markings shall be provided on all indoor and outdoor units which complete the REFRIGERATING SYSTEM when installed. When an A2L REFRIGERANT is used, the flame symbol ISO 7010-W021 (2011-05) shall be replaced with the A2L symbol described in 7.6.

If a FLAMMABLE REFRIGERANT is used, the symbols for "read operator's manual", "operator's manual; operating instructions" and "service indicator; read technical manual" (symbols ISO 7000-0790 (2004-01), and ISO 7000-1659 (2004-01)) including colour and format shall be placed on the appliance in a location visible to the persons required to know the information. The perpendicular height of the symbol shall be at least 10 mm.

If a FLAMMABLE REFRIGERANT is used, an additional warning symbol (flame symbol: ISO 7010-W021 (2011-05)) shall be placed on the nameplate of the unit near the declaration of the refrigerant type and charge information. The perpendicular height of the symbol shall be at least 10 mm, and the symbol need not be in colour. When an A2L REFRIGERANT is used, the flame symbol ISO 7010-W021 (2011-05) shall be replaced with the A2L symbol described in 7.6.

The following warning shall also be applied to the non-fixed appliance when a FLAMMABLE REFRIGERANT is employed. The warning shall be placed on the outside of the appliance such that it is visible when in service for NON-FIXED APPLIANCE.

WARNING Appliance shall be installed, operated and stored in a room with a floor area larger than 'X' m^2.

The minimum room size X shall be specified on the appliance. The X in the marking shall be determined in m^2 according to Annex GG; the marking shall not be required if the REFRIGERANT CHARGE (m_c) of the appliance is up to m_1 according to GG.1.2.

NOTE 101 For the REFRIGERATING SYSTEM, if the MAXIMUM ALLOWABLE PRESSURE of the LOW-PRESSURE SIDE and the HIGH-PRESSURE SIDE is the same, a single indication is permitted.

If not already visible when accessing a SERVICE PORT and if a SERVICE PORT is provided, the SERVICE PORT shall be marked to identify the type of refrigerant. If the refrigerant is flammable, symbol ISO 7010-W021 (2011-05) shall be included, without specifying the colour. When an A2L REFRIGERANT is used, the flame symbol ISO 7010-W021 (2011-05) shall be replaced with the A2L symbol described in 7.6.

Appliances employing REFRIGERATING SYSTEMS with MAXIMUM ALLOWABLE PRESSURES greater than 7 MPa shall be marked with symbol ISO 7000-1701 (2004-01) followed by the text "(X) MPa" and the Operator's manual; operating instructions symbol ISO 7000-1641 (2004-01).

Where: "X" is not less than the MAXIMUM ALLOWABLE PRESSURE as determined in Annex EE.

7.1DV.1 DR *Modification of Clause 7.1 of the Part 1 by adding the following to the third dashed item:*

Only applies to cord connected appliances;

7.1DV.2 DR *Modification of Clause 7.1 of the Part 2 by adding the following dashed items after the first dashed item in the "Addition":*

– motor [full load amps (FLA) and horsepower (Hp)]

For motors controlled by adjustable speed drive, FLA shall be replaced with either the motor's maximum operating current (MOC) or the rated input current of the power conversion equipment. When there is bypass utilized, the FLA shall be replaced with the largest of the motor's MOC, the rated input current to the power conversion equipment, or the FLA of the motor.

– total input current (cord connected units);

– minimum circuit ampacity (MCA) (permanently connected equipment only);

– motor compressor ratings rated load amps (RLA) as determined in Annex 101.DVB, and locked rotor amps (LRA);

For motor-compressors controlled by adjustable speed drive, RLA and LRA shall be replaced with the rated input current of the power conversion equipment.

– rating of overcurrent protective device (MOP) (permanently connected equipment only);

– branch circuit selection current (BCSC)

– if the motor-compressor maximum continuous current (MCC) exceeds 1.56 of the marked equipment nameplate RLA, or MRC;

– the short-circuit current rating (SCCR) as determined in Annex 101.DVB for motor controllers, equipment control panels, overall equipment panels, or industrial control panels when employed with multiple motor load and combination load equipment;

The short-circuit current rating of motor controllers, overall equipment panels, equipment control panels, or industrial control panels shall include the following marking or the equivalent as specified for the motor controllers, equipment control panels, overall equipment panels, or industrial control panels: "Short-circuit current: ____kA rms symmetrical, ___V maximum".

Equipment intended for use in one- and two-family dwellings, cord- and attachment plug–connected equipment, or equipment supplied from a branch circuit protected at 60 A or less is not required to be marked with a short-circuit current rating.

– manufacturing date or date code and location if the product is produced in more than one location;

– units with hot water coils shall be marked with the maximum inlet water temperature;

– units with steam coils shall be marked with the MAXIMUM ALLOWABLE PRESSURE at which the steam coil is intended to be used;

7.1DV.3 DR *Modification of Clause 7.1 of the Part 2 by replacing the third dashed item in the "Addition" with the following:*

– refrigerant or refrigerants as designated under ISO 817. A means shall be provided to permanently identify the refrigerant installed. Appliances using flammable refrigerants shall not be marked with alternative refrigerants of different classification per ISO 817;

7.1DV.4 DR *Modification of Clause 7.1 of the Part 2 by replacing the seventh dashed item in the "Addition" with the following:*

– for pre-charged pipe sets

- refrigerant number in accordance with ISO 817;
- the refrigerant charge in the line set;
- maximum allowable pressure;
- symbol ISO 7010-W021. When an A2L refrigerant is used, the flame symbol ISO 7010-W021 shall be replaced with the A2L symbol described in Clause 7.6.

7.1DV.5 DR *Modification of the paragraph above Note 101 in Clause 7.1 of the Part 2 by adding the following:*

The value of "X" in the warning for non-fixed appliances with flammable refrigerants shall be provided in both m^2 and ft^2.

For ITE COOLING APPLIANCES complying with Annex 101.DVN, which are not FIXED APPLIANCES, the following warning shall be applied when an A2L refrigerant is employed. The warning shall be placed on the outside of the appliance such that it is visible when it is not in use.

WARNING

Appliance shall be installed and operated in a room with an EFFECTIVE DISPERSAL VOLUME larger than 'A' m^3 ('B' ft^3).

When stored in an unpowered state, the appliance must be stored in a room with a floor area larger than 'X' m^2 ('Y' ft^2).

The minimum EFFECTIVE DISPERSAL VOLUME 'A' and the minimum room size 'X' shall be specified on the appliance. The 'A' in the marking shall be determined in m^3 (ft^3) according to Clause 101.DVN.8. The 'X' in the marking shall be determined in m^2 (ft^2) according to Annex GG. The marking shall not be required if the refrigerant charge (m_c) of the appliance is less than or equal up to m_1 according to Clause GG.1.2.

7.1DV.6 DR *Modification of Clause 7.1 of the Part 2 to add the following at the end:*

A PARTIAL UNIT or auxiliary devices that cannot be marked or provided with a nameplate, such as uncased coils, shall be provided with a distinctive model, part number, or type designation or the equivalent legibly marked on a tag attached to the partial unit or device.

7.1DV.7 DR *Modification of Clause 7.1 of the Part 2 to add the following at the end:*

If an A2 or A3 flammable refrigerant is used, the air conditioning equipment shall have red [Pantone® Matching System (PMS) #185] marked service ports, pipes, hoses, and other devices through which the refrigerant is serviced. This color shall be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (e.g., process tubes). The color mark shall extend at least 25 mm (1 in) from the refrigerant servicing point and shall be replaced if removed.

7.1DV.8 D1 *Modification of Clause 7.1 of the Part 2 to add the following at the end:*

If the refrigerant is flammable, the symbol of the United Nations GHS or a combination of the United Nations GHS and ISO 7010-W021 symbols, including the refrigerant class per ISO 817, shall be visible when accessing a SERVICE PORT and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (e.g., process tubes). The symbol shall be in color.

7.1DV.9 D1 *Modification of Clause 7.1 of the Part 2 by addition of the following at the end:*

Where alternative refrigerants are marked on the nameplate, all markings and instructions shall be provided for each of the refrigerants marked on the nameplate.

7.1DV.10 D1 *Modification of Clause 7.1 of the Part 2 by addition of the following at the end:*

Appliances using flammable refrigerants shall also comply with Annex 101.DVF.

7.1DV.11 D1 *Modification of Clause 7.1 of the Part 2 by adding the following at the end:*

The marking symbol ISO 7000-1701 shall be visible within sight of the refrigerant service ports.

7.1DV.12 D1 *Modification of Clause 7.1 of the Part 2 by adding the following at the end:*

In all cases in Clause 7.1, where reference is made to ISO 7010-W021, it shall be replaced with "ISO 7010-W021 including the refrigerant class per ISO 817". All references in Clause 7.1 to the A2L symbol in Clause 7.6 do not apply. This applies to all flammable refrigerants. All references in Clause 7.1 stating the essence of "when an A2L refrigerant is used, the flame symbol ISO 7010-021 shall be replaced with the A2L symbol in Clause 7.6" do not apply.

7.1DV.13 D1 ***Modification of Clause 7.1 of the Part 2 by adding the following at the end:***

Refrigerant to water heat exchangers intended to heat water not intended for human consumption shall be marked with "Not Suitable for Potable Water Connection" at the point of the water connections.

For refrigerant to water heat exchangers intended to heat water, the water inlet and outlet, or the direction of flow, shall be marked.

7.1DV.14 D1 ***Modification of Clause 7.1 of the Part 2 by addition of the following at the end:***

Note 101DV: Note 101 does not apply.

Appliances classified according to Clause 6.101 as APPLIANCES NOT ACCESSIBLE TO THE GENERAL PUBLIC, shall be marked "For Installation Only in Locations Not Accessible to the General Public".

NOTE 102DV: Additional requirements, such as those in Clause 7.112DV.1, may also apply to these appliances.

7.1DV.15 D1 ***Modification of Clause 7.1 of the Part 1 by adding the following to the seventh dashed item:***

or "For Outdoor Use" per Annex 101.DVO;

7.1DV.16 D1 ***Modification of Clause 7.1 of the Part 2 by replacing the sixth dashed item with the following:***

– maximum allowable pressure for the refrigerant circuit; if the maximum allowable pressure for the suction and discharge side differ, both suction and discharge pressures shall be marked;

7.1DV.17 D1 ***Modification of Clause 7.1 of the Part 2 by replacing the fourth paragraph with the following:***

For appliances using FLAMMABLE REFRIGERANTS, the flame symbol of the United Nations GHS and the operator's manual symbol described in Clause 7.6 shall be visible when viewing the appliance after it has been installed. The marking may be behind a detachable part that has to be detached before maintenance or repair work. The perpendicular height of the diamond used for the symbol shall be at least 30 mm. For appliances that are not single packaged units, the required markings shall be provided on all indoor and outdoor units complete the REFRIGERATING SYSTEM when installed. When an A2L REFRIGERANT is used, the flame symbol ISO 7010-W021 (2011-05) shall be replaced with the United Nations GHS symbol described in Clause 7.6.

7.1DV.18 DR ***Modification of Clause 7.1 of the Part 2 by adding the following to the end:***

For units evaluated to Annex 101.DVN, there shall be a marking on the nameplate stating the following:

“For use in ITE cooling applications only.”

7.1DV.19 DR *Modification of Clause 7.1 of the Part 2 by adding the following to the end:*

Pressurized control panels used for Clause 22.116DV.2 but not complying with ANSI/NFPA 496 or UL 60079-2 shall be marked with the following:

− intended external area classification for the protected enclosure (either the class and division or the zone); and

− pressurization type.

7.1DV.20 DR *Modification of Clause 7.1 of the Part 2 by replacing the sixth paragraph of with the following:*

If a flammable refrigerant is used, a warning symbol [flame symbol: ISO 7010-W021 (2011-05)] including the safety group per ISO 817, as described in Clause 7.6, shall be placed within sight of the marking of the refrigerant designation on the appliance. The height of the symbol shall be at least 10 mm.

NOTE 103DV The refrigerant designation is typically found on the nameplate of the appliance.

7.2DV D1 *Modification of Clause 7.2 of the Part 1 by replacing it with the following:*

Appliances shall be marked in letters not less than 3.2 mm (1/8 in) high on all panels providing access to hazardous voltage uninsulated live parts with the substance of the following:

“WARNING: RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH. DISCONNECT All REMOTE ELECTRIC POWER SUPPLIES BEFORE SERVICING”, or the equivalent.

For equipment with multiple hazardous voltage power supplies, this marking shall be located on all panels providing access to hazardous voltage uninsulated live parts.

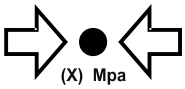
7.4DV D1 *Modification of Clause 7.4 of the Part 1 by replacing it with the following:*

For FIXED APPLIANCES, a wiring diagram shall be provided on the unit.

For any appliance that can be adjusted for different RATED VOLTAGES or RATED FREQUENCIES, the voltage or the frequency to which the appliance is adjusted shall be clearly discernible. If frequent changes in voltage setting or frequency setting are not required, this requirement is considered to be met if the RATED VOLTAGE or RATED FREQUENCY to which the appliance is to be adjusted can be determined from a wiring diagram affixed to the appliance.

NOTE The wiring diagram may be on the inside of a cover that has to be removed to connect the supply conductors. Material may be paper or the equivalent.

7.6 *Addition:*

	[symbol ISO 7010-W021 (2011-05)]	warning; flammable materials
	[symbol ISO 7000-1659 (2004-01)]	service indicator; read technical manual
	A2L symbol	warning; low burning velocity material
	[symbol ISO 7000-1701 (2004-01)]	pressure
	[symbol IEC 60417-6040 (2010-08)]	ultraviolet radiation, instructional safeguard
	[symbol ISO 7000-1641 (2004-01)]	operator's manual; operating instructions

su3105

7.6DV D1 ***Modification of Clause 7.6 of the Part 2 by addition of the following:***

Replace symbol ISO 7010-W021 with the UN GHS (Globally Harmonized System of Classification and Labeling of Chemicals) flame symbol or a combination of the modified ISO 7010-W021 and the UN GHS flame symbols as shown below:

su4470a

Refrigerant Safety Group AXX

or

Refrigerant
Safety Group
AXX

The refrigerant safety group shall be listed in alphanumeric form, as designated in ISO 817.

Note 1DV: The UN GHS flame symbol is a red bordered diamond symbol, and the ISO 7010-W021 symbol is the yellow triangle.

The safety group shall be in text not less than 1/3 the height of the symbol.

The size of the UN GHS and the ISO flame symbols shall be a minimum of 15 mm in height.

7.12 *Addition:*

For APPLIANCES NOT ACCESSIBLE TO THE GENERAL PUBLIC, the classification according to 6.101 shall be included.

For appliances using FLAMMABLE REFRIGERANTS, an installation, service and operation manual, either separate or combined manuals, shall be provided and include the information given in Annex DD.

7.12.1 *Addition:*

In particular, the following information shall be supplied:

• that the appliance shall be installed in accordance with national wiring regulations;

• the dimensions of the space necessary for correct installation of the appliance including the minimum permissible distances to adjacent structures;

• for appliances with SUPPLEMENTARY HEATERS, the minimum CLEARANCE from the appliance to combustible surfaces;

• a wiring diagram with a clear indication of the connections and wiring to external control devices and SUPPLY CORD;

• the range of external static pressures at which the appliance was tested (add-on HEAT PUMPS and ducted appliances with SUPPLEMENTARY HEATERS only);

• the method of connection of the appliance to the electrical supply and interconnection of separate components;

• indication of which parts of the appliance are suitable for outdoor use, if applicable;

• details of type and rating of fuses, or rating of circuit breakers;

• details of supplementary heating elements that may be used in conjunction with the appliance, including fitting instructions either with the appliance or with the SUPPLEMENTARY HEATER;

• maximum and minimum water or brine operating temperatures;

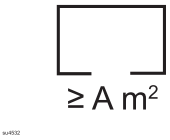
• maximum and minimum water or brine operating pressures;

• instructions on charging of refrigerants when addition of charge is required by the manufacturer for completing the REFRIGERATING SYSTEM.

Open storage tanks of HEAT PUMPS for water heating shall be accompanied by an instruction sheet which shall state that the vent shall not be obstructed.

7.12.1DV D1 ***Modification of Clause 7.12.1 of the Part 2 by adding the following:***

• when the symbol IEC 60417-6412 (2019-03) is used, a warning that the appliance shall be installed, operated and stored in a room with a floor area not less than the minimum room area.



7.12.9DV DR ***Add the following subclauses to Clause 7.12 of the Part 1:***

7.12.9DV.1 For each language, the instructions specified in Clause 7.12 and from Clauses 7.12.1 to 7.12.8 shall be in hard copy format and shall appear together before any other instructions supplied with the appliance. Alternatively, these instructions may be supplied with the appliance separately from any functional use booklet. They may follow the description of the appliance that identifies parts, or follow the drawings/sketches common to the languages of the instructions.

Compliance is checked by inspection.

7.12.9DV.2 For appliances using FLAMMABLE REFRIGERANTS, an installation manual, a service, maintenance and repair manual, and a decommissioning manual (either as separate or combined manuals) shall be made available and include the information given in Annex DD.

Compliance is checked by inspection.

Additional guidance on transportation, marking and storage for units that employ FLAMMABLE REFRIGERANTS is given in Annex CC.

7.15 *Addition:*

A marking may be located on a panel that can be removed for installation or service, providing that the panel shall be in place for the intended operation of the appliance.

7.101 A marking shall be provided for a replaceable fuse or a replaceable overload PROTECTIVE DEVICE provided as a part of a product or remote control assembly. It shall be visible when the cover or door of the compartment is open. This marking shall specify

• the rating of the fuse in amperes, the type and voltage rating, or

• the manufacturer and model designation of the replaceable overload protective device.

Compliance is checked by inspection.

7.101DV D1 ***Modification of Clause 7.101 of the Part 2 by replacing the second sentence with the following:***

The marking shall be visible when the cover or door of the compartment is open, or on the electrical wiring diagram or nameplate.

7.102 If the product is intended for permanent connection to fixed wiring with aluminium wires, the marking shall so state.

Compliance is checked by inspection.

7.103 For appliances made up of more than one factory made assembly specified by the manufacturer to be used together, instructions shall be provided for completing the assembly to ensure compliance with the requirements.

7.103DV D1 ***Modification of Clause 7.103 of the Part 2 by adding the following:***

Compliance is checked by inspection.

7.104 For PARTIAL UNITS, the instructions or markings shall include the following additional information.

• For EVAPORATING UNITS and CONDENSING UNITS, the instructions or markings shall include a wording to assure that the maximum operating pressure is considered when connecting to any CONDENSER UNIT or EVAPORATOR UNIT.

• For EVAPORATING UNITS, CONDENSING UNITS and CONDENSER UNITS, the instructions or markings shall include refrigerant charging instructions.

• A warning to assure that PARTIAL UNITS shall only be connected to an appliance suitable for the same refrigerant.

• This unit <model xxx> is a PARTIAL UNIT AIR CONDITIONER, complying with PARTIAL UNIT requirements of this International Standard, and must only be connected to other units that have been confirmed as complying to corresponding PARTIAL UNIT requirements of this International Standard.

• The electrical interfaces shall be specified with purpose, voltage, current, and safety class of construction.

• The SELV connection points, if provided, are to be clearly indicated in the instructions. The connection point should be marked with the “read the instructions” symbol per ISO 7000-0790 (2004-01) and the Class III symbol according to IEC 60417-5180 (2003-02).

7.104DV D1 ***Modification of Clause 7.104 of the Part 2 by replacing the fourth bullet with the following:***

• This unit <model xxx> is a PARTIAL UNIT AIR CONDITIONER, complying with PARTIAL UNIT requirements of this Standard, and must only be connected to other units that have been confirmed as complying to corresponding PARTIAL UNIT requirements of this Standard, UL 60335-2-40/CSA C22.2 No. 60335-2-40, or UL 1995/CSA C22.2 No 236.

7.105 For appliances using FLAMMABLE REFRIGERANTS that have safety features depending upon the proper function of a REFRIGERANT DETECTING SYSTEM, the instructions or unit markings shall contain the substance of the following:

“This unit is equipped with a refrigerant leak detector for safety. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.”

If any supplemental unit is employed to detect leaked refrigerant, such unit shall also apply this marking or be accompanied by such instructions.

Compliance is checked by inspection.

7.105DV D1 ***Modification of Clause 7.105 of the Part 2 by replacing it with the following:***

For appliances using FLAMMABLE REFRIGERANTS with safety features that depend upon the proper function of a leak detection system used for leak mitigation, the instructions and unit markings shall contain the substance of the following:

"LEAK DETECTION SYSTEM installed. Unit must be powered except for service." If any remote located REFRIGERANT SENSOR is employed to detect leaked refrigerant, such a remote located REFRIGERANT SENSOR shall also apply to this marking or be accompanied by such instructions.

For appliances using FLAMMABLE REFRIGERANTS with safety features that depend upon continuous air circulation, the instructions and unit markings shall contain the substance of the following:

"Continuous air circulation required for proper functioning. Unit must be powered except for service."

Compliance is checked by inspection.

7.106 For appliances using FLAMMABLE REFRIGERANTS that have safety features depending upon the proper function of ventilation, the instructions or unit markings shall contain the substance of the following:

“This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.”

If any supplemental unit is employed to dilute leaked refrigerant, such unit shall also apply this marking or be accompanied by such instructions.

Compliance is checked by inspection.

7.106DV D1 ***Modification of Clause 7.106 of the Part 2 by adding the following:***

The marking shall be applied to the indoor unit and any partial unit which must be powered to activate the detection system. It shall be visible after installation without the removal of panels.

7.107 For FLAMMABLE REFRIGERANTS, when addition of charge is required by the manufacturer installation instructions for completing the REFRIGERATING SYSTEM, the manufacturer shall provide a label that allows the installer to note the resulting total REFRIGERANT CHARGE for each REFRIGERATING SYSTEM. See Figure 101 for an example of label for field charged units.

7.107DV D1 ***Modification of Clause 7.107 of the Part 2 by adding the following:***

The label or other marking shall be applied as part of or adjacent to the nameplate of the compressor bearing unit.

Compliance is checked by inspection.

7.108 For appliances using FLAMMABLE REFRIGERANTS, the flame symbol described in 7.6 shall be visible in each of the following conditions:

– on the packaging of the appliance if the appliance is charged with refrigerant excluding appliances with A2L REFRIGERANT CHARGE not exceeding m_1;

– when viewing the appliance on display for sale. This does not apply to appliances using A2L REFRIGERANTS.

For appliances that are not FACTORY SEALED SINGLE PACKAGED UNITS, the required markings shall be provided on all indoor and outdoor units which complete the REFRIGERATING SYSTEM.

7.108DV D1 ***Modification of Clause 7.108 of the Part 2 by adding the following:***

The perpendicular height of the symbol shall be at minimum of 30 mm.

Compliance is checked by inspection.

For appliances using FLAMMABLE REFRIGERANTS, excluding appliances with A2L REFRIGERANT CHARGE not exceeding m_1, the flame symbol UN GHS or the combination of UN GHS flame symbol and the ISO 7010-W021 (2011-05) symbol including the safety group per Annex BB described in Clause 7.6 shall be visible on the packaging of the appliance if the appliance is charged with refrigerant.

7.109 Appliances employing UV-C GERMICIDAL LAMP SYSTEMS shall be marked with ULTRAVIOLET RADIATION hazard symbol IEC 60417-6040 (2010-08) and the Read operator's manual symbol ISO 7000-0790 (2004-01) in the following locations:

– doors and access panels that provide direct access to an area within the appliance where the measured UV-C SPECTRAL IRRADIANCE is greater than 1,7 μW/cm^2;

– USER MAINTENANCE access panels,

– UV-C BARRIERS.

Compliance is checked by inspection.

7.110 For appliances that employ UV-C GERMICIDAL LAMP SYSTEMS, the instructions shall include the substance of the following:

– this appliance contains a UV-C LAMP;

– read the maintenance instructions before opening the appliance;

– details for cleaning and other USER MAINTENANCE of the appliance. They shall state that prior to cleaning or other maintenance, the appliance must be disconnected from the supply mains;

– the method, frequency of cleaning, and necessary precautions to be taken;

– precautions to be taken when replacing UV-C emitters and starters, if applicable;

– unintended use of the appliance or damage to the housing may result in the escape of dangerous UV-C radiation. UV-C radiation may, even in small doses, cause harm to the eyes and skin;

– appliances that are obviously damaged must not be operated;

– the appliance must be disconnected from the supply before replacing the UV-C LAMP;

– doors and access panels bearing the ultraviolet radiation hazard symbol which may have UV-C SPECTRAL IRRADIANCE greater than 1,7 μW/cm^2 are provided with an interlock switch to interrupt the power to the UV-C LAMPS for your safety. Do not over-ride;

– before opening doors and access panels bearing the ULTRAVIOLET RADIATION hazard symbol for the conducting USER MAINTENANCE, it is recommended to disconnect the power;

– UV-C BARRIERS bearing the ULTRAVIOLET RADIATION hazard symbol should not be removed;

– for appliances with UV-C LAMPS, information on the replacement of UV-C LAMPS shall be given, including the model and/or part number;

– if field installed, the factory specified UV-C GERMICIDAL LAMP SYSTEMS approved for use with the subject product shall be specified in the instructions by the specific model number;

– do not operate UV-C LAMPS outside of the appliance.

Compliance is checked by inspection

7.111 For appliances employing REFRIGERATING SYSTEMS with MAXIMUM ALLOWABLE PRESSURES greater than 7 MPa, the instructions shall include the substance of the following:

– WARNING: System contains refrigerant under very high pressure. The system must be serviced by qualified persons only.

7.111DV D1 ***Modification of Clause 7.111 of the Part 2 by replacing it with the following:***

An appliance employing REFRIGERATING SYSTEMS with MAXIMUM ALLOWABLE PRESSURE greater than 7 MPa shall be marked within sight of the refrigerant service ports with the following:

a) WARNING: System contains refrigerant under very high pressure. The system must be serviced by qualified persons only. This warning shall also be included in the instructions.

b) With the symbol ISO 7000-1701 (2004-01), including the text "(X) MPa", where "X" is not less than the MAXIMUM ALLOWABLE PRESSURE as determined in EE.2DV.

Compliance is checked by inspection

7.112DV DR ***Add subclauses 7.112DV.1 to 7.112DV.6 to of Clause 7 of the Part 2:***

7.112DV.1 Appliances that meet the exception of Clause 20.2DV of the Part 1 shall be marked with the following where readily visible after installation:

"CAUTION: Mount with the lowest moving parts at least 2.5 m (8.2 ft) above floor or grade level."

7.112DV.2 All indoor units meeting the requirements of Clause 22.125DV as ENHANCED TIGHTNESS REFRIGERATING SYSTEMS shall be marked with "ETRS" enclosed in a box on the unit rating plate, with the font size no less than 5,0 mm.

7.112DV.3 For appliances incorporating the construction described in the second item of Clause 13.2DV.1, the instructions shall include the substance of the following:

– WARNING: RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH: System contains oversize protective earthing (grounding) terminal which shall be properly connected

7.112DV.4 For appliances incorporating the construction described in the third item of Clause 13.2DV.1, the instructions shall include the substance of the following:

– WARNING: RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH: System contains two independent protective earthing (grounding) terminals which both shall be properly connected and secured

7.112DV.5 Equipment intended to utilize a TRANSCRITICAL REFRIGERATING SYSTEM and required to include pressure regulating relief valves per Item a) of Clause 22.131DV.2 shall provide instructions that indicate the following:

a) If the system is de-energized, venting of the refrigerant through the pressure-regulating relief valves on the equipment can occur. In such cases, the system might need to be recharged with refrigerant, but in any case, the pressure-regulating relief valve(s) shall not be defeated or capped. The relief setting shall not be altered.

b) A sufficient number of pressure-relief and pressure-regulating relief valves might need to be provided based on the system capacity and located such that no stop valve is provided between the relief valves and the parts or section of the system being protected.

c) If the equipment contains a pressure vessel but the pressure-regulating and -relief valves are not installed as part of the equipment as permitted by Clauses 22.131DV.3 and 22.131DV.4, the instructions shall specify

1) the method for installing the valves within the fittings, and

2) that the equipment shall be provided with an adequate number of pressure regulating and relief valves based on the system capacity and located such that no stop valve(s) are provided between the relief valve(s) and the parts or section of the system being protected.

7.112DV.6 If the equipment contains a pressure vessel within a TRANSCRITICAL REFRIGERATING SYSTEM, but pressure relief valves and pressure-regulating relief valves are not provided as part of the equipment as permitted by Clause 22.131DV.3, a marking shall be located where visible to the installer indicating that pressure-relief valves or pressure-regulating relief valves are not installed on the equipment and that a sufficient number of valves having capacity deemed adequate shall be field-installed on the system.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1.1DV.2 D1 *Modification to replace Clause 8.1.1DV.2 of the Part 1 with the following:*

In addition, test probe 18 and test probe 19 of IEC 61032 shall be applied as described for test probe B (IEC 61032) to APPLIANCES ACCESSIBLE TO THE GENERAL PUBLIC.

8.1.5 *Addition:*

As regards the products which have a dedicated installation panel or cover and which cannot be installed without them, compliance is checked according to 5.10 (after the installation as instructed in the installation manual).

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

9DV DR *Modification by replacing Clause 9 of the Part 2 with the following:*

This clause of Part 1 is applicable only for cord-connected appliances.

10 Power input and current

This clause of Part 1 is applicable.

10.101DV D1 *Modification by replacing Clause 10 of the Part 2 with the following:*

This clause of Part 1 is applicable except as follows:

For appliances other than cord connected, the rated power of Clause 10.1 or rated current of Clause 10.2 is to be measured separately for each motor load where the motor nameplate power or current is not used to determine the appliance ratings. Appliance provided with multiple supply connections to building mains for electric resistance heaters with subdivided loads shall take separate measurements for power or current for each divided load.

11 Heating

This clause of Part 1 is replaced by the following.

11.1 Appliances and their surroundings shall not attain excessive temperatures in normal use.

Compliance is checked by determining the temperatures of the various parts under the conditions specified in 11.2 to 11.7. Nevertheless, if the temperature of the motor winding exceeds the value specified in Table 3 or if there is doubt with regard to the classification of the insulation system employed in a motor, compliance is checked by the tests of Annex C.

11.1DV DR *Modification of Clause 11.1 of the Part 2 by adding the following:*

Appliances are operated until steady conditions are established. Steady conditions are established when all temperatures are constant. A temperature shall be considered constant when three successive measurements taken at 10 min intervals, at the same point of any operating cycle, do not differ by more than a 3 K which increase indicate that stabilized temperatures have been established.

In addition, the polymeric materials that enclose or support LIVE PARTS shall not exceed their relative thermal index determined in accordance with the standards in Annex DVA of the Part 1 and the Part 2.

11.2 *Appliances are installed in a test room in accordance with the installation instructions. In particular,*

• *CLEARANCES to adjacent surfaces specified by the manufacturer shall be maintained;*

• *flow rates for liquid source or sink equipment shall be the minimum specified in the instructions except for HYDRONIC FAN COIL UNITS where the flow rates and liquid temperatures shall be the maximum specified in the instructions;*

• *the outlet duct connected to the appliance shall be subjected to the maximum static pressure given in the instructions;*

• *for appliances provided with means of adjusting the flow, the flow for the tests shall be the minimum obtainable;*

• *adjustable limit controls are set at the maximum cut-out setting and the minimum differential permitted by the control adjusting means.*

For appliances provided with SUPPLEMENTARY HEATERS, an additional test casing as described in 11.9 is used.

11.2DV.1 D1 *Modification of Clause 11.2 of the Part 2 by replacing the third and fourth bullets with the following:*

1) the outlet duct connected to the appliance shall be subject to the maximum static pressure given in the instructions in heating mode and the minimum static pressure given in the instructions in cooling mode;

2) for appliances provided with means of adjusting the conditioned airflow, the initial airflow for the test shall be the minimum obtainable in heating mode and the maximum obtainable in cooling mode per the manufacturer's instructions.

11.2DV.2 D1 *Modification of Clause 11.2 of the Part 2 by adding the following bullet:*

1) appliances with air filters that are not factory provided and not specified for field installation shall be tested with 2 mm water column added to the manufacturer's maximum specified external static pressure.

11.2.1 *For heating tests of ducted appliances with SUPPLEMENTARY HEATERS, an inlet duct is connected to the inlet air opening of the appliance (assuming that the appliance is intended to be so applied). The duct shall be the same size as the flanges, if flanges are provided. If flanges are not provided, the duct is the same size as the inlet opening.*

An appliance that includes or has provision for SUPPLEMENTARY HEATER is fitted with a metal outlet duct in accordance with Figure 102a) or Figure 102b), depending on the direction of the airflow.

The inlet duct is provided with an adjustable restricting means by which the airflow can be reduced.

The restriction should be uniform across the duct's cross sectional area, so that the full heating coil surface will be exposed to the airflow except when the restriction is closed.

11.2.1DV.1 DE *Modification of Clause 11.2.1 in the Part 2 to add a note as follows:*

NOTE 1DV For horizontal ducted products, reference Figure 102a, rotated 90 degrees counterclockwise.

11.2.1DV.2 D2 *Modification of Clause 11.2.1 in the Part 2 by adding the following:*

For the tests of Clause 11 and Clause 19, the distance from the air outlet opening of the appliance to the furthest point on the test duct, perpendicular to the outlet opening, shall be no more than

a) for upflow appliances $(AB)^{1/2}$, as shown in Figure 102 a), or the minimum distance specified by the manufacturer, whichever is lower; and

b) for downflow appliances [300 + $(AB)^{1/2}$], as shown in Figure 102 b), or the minimum distance specified by the manufacturer, whichever is lower.

NOTE 2DV Appliances may be specified by the manufacturer for use in applications with limited space for the appliance and connected ducts. For example:

– For upflow appliances intended for use in manufactured (mobile) homes, the combined height of the appliance and ducts are typically limited to 2.1 m (7 ft) minus the specified clearance to combustible material.

– For downflow appliances intended for use in manufactured (mobile) homes, the distance from the air outlet opening to the furthest point on the test duct, perpendicular to the outlet opening, is typically reduced to not less than [25.4 + (AB)$^{1/2}$].

11.2.1DV.3 D2 *Modification of Clause 11.2.1 in the Part 2 by adding the following:*

For appliances with water heat exchangers intended to heat water and that are provided with storage tanks, after a full tank of water has been heated to the temperature at which the temperature-regulating thermostats open, one-fourth of the water shall be drawn off and replaced promptly with cold water. The cold water entering temperature shall be 15 °C (59 °F). The appliance shall then be allowed to heat again until the thermostats open, at which time temperatures shall be observed immediately.

The temperature of the water at the water outlet shall be measured as water is drawn off immediately following the second opening of the temperature-regulating control.

For appliances with water heat exchangers intended to heat water and that are not provided with storage tanks, the water flow rate through the unit shall be reduced until a temperature-regulating control operates, at which time the control shall be bypassed and the water temperature is maintained within 2 K of temperature-regulating control. The unit shall then be operated continuously until temperatures have stabilized.

11.2.2 *A ducted appliance which does not include* SUPPLEMENTARY HEATERS *is fitted with an outlet duct sized to fit the casing flanges, or opening without flanges, or locations marked for flanges, and arranged to discharge away from the return air inlet.*

The outlet duct is provided with a restricting means to obtain the maximum static pressure given in the instructions.

11.2.3 For the evaluation and testing of PARTIAL UNITS, the following test setup and conditions are to be applied.

• EVAPORATOR UNITS and CONDENSER UNITS are tested as individual units at the maximum ambient temperature stated in the instructions. If not stated in the instructions, these units shall be tested at an ambient temperature that is equal to the saturated temperature of the refrigerant at the marked MAXIMUM ALLOWABLE PRESSURE (± 0,1 MPa) minus 10 K (± 1 K).

• CONDENSING UNITS are tested in the cooling mode only, at the maximum specified ambient temperature with 9 K (± 1 K) sub-cooling and the maximum specified evaporating pressure with 11 K (± 1 K) superheat. For CONDENSING UNITS provided with expansion device(s), the superheat/sub-cooling is to be as under the normal control of the expansion device(s).

• EVAPORATING UNITS, intended for cooling only, are tested in the cooling mode only with a condensing pressure that is equal to the marked MAXIMUM ALLOWABLE PRESSURE (± 0,1 MPa) with 9 K (± 1 K) sub-cooling.

• EVAPORATING UNITS that are intended for reverse cycle operation are tested in the heating mode only, at the maximum specified evaporating pressure.

NOTE 101 Testing for CONDENSING UNITS and EVAPORATING UNITS requires connection to calorimeter stand or similar device capable of controlling the refrigerant entering and leaving conditions as specified in the test above. CONDENSER UNITS and EVAPORATOR UNITS do not require a calorimeter stand or similar device.

11.2.3DV DE *Modification of Clause 11.2.3 in the Part 2 by replacing the first bullet with the following and by adding the following note:*

1) EVAPORATOR UNITS are tested as individual units at the maximum ambient temperature stated in the instructions. If not stated in the instructions, these units shall be tested at the conditions listed in Table 101.DVA.1.

2) CONDENSER UNITS are tested as individual units at the maximum ambient temperature stated in the instructions. If not stated in the instructions, these units shall be tested at an ambient temperature that is equal to the saturated temperature of the refrigerant at the MAXIMUM ALLOWABLE PRESSURE (± 0,1 MPa) minus 10 K (± 1 K).

NOTE 102DV For PARTIAL UNITS, it may not be necessary to operate the refrigeration system during the test of Clauses 10 and 11 if all of the following apply:

– the motor-compressor is in compliance with UL 60335-2-34,

– the motor-compressor RLA marked on the appliance is not less than 64 % of the motor-compressor MCC, and

– the control box is externally loaded at not less than the marked compressor RLA or MRC and the marked motor rated current or MOC.

11.3 *Temperatures other than those of windings are determined by means of fine-wire thermocouples so chosen and positioned that they have the minimum effect on the temperature of the part under test.*

NOTE 101 Thermocouples having wires with a diameter not exceeding 0,3 mm are considered to be fine-wire thermocouples.

Thermocouples used for determining the temperatures of the surface of walls, ceiling and floor are embedded in the surface or attached to the back of small blackened disks of copper or brass, 15 mm in diameter and 1 mm thick, which are flush with the surface.

So far as is possible, the appliance is positioned so that parts likely to attain the highest temperatures touch the disks.

In determining the temperatures of handles, knobs, grips and the like, consideration is given to all parts which are gripped in normal use and, if of insulating material, to parts in contact with hot metal.

The temperature of electrical insulation, other than that of windings, is determined on the surface of the insulation, at places where failure could cause a short circuit, contact between LIVE PARTS and ACCESSIBLE metal PARTS, bridging of insulation or reduction of CLEARANCES and CREEPAGE DISTANCES below the values specified in Clause 29.

Temperatures of windings are determined by the resistance method unless the windings are non-uniform or severe complications are involved in order to make the necessary connections, in which case the temperatures are determined by means of thermocouples.

The temperatures in the duct are to be measured by means of a thermocouple grid consisting of nine thermocouples of identical length, wired in parallel to form a grid with a thermocouple located centrally in each of nine equal duct areas in a plane perpendicular to the axis of the airflow.