

INTERNATIONAL STANDARD

IEC 60335-2-104

First edition
2003-01

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

*Appareils électrodomestiques et analogues –
Sécurité –*

*Partie 2-104:
Règles particulières pour les appareils de récupération et/ou
de recyclage des fluides frigorigènes des climatiseurs et des
appareils de réfrigération*



Reference number
IEC 60335-2-104:2003(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

X

For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

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.

It forms the first edition of IEC 60335-2-104.

The text of this part of IEC 60335 is based on the following documents:

FDIS	Report on voting
61D/115/FDIS	61D/120/RVD

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

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 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 publication will remain unchanged until 2005. 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.

- Clause 3: The d.c. component in the appliance neutral is limited (Australia).
- 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).

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

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.

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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 International Standard deals with the safety of electrical appliances to recover and/or recycle refrigerant from air conditioning and refrigeration equipment incorporating open drive or motor-**compressors**, 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 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 A definition of “sealed motor-**compressor**” is given in IEC 60335-2-34.

NOTE 102 Requirements for refrigeration safety are covered by ISO 5149.

NOTE 103 For appliances using flammable refrigerants, additional requirements are under consideration.

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 by the national health authorities, the national authorities responsible for the protection of labour, national water supply authorities and similar authorities.

NOTE 105 This standard does not apply to

- 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 60335-2-34:2002, *Household and similar electrical appliances – Safety – Part 2: Particular requirements for motor-compressors*

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

3 Definitions

This clause of part 1 is applicable except as follows.

3.1.6

rated current *Addition:*

NOTE 101 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.

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

compressor

a refrigerant open drive or motor-compressor with the suction side (low pressure side) intended to be connected to a system from which the refrigerant is being removed. The discharge side is connected to the refrigerant recovery tank

3.102

temperature limiting device

a control that serves to prevent excessive temperature

3.103

pressure-limiting device

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

3.104

pressure-relief device

pressure actuated valve or rupture member which functions to relieve excessive pressure automatically

NOTE A rupture member is a device that will rupture at a predetermined pressure.

3.105

service garage

location where vehicle testing, diagnostic and repair work is performed

3.106

recovery

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

3.107

recycle

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

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.

5.7 Replacement:

The tests and test conditions of clauses 10 and 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.

6.1 Modification:

Appliances shall be **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 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.

Additions:

- **rated frequency**;
- each applicable refrigerant for which the appliance is rated;
- for a single component refrigerant, one of the following:
 - the chemical name;
 - the chemical formula;
 - the refrigerant number;

- for a blended refrigerant, one of the following:
 - the chemical name of each of the components;
 - the chemical formula for each of the components;
 - the refrigerant numbers of each of the components;
 - the refrigerant number of the refrigerant blend;
- permissible excessive operating pressure for the storage tank;
- for the refrigerant circuit, should the permissible excessive operating pressure for the suction and discharge side differ, a separate indication is required;
- appliances intended for use in **service garages** shall be marked: “This appliance should be used in locations with mechanical ventilation that provides at least four air changes per hour or the appliance should be used at least 0,5 m above the floor;
- marked to indicate that it should not be used in the vicinity of spilled or open containers of flammable liquid.

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 3 or if there is doubt with regard to the classification of the insulation system employed in a motor, compliance is checked by the tests of annex C.

11.2 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 cutout 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.*

11.5 *Appliances of the water-cooled type shall be operated with the water flow maintained at the most severe condition as specified by the manufacturer.*

11.6 *All appliances are operated continuously until steady state conditions are obtained. All appliances shall function to meet the criteria in Annex AA, which specifies minimum criteria for the refrigerants, so they can be reused.*

11.7 *During the test, the temperatures are monitored continuously and shall not exceed the values shown in Table 3. **Protective devices** shall not operate and sealing compound shall not flow out.*

Table 3 – Temperature limits

Part	Temperature °C
Windings of sealed motor-compressors ^a – with synthetic insulation – with other insulation	140 130
External enclosures of sealed motor-compressors or of any other motor	150
Windings ^b if the winding insulation is (other than motor-compressors): – of class A material ^c – of class E material ^c – of class B material ^c – of class F material ^c – of class H material ^c – of class 200 – of class 220 – of class 250	100 (90) 115 (105) 120 (110) 140 165 185 205 235
Terminals, including earthing terminals, for external conductors of stationary appliances , unless they are provided with a supply cord .	85
Ambient of switches, and thermostats and temperature limiters ^d – without T marking – with T marking	55 T
Rubber or polyvinyl chloride insulation of internal and external wiring, including supply cords : – without temperature rating ^e – with temperature rating (T)	75 T
Cord sheaths used as supplementary insulation	60
Rubber, other than synthetic, used for gaskets or other parts, the deterioration of which could affect safety: – when used as a supplementary insulation or reinforced insulation – in other cases	65 75
Lampholders B22, E26 and E27: – metal or ceramic type – insulated type, other than ceramic – with T-marking	185 145 T
Lampholders E14 and B15: – metal or ceramic type – insulated type, other than ceramic – with T-marking	155 115 T
Material used as insulation other than that specified for wires and windings: – impregnated or varnished textile, paper or press board – laminated bonded with: <ul style="list-style-type: none"> • melamine-formaldehyde, phenol-formaldehyde or phenol-furfural resins • urea-formaldehyde resin – printed circuit boards bonded with epoxy resin – moulding of: <ul style="list-style-type: none"> • phenol-formaldehyde with cellulose fillers • phenol-formaldehyde with mineral fillers 	95 110 90 145 110 90