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

Third Edition, Dated November 1, 2019

Summary of Topics

This third edition of ANSI/UL 60335-2-40 is an alignment with IEC 60335-2-40:2018 (6th edition), with national differences.

The new requirements are substantially in accordance with Proposal(s) on this subject dated December 7, 2018 and July 12, 2019.

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Third Edition

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

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

November 1, 2019

Approved American National Standard

ANSI/UL 60335-2-40-2019

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 any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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

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

The most recent designation of ANSI/UL 60335-2-40 as an American National Standard (ANSI) occurred on November 1, 2019. 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.

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PREFACE

This is the harmonized CSA Group and UL standard for Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers. It is the third edition of CAN/CSA-C22.2 No. 60335-2-40, and the third edition of UL 60335-2-40. This edition of CAN/CSA-C22.2 No. 60335-2-40 supersedes the previous edition (s) published on September 15, 2017. This edition of UL 60335-2-40 supersedes the previous edition(s) published on September 15, 2017.

This harmonized standard is based on IEC Publication 60335-2-40: 6.0 edition 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.

At the time of this publication, IEC 60335-2-40, Edition 6.0 is available from IEC in English only. CSA Group will publish the French version when it becomes available from the IEC.

In Canada, for general requirements on the standards of the Canadian Electrical Code, Part II, see CAN/CSA-C22.2 No. 0.

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.

This CAN/CSA-C22.2 No. 60335-2-40, Standard for Safety for Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers is to be used in conjunction with the second edition of CAN/CSA-C22.2 No. 60335-1:16. The requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers are contained in this Part 2 Standard and CAN/CSA-C22.2 No. 60335-1:16. Requirements of this Part 2 Standard, where stated, amend the requirements of CAN/CSA-C22.2 No. 60335-1:16. Where a particular subclause of CAN/CSA-C22.2 No. 60335-1:16 is not mentioned in CAN/CSA-C22.2 No. 60335-2-40, the CAN/CSA-C22.2 No. 60335-1:16 subclause applies.

This UL Standard 60335-2-40 Standard for Safety for Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, 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 and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows:

a) Technical national differences are allowed for national differences resulting from conflicts in 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.

b) Presentation is word for word except for editorial changes that do not alter the technical content of the standard. Examples of editorial changes include:

1) different font sizes, figure sizes, and table sizes;

2) minor variations in format, such as indentation and pagination;

3) font appearance (including the use of italic or bold text or uppercase or lowercase letters);

4) the use of a symbol (e.g., A or %) rather than the word (Ampere or percent), or the word rather than the symbol;

5) inclusion of inch-pound units for informational purposes;

6) corrections of misprints or typographical errors;

7) bilingual column headings or figure captions on a common table or figure in a bilingual edition;

8) change from first-angle to third-angle drawing;

9) addition of a statement: “This is a first-angle drawing”; and

10) substitution of a point (.) for a comma (,) as the decimal marker.

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.

These materials are subject to copyright claims of IEC and UL. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of UL. All requests pertaining to the Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, UL 60335-2-40 Standard should be submitted to UL.

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NATIONAL DIFFERENCES

GENERAL

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.

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

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

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

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

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

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

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

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

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

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

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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY – Part 2-40: 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.

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

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

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

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

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

Subcommittee 61 D has prepared International Standard IEC 60335: 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/XX/FDIS	61D/XX/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 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.

A bilingual version of this publication may be issued at a later date.

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 ***Modification of the of the first sentence of the 7th paragraph after item 9 by replacing it with the following paragraph:***

This Part 2-40 is intended to be used in conjunction with CAN/CSA-C22.2 No. 60335-1:16 and the sixth edition of UL 60335-1. All references in this standard to IEC 60335-1 shall be replaced by CAN/CSA-C22.2 No. 60335-1:16 and the sixth edition of UL 60335-1.

102DV DE ***Modify the paragraph following NOTE 3 in the Part 2 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 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.

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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 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, dehumidifiers, 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 International Standard.

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

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

a) A1; and

b) B1 (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.1 DR *Modification of Clause 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 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/NFPA 70, *National Electrical Code*

ANSI/NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*

ANSI/NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*

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*

CAN/ULC-S102, ***Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies***

CSA B52, ***Mechanical Refrigeration Code***

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

CAN/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. 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. 100, ***Motors and generators***

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

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

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

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

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

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

CAN/CSA-C22.2 No. 198.1, ***Extruded insulating tubing***

CSA C22.2 No. 253, ***Medium-voltage ac contactors, controllers, and control centres***

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

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***

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

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

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

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

CSA Technical Information Letter No. M-07, ***Interim Certification Requirements for Photovoltaic (PV) Arc-Fault Protection (DC-AFP)***

IAPMO, ***Uniform Mechanical Code***

ICC, ***International Mechanical Code***

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

UL 67, ***Panelboards***

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

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

UL 224, ***Standard for Extruded Insulating Tubing***

UL 347, ***Standard for Medium-Voltage AC Contactors, Controllers, and Control Centers***

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

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

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

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

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

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

UL 1441, ***Standard for 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, ***Standard for Tests for Flammability of Small Polymeric Component Materials***

UL 1699B, ***Standard for 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 2043, ***Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces***

UL 2395, ***Standard for 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 9703, ***Outline of Investigation for Distributed Generation Wiring Harnesses***

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

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

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

IEC 60079-29-2, ***Explosive atmospheres – Part 29-2: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen***

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

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

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***

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

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

3.101
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

3.115
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:***

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

3.121
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 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 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 metres.

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 metres.

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.

3.139
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

3.141
A2L REFRIGERANT
refrigerant classed as A2L according to ISO 817

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

3.143DV D1 ***Delete Clause 3.143 of the Part 2:***

This definition does not apply.

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 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 ($\lambda \approx 1$ nm) and the region of transition to radio waves ($\lambda \approx 1$ 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

3.151
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]

3.152
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 $\mu W/cm^2$

3.154
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 1DV 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 tapped control circuit is one 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
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 maximum quantity of refrigerant that can be released into a space

3.166DV
PRESSURE-RELIEF VALVE
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
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, which takes up 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
fitting made with a metal of a known low melting temperature. 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
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
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 field 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 installation for field installation of an accessory or option

3.177DV
LEAK DETECTION SYSTEM
a sensing system which 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 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)
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
part of the refrigerant sensor which is sensitive to the gas/vapour to be measured.

3.189DV
REFRIGERANT SENSOR
assembly in which the sensing element is housed and that can also contain associated circuit components

3.190DV
INTEGRAL REFRIGERANT SENSOR
a sensor that is within or directly mounted to the equipment housing.

Note 1DV to entry: Refrigerant sensors directly mounted in the appliance are integral refrigerant sensors.

3.191DV
LIMITED LIFE REFRIGERANT SENSOR
A REFRIGERANT SENSOR which is expected to fail within the life of the appliance.

4 General requirement

This clause of Part 1 is applicable.

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

All references to "sanitary hot water heat pumps" in this Part 2 shall be replaced with "hot water heat pumps and heat recovery units".

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.

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 a separate sample.

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.

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

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 5.101 of this Part 2 as follows:***

Replace "IEC 60335-2-34:2012" with "UL 60335-2-34:2017 and 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 5.102 of this Part 2 as follows:***

Replace "IEC 60335-2-34" with "UL 60335-2-34 and 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.

6.101 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.

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.