INTERNATIONAL STANDARD

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Household and similar electrical appliances – Safety –

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

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

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

FOREWORD

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This part of International Standard 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.

This consolidated version of IEC 60335-2-40 is based on the fourth edition (2002) [documents 61D/116/FDIS and 61D/121/RVD], its amendment 1 (2005) [documents 61D/138/FDIS and 61D/140/RVD] and its amendment 2 (2005) [documents 61D/136C/FDIS and 61D/142/RVD].

It bears the edition number 4.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) of that standard.

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

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for 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 committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

The contents of the corrigendum 1 to Amendment 1 of May 2006 have been included in this copy.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice.

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.

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.

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 International Standard deals with the safety of electric **heat pumps**, including **sanitary hot water heat pumps**, **air-conditioners**, and **dehumidifiers** incorporating motor-compressors and hydronic room **fan coils**, their maximum **rated voltages** being not more than 250 V for single phase appliances and 600 V for all other appliances.

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.

This standard also applies to electric **heat pumps**, **air conditioners** and **dehumidifiers** containing **flammable refrigerant**. **Flammable refrigerants** are defined in 3.120.

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 IEC60335-2-34, which includes the statement that the term motor-compressor is be used to designate either a hermetic motor-compressor or semi-hermetic motor-compressor.

NOTE 102 Requirements for refrigeration safety are covered by ISO 5149, and 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 chemicals other than group A1, A2, or A3 as defined by 3.121.

NOTE 103 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 sections and clauses in ISO 5149 of particular concern to this standard are as follows:

– Section 3: Design and construction of equipment applies to all appliances and systems.

– Section 4: Requirements for utilization applies to appliances and systems which are for "similar electrical appliances", i.e. commercial and light industrial.

– Section 5: Operating procedures applies to appliances and systems which are for "similar electrical appliances", i.e. commercial and light industrial.

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 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 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 60068-2-52:1996, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60079-14, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in hazardous areas (other than mines)*

IEC 60079-15:2001, *Electrical apparatus for explosive atmospheres – Part 15: Type of protection "n"*

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

ISO 817:1974, *Organic refrigerants – number designation*

ISO 3864:1984, *Safety colours and safety signs*[1)]

ISO 5149:1993 *Mechanical refrigerating systems used for cooling and heating – Safety requirements*

ISO 7000: Graphical symbols for use on equipment – Index synopsis

ANSI/ASHRAE 34:2001, *Designation and safety classification of refrigerants*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.4 *Addition:*

NOTE 101 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.

1) ISO 3864:1984 has been replaced by ISO 3864-1 2002, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas* and ISO 7010:2003, *Graphical symbols – Safety colours and safety signs -- Safety signs used in workplaces and public areas.* However the safety sign referred to here in ISO 3864 (symbol B.3.2, Caution, risk of fire) is no longer contained in either ISO 3864-1 or ISO 7010.

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 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.

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. It includes an electrically operated refrigeration system for cooling and possibly dehumidifying the air. It may have means for heating, circulating, cleaning and humidifying the air

3.104
dehumidifier
encased assembly designed to remove moisture from its surrounding atmosphere. It includes an electrically operated refrigeration system and the means to circulate air. It also includes a drain arrangement for collecting and storing and/or disposing of the condensate

3.105
dehumidification – comfort
dehumidification to reduce the humidity within a space to a level to satisfy the requirements of the occupants

3.106
dehumidification – process
dehumidification to reduce the humidity within a space to a level necessary for the process or the storage of goods and/or materials or the drying out of the building fabric

3.107
dehumidification – heat recovery
dehumidification where the latent and sensitive heat removed from the space together with the compressor heat is reused in another application rather than rejected outside to waste

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 refrigeration 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

3.117
self-contained unit
complete appliance, in suitable frames or enclosures, that is fabricated and shipped in one or more sections, and has no refrigerant containing parts connected in the field other than by companion or block valves

NOTE 1 A **self-contained unit** in a single frame or enclosure is called a single package unit.

NOTE 2 A **self-contained unit** in more than one frame enclosure is called a split package unit.

3.118
appliances accessible to the general public
appliances intended to be located in residential buildings or in commercial buildings

3.119
appliances not accessible to the general public
appliances which are intended to be maintained by qualified service personnel and located either in machine rooms and the like or at a level not less than 2,5 m or in secured rooftop areas

3.120
fan coil
air handling unit
factory-made assembly which provides one or more of the functions of forced circulation of air, heating, cooling, dehumidification and filtering of air, but which does not include the source of cooling or heating

NOTE The device is normally designed for free intake of air from a room and delivery of air into the same room, but may be applied with duct work. This device may be designed for furred-in application or with an enclosure for application within the conditioned space.

3.121
flammable refrigerant
refrigerant with a classification of class A2 or A3 in compliance with ANSI/ASHRAE 34-2001 [ISO817] classification.

3.122
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

3.123
maximum allowable pressure
a limit to the refrigerating system operating pressure, generally the maximum pressure for which the equipment is designed, as specified by the manufacturer

NOTE Maximum allowable pressure constitutes a limit to the operating pressure whether the equipment is working or not, see Clause 21.

3.124
low-pressure side
the part(s) of a refrigerating system operating at the evaporator pressure

3.125
high-pressure side
the part(s) of a refrigerating system operating at the condenser pressure

3.126
service port
a 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

4 General requirement

This clause of Part 1 is applicable.

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.

NOTE 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.

5.6 *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.

5.10 *Addition:*

For split-package units, the refrigerant lines shall be installed in accordance with the installation instructions. The refrigerant line length shall be the maximum length stated in the installation instructions or 7,5 m, whichever is the shorter. The thermal insulation of the refrigerant lines shall be applied in accordance with the installation instructions.

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

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

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 harmfull 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.