IEC 60335-2-40

Edition 7.0 2022-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Household and similar electrical appliances – Safety –
Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

Appareils électrodomestiques et analogues – Sécurité –
Partie 2-40: Exigences particulières pour les pompes à chaleur électriques, les climatiseurs et les déshumidificateurs

IEC 60335-2-40:2022-05(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

FOREWORD

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.
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IEC 60335 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. It is an International Standard.

This seventh edition cancels and replaces the sixth edition published in 2018. This edition constitutes a technical revision.

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

– Clause 1 – added **thermoelectric heat pumps** to the scope and increased maximum **rated voltage** to 300 V for single phase appliances;
– Clause 7 – revised requirements for marking on the appliance and packaging, including a symbol for minimum floor area and modifying the symbol for **flammable refrigerants** to include the safety group per ISO 817;
– Clause 11 and Clause 19 – restructured for alignment with Part 1 and added requirements for **supplementary air heaters**;

- Clause 13 and Clause 16 – revised requirement for leakage current for **stationary class I motor-operated appliances**;
- Clause 21 – added requirements for **particle foam material** and revised requirements for transport testing;
- Clause 22 – removed limit on the sum of **refrigerant charges** for appliances with multiple **refrigerating systems**, and revised requirements for avoiding ignition sources, **leak detection systems**, **safety shut-off valves**, and **particle foam material**;
- Clause 23 – added requirements to avoid contact between wires and refrigerant piping;
- Clause 24 – revised requirements for motor-compressors;
- Clause 30 – added requirements for resistance to heat of **particle foam material**;
- Annex BB – revised Table BB.1 with refrigerant information and added a link to ISO 817 refrigerant data;
- Annex DD – revised requirements for information in the manual for appliances with **flammable refrigerants**;
- Annex EE – revised requirements for pressure testing;
- Annex FF – revised requirements for leak simulation tests;
- Annex GG – added requirements for applying **releasable charge**, added additional coverage for A2 and A3 refrigerants, including new charge limits for appliances with **circulation airflow** and for **enhanced tightness refrigerating systems**, and revised requirements for **enhanced tightness refrigerating systems** using **A2L refrigerant**;
- Annex LL – revised requirements for **refrigerant detection systems**;
- Annex MM – revised simulated leak rate;
- Annex OO – deleted annex for conditioning internal wiring using UV light.
- Annex PP – new coverage of **leak detection system** confirmation test;
- Annex QQ – new coverage of method for determining **releasable charge**.

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

Draft	Report on voting
61D/491/FDIS	61D/493/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

This part 2-40 is to be used in conjunction with 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 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.

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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.

Guidance documents concerning the application of the safety requirements for appliances can be accessed via TC 61 supporting documents on the IEC website

https://www.iec.ch/tc61/supportingdocuments

This information is given for the convenience of users of this International Standard and does not constitute a replacement for the normative text in this standard.

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 can 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 publications, basic safety publications and group safety publications 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.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-40: 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**, **sanitary hot water heat pumps** and **air conditioners**, incorporating motor-compressors as well as **hydronic fan coils units**, **dehumidifiers** (with or without motor-compressors), **thermoelectric heat pumps** and **partial units**. Their maximum **rated voltage** being not more than 300 V for single phase appliances and 600 V for multi-phase appliances.

Appliances not intended for normal household use but which nevertheless can 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 can consist of one or more factory-made assemblies. If provided in more than one assembly, the separate assemblies are 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 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. **Flammable 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.

As far as practical, this standard deals with common hazards presented by appliances that are encountered in normal use and assumes that installation, servicing, decommissioning, and disposal are safely handled by competent persons and accidental release of refrigerants is avoided. However, it does not prescribe the criteria to ensure competence of persons during installation, servicing and disposal. Safety requirements during disposal are not specified in this standard.

NOTE 103 Annex HH provides informative requirements on competence of persons. Criteria for competence of personnel for the purpose of certification schemes can be found in ISO 22712[1].

Unless specifications are covered by this standard, including the annexes, requirements for refrigerating safety are covered by:

– ISO 5149-1:2014, ISO 5149-1:2014/AMD1:2015, and ISO 5149-1:2014/AMD2:2021,
– ISO 5149-2:2014 and ISO 5149-2:2014/AMD1:2020,
– ISO 5149-3:2014 and ISO 5149-3:2014/AMD1:2021.

[1] Under preparation. Stage at the time of publication: ISO FDIS 22712:2022

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 104 Attention is drawn to the fact that

- for appliances intended to be used in vehicles or on-board ships or aircraft, additional requirements can be necessary;
- in many countries, additional requirements are specified, 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 105 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).

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 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

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

IEC 60079-14:2013, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

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

IEC 60335-2-34:2021, *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 60695-1-10, *Fire hazard testing – Part 1-10: Guidance for assessing the fire hazard of electrotechnical products – General guidelines*

IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

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

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

ISO 817, *Refrigerants – Designation and safety classification*

ISO 527-3, *Plastics − Determination of tensile properties − Part 3: Test conditions for films and sheets*

ISO 1302:2002[2], *Geometrical Product Specifications (GPS) – Indication of surface texture in technical product documentation*

ISO 2578, *Plastics – Determination of time-temperature limits after prolonged exposure to heat*

ISO 5149-1:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Definitions, classification and selection criteria*
ISO 5149-1:2014/AMD1:2015
ISO 5149-1:2014/AMD2:2021

ISO 5149-2:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation*
ISO 5149-2:2014/AMD1:2020

ISO 5149-3:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site*
ISO 5149-3:2014/AMD1:2021

ISO 5151:2017, *Non-ducted air conditioners and heat pumps – Testing and rating for performance*
ISO 5151:2017/AMD1:2020

ISO 7010:2019, *Graphical 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 13355:2016, *Packaging − Complete, filled transport packages and unit loads − Vertical random vibration test*

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*

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.

2 Withdrawn.

3.1.9 *Replacement:*

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

3.5.4 *Addition:*

Note 101 to entry: Appliances connected to water pipes or refrigerant pipes that are secured to the building are also **fixed appliances**.

3.8.101
particle foam material
closed cell material moulded from thermoplastic particles (e.g. beads) with 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 can 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 (gas or liquid)

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 heaters

3.114.1
supplementary heater
electric heater that supplements or replaces the output of the refrigerant circuit for the purpose of heating air or water

3.114.2
supplementary water heater
supplementary heater specifically for the purpose of heating water

3.114.3
supplementary air heater
supplementary heater specifically for the purpose of heating air in conjunction with, or instead of, the refrigerating circuit

Note 1 to entry: **Supplementary air heaters** include electric heaters provided as part of an appliance with cooling-only refrigerant circuits.

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

3.117
appliances accessible to the general public
appliances intended to be located in residential buildings or in commercial buildings in a location without restricted access

3.118
appliances not accessible to the general public
appliances which are located in a secured location with restricted access (e.g. machine rooms, rooftop and the like, or at a level above 2,5 m)