IEC 60335-2-104

Edition 2.0 2021-05

INTERNATIONAL STANDARD

colour inside

Household and similar electrical appliances – Safety – Part 2-104: Particular requirements for appliances to recover and/or recycle refrigerant from air conditioning and refrigeration equipment

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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 60335-2-104 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 second edition cancels and replaces the first edition published in 2003. This edition constitutes a technical revision.

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

a) Clause 1 – The scope has been edited to reflect that "appliance" in this document means recovery and/or recycle equipment to recover and/or recycle refrigerant from air-conditioning and refrigeration equipment.
b) Clause 2 – Normative references were added.
c) Clause 3 – Some definitions were deleted, some were added.
d) Subclause 7.1 – Some markings were deleted, some were added.

e) Subclause 7.6 – Symbols were added for “read operator’s manual”, “operator’s manual; operating instructions” including coloring are placed in visible location; maximum allowable pressure markings following X MPa.

f) Subclause 19.11.4 was modified.

g) Subclause 21.1 was modified.

h) Subclause 21.2 was modified.

i) Subclause 22.102 was modified.

j) Subclause 22.104.1.1 was modified.

k) Subclause 22.104.5 was modified.

l) Subclause 22.104.10 was modified.

m) Subclause 22.104.11 was modified.

n) Subclause 22.105.1 was modified.

o) Subclause 22.107 was modified.

p) Subclause 30.2 was moved to Clause 29.

q) Annex AA was deleted and replaced with Annex AA.

r) Annex BB was deleted and replaced with former IEC 60335-2-104 Annex CC (normative) Compatibility requirements following addition to Annex BB.

s) Annex DD was deleted and replaced with Annex CC.

t) New Annex DD was added.

u) New Annex EE was added.

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

Draft	Report on voting
61D/472/FDIS	61D/474/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/standardsdev/publications.

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

This part 2 is to be used in conjunction with the fifth edition of IEC 60335-1:2010 and its amendments.

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 appliances to recover and/or recycle refrigerant from air conditioning and refrigeration equipment.

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 smaller roman type.

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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

NOTE 4 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months or later than 36 months from the date of publication.

The following differences exist in the countries indicated below:

- 6.1: Class 01 appliances are allowed (Japan).
- 11.8: The temperature of the wooden walls in the test casing is limited to 85 °C (Sweden).

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

INTRODUCTION

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

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

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

When a part 2 standard does not include additional requirements to cover hazards dealt with in Part 1, Part 1 applies.

NOTE 1 This means that the technical committees responsible for the part 2 standards have determined that it is not necessary to specify particular requirements for the appliance in question over and above the general requirements.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

NOTE 2 Horizontal and generic standards covering a hazard are not applicable since they have been taken into consideration when developing the general and particular requirements for the IEC 60335 series of standards. For example, in the case of temperature requirements for surfaces on many appliances, generic standards, such as ISO 13732-1 for hot surfaces, are not applicable in addition to Part 1 or part 2 standards.

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

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

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-104: Particular requirements for appliances to recover and/or recycle refrigerant from air conditioning and refrigeration equipment

1 Scope

This clause of Part 1 is replaced by the following:

This part of IEC 60335 deals with the safety of electrical **recovery** and/or **recycle** equipment to recover and/or **recycle refrigerant** from air conditioning and refrigeration equipment. This applies to air-conditioning, heat-pumps and refrigeration equipment incorporating open drive or motor-**compressors**, their maximum **rated voltages** being not more than 300 V for single phase appliances and 600 V for all other equipment.

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 service personnel 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 In this document, the term appliance is to denote **recovery** equipment.

2 Normative references

This clause of Part 1 is applicable except as follows.

Replacement:

IEC 60065:2014, *Audio, video and similar electronic apparatus – Safety requirements*

Addition:

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

IEC 60079-15:2010[1], *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 600320 (all parts), *Appliance couplers for household and similar general purposes*

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

1 Withdrawn.

IEC 60335-2-40:2018, *Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers*

IEC 62640:2011, *Residual current devices with or without overcurrent protection for socket-outlets for household and similar uses*
IEC 62640:2011/AMD1:2015

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

ISO 817:2014, *Refrigerants – Designation and safety classification*
ISO 817:2014/AMD1:2017

ASTM D4728-17, *Standard Test Method for Random Vibration Testing of Shipping Containers*

SAE J2210 HFC-134a (R-134a), *Recovery/Recycling Equipment for Mobile Air-Conditioning Systems*

SAE J2843 R-1234yf [HFO-1234yf], *Recovery/Recycling/Recharging Equipment for Flammable Refrigerants for Mobile Air-Conditioning Systems*

SAE J3030, A*utomotive Refrigerant Recovery/Recycling/Recharging Equipment Intended for use with Both R-1234yf and R-134a*

3 Terms and definitions

This clause of part 1 is applicable except as follows.

3.1.6
rated current

Note 101 to entry: If the appliance comprises electrical accessories, including fans, the **rated current** is based upon the total maximum electrical power input with all accessories energized, when operating continuously under the appropriate environmental conditions.

Replacement:

3.1.9
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
compressor
open drive **compressor** or motor-**compressor** (hermetically sealed) with the suction side (low pressure side) which is intended to be temporarily connected to the appliance's low pressure side to remove refrigerant

3.102
pressure-limiting device
mechanism that automatically responds to a predetermined pressure by stopping the operation of the pressure-imposing element

3.104
recovery
pumping out (removal) of **refrigerant** from air conditioning or refrigeration equipment

3.105
recycle
pumping out (removal) and cleaning of **refrigerant** from air conditioning or refrigeration equipment

3.106
refrigerant
substance that is classified by ISO 817 as A1, A2L, A2, A3 or B1

3.107
flammable refrigerant
substance that is classified by ISO 817 as A2L, A2, or A3

3.108
recovery cylinder
receptacle used for recovered **refrigerant**

3.109
scale
weighing device which is capable of measuring recovered **refrigerant**

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.

Replacement:

5.7 The tests and test conditions of Clause 10 and Clause 11 are carried out under conditions as in 11.4 or under the most severe operating conditions within the operating temperature range specified by the manufacturer.

6 Classification

This clause of Part 1 is applicable except as follows.

Modification:

6.1 Appliances shall be of one of the following classes with respect to protection against electric shock:

class I, class II or **class III**.

Compliance is checked by inspection and by the relevant tests.

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 may be IPX0.

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;

Replace the third dash by:

– **rated current** in amperes;

Addition:

– **rated frequency**;
– IP rating;
– maximum high and low side pressure;
– each applicable **refrigerant** for which the appliance is rated;
– for each **refrigerant,** one of the following:
  • the chemical name;
  • the **refrigerant** number (R designation) per ISO 817;
– the **recovery cylinder** shall meet the pressure of the **refrigerant** being recovered. 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;
– **appliances** (**recovery** equipment) intended for use in service garages or other environments where flammable gases may be present shall be marked: "This appliance should be used in locations with mechanical ventilation that provides at least four air changes per hour;
– **recovery** equipment intended for use in service garages that are covered by SAE J standards covering **recovery** equipment for flammable equipment shall be exempt from this marking and fall under the appropriate SAE or VDA standard.

For **flammable refrigerants**, any tubing or other devices through which the **refrigerant** is intended to be serviced shall be painted or colored red. This color shall be present at all places where service puncturing, or otherwise creating an opening in the **refrigerant** circuit might be expected. In the case of a process tube on a **compressor**, the color mark shall extend at least 25 mm from the **compressor**.

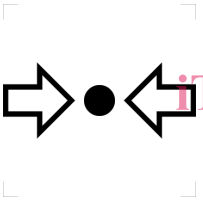
7.6 *Addition:*

Markings shall include the symbols for "read operator's manual", "operator's manual; operating instructions" (symbol ISO 7000-0790 (2004-01)) including colour, and be placed on the **recovery** equipment in a location visible to the persons required to know the information. The perpendicular height of the symbol shall be at least 10 mm.

The maximum allowable pressures shall be marked with symbol ISO 7000-1701 (2004-01) followed by the text "(X) MPa".

If the **recovery** equipment is certified for use with **flammable refrigerant**, the **flammable refrigerant** symbol shall be used per ISO 7010-W021 (2011-05) and the perpendicular height of the triangle shall be at least 30 mm.

[symbol ISO 7000-1641 (2004-01)] operator's manual; operating instructions



[symbol ISO 7000-1701 (2004-01)] pressure

(X) MPa

[symbol ISO 7010-W021 (2011-05)] warning; flammable material

7.15 *Addition:*

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

7.101 A marking shall be provided for a replaceable fuse or a replaceable overload **protective device** provided as a part of a product. It shall be visible when the cover or door of the compartment is open. This marking shall specify

– the rating of the fuse in amperes, the type and voltage rating, or
– the manufacturer and model designation of the replaceable overload **protective device**.

8 Protection against access to live parts

This clause of Part 1 is applicable.

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable.

11 Heating

This clause of Part 1 is replaced by the following.

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

Compliance is checked by determining the temperatures of the various parts under the conditions specified in 11.2 to 11.7. Nevertheless, if the temperature of the motor winding exceeds the value specified in Table 1 or if there is a doubt with regard to the classification of the insulation system employed in a motor, compliance is checked by the tests of Annex C.

11.2 The appliance is installed in a test room in accordance with the manufacturer's installation instructions. In particular

– **clearances** to adjacent surfaces specified by the manufacturer shall be maintained;

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

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

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

The temperature of motor windings or of coils may be measured by the change-in-resistance method.

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

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

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

*The temperature of electrical insulation, other than that of windings, is determined on the surface of the insulation, at places where failure could cause a short circuit, contact between **live parts** and accessible metal parts, bridging of insulation or reduction of **creepage distances** or **clearances** below the values specified in 29.1.*

11.4 *Appliance is operated at normal operating voltage in a test room maintained at 43 °C or at the maximum temperature specified by the manufacturer if higher, until temperatures reach stabilisation.*