IEC 60335-2-34

Edition 6.0 2021-03
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

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

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-34: Particular requirements for motor-compressors

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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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60335-2-34:2012+AMD1:2015+AMD2:2016 CSV. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

This part of IEC 60335 has been prepared by subcommittee 61C: Safety of refrigeration appliances for household and commercial use, of IEC Technical Committee 61: Safety of household and similar electrical appliances.

This sixth edition cancels and replaces the fifth edition published in 2012, Amendment 1:2015 and Amendment 2:2016. This edition constitutes a technical revision.

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

– it aligns the text with IEC 60335-1, Ed 5.2;
– application categories and tests have been extended (3.1.102, Annex AA);
– use of a motorette for winding wire compatibility tests introduced (3.8.102, Annex BB);
– height of the triangle, symbol ISO 7010 W021 has been introduced (7.14);
– some notes are converted to normative text (1, 15.3, 22.21, 23.8, 29.3.4, Figure AA.1);
– note in Subclause 6.101 becomes normative in Clause 11;
– optional pressure endurance test introduced (18.101, Annex EE);
– compatibility test for insulation inside the housing clarified (22.9);
– clarification of clearances inside the housing for motor-compressors suitable for use at altitudes exceeding 2 000 m (29.1);
– normative references and associated text have been updated (24.101, Annex DD);
– breaking strength of tie cord after temperature heating cycle has been updated (Annex CC).

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

Draft	Report on voting
61C/873/FDIS	61C/874/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 latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fifth edition (2010) 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 motor-compressors.

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 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.

– 7.1: The locked-rotor current marking is required for some motor-compressors (USA).

– 22.7: Different test pressures are used (Japan, USA).

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.

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.

If testing of the **motor-compressor** includes testing in accordance with Annex AA, temperatures of the **motor-compressor** windings, **housing** and other parts related to the **motor-compressor**, such as terminals, internal wiring and insulating materials, are not measured when the complete appliance in which the **motor-compressor** is used is tested.

These requirements apply to sealed (hermetic and semi-hermetic type) **motor-compressors** with their associated starting, cooling capacity control and protection systems, tested separately under the most severe conditions of the refrigerating system operation which, within reasonable limits, could occur in the applications for which they are used.

In particular, the construction detail inspection and locked-rotor testing may be done separately on the **motor-compressor**, thereby eliminating the need for inspection and testing when the **motor-compressor** is applied to many different appliances and factory-built assemblies.

Operational tests may also be conducted on the **motor-compressor** separately in certain circumstances. The specification for this type testing is provided in Annex AA. However, the tests of the existing standards relevant to the given kind of application, such as IEC 60335-2-24 and IEC 60335-2-40, may need to be conducted on the final application and used as the final determination of acceptability.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-34: Particular requirements for motor-compressors

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of sealed (hermetic and semi-hermetic type) **motor-compressors**, their protection and control systems, if any, which are intended for use in equipment for household and similar purposes and which conform with the standards applicable to such equipment. It applies to **motor-compressors** tested separately, under the most severe conditions that may be expected to occur in normal use, their **rated voltage** being not more than 250 V for single-phase **motor-compressors** and 600 V for other **motor-compressors**.

This standard also covers

– multi-speed **motor-compressors**, that are **motor-compressors**, the speed of which can be set to different values;

– variable capacity **motor-compressors** that are **motor-compressors** where the capacity of the compressor is controlled at fixed speeds.

NOTE 101 Examples of equipment which contain **motor-compressors** are

~~– refrigerators, food freezers and ice makers (IEC 60335-2-24);~~

~~– air-conditioners, electric heat pumps and dehumidifiers (IEC 60335-2-40);~~

~~– commercial dispensing appliances and vending machines (IEC 60335-2-75);~~

~~– factory-built assemblies for transferring heat in applications for refrigerating, air-conditioning or heating purposes or a combination of such purposes.~~

– tumble dryers (IEC 60335-2-11);

– refrigerating appliances, ice-cream appliances and ice-makers (IEC 60335-2-24);

– electrical heat pumps, air-conditioners and dehumidifiers (IEC 60335-2-40);

– commercial dispensing appliances and vending machines (IEC 60335-2-75);

– commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or compressor (IEC 60335-2-89);

– electrical equipment for measurement, control, and laboratory use (IEC 61010-2-011);

– professional ice-cream makers (IEC 60335-2-118);

– refrigerating systems and heat pumps (ISO 5149-2).

This standard does not supersede the requirements of standards relevant to the particular appliance in which the **motor-compressor** is used. However, if the **motor-compressor** type used complies with this standard, the tests for the **motor-compressor** specified in the particular appliance standard may not need to be made in the particular appliance or assembly. If the **motor-compressor control system** is associated with the particular appliance control system, additional tests ~~may~~ could be necessary on the final appliance.

So far as is practical, this standard deals with the common hazards presented by **motor-compressors** used in appliances which are encountered by all persons in and around the home. However, it does not in general take into account

– the use of appliances by young children or infirm persons without supervision;

– playing with the appliances by young children.

NOTE 102 Attention is drawn to the fact that

– for **motor-compressors** intended to be used in appliances in vehicles or on board ships, additional requirements ~~may~~ could be necessary;

– in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour and similar authorities.

~~NOTE 103~~ This standard does not apply to

– **motor-compressors** designed exclusively for industrial purposes;

– **motor-compressors** used in 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).

NOTE ~~104~~103 If **motor-compressors** for refrigerant R-744 used in appliances with a **transcritical refrigeration system** are equipped with **pressure relief devices**, compliance with the requirements for these devices is checked during the tests on the final appliance.

2 Normative references

This clause of Part 1 is applicable, except as follows.

Addition:

IEC 60079-1:2014, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

IEC 60079-15:~~2010~~2017, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60851-4:2016, ~~*Methods of test for*~~ *Winding wires – Test methods – Part 4: Chemical properties*

IEC 60851-5:2008, *Winding wires – Test methods – Part 5: Electrical properties*
IEC 60851-5:2008/AMD1:2011
IEC 60851-5:2008/AMD2:2019[1]

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

ISO 7010:2019, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

3 Terms and definitions

This clause of Part 1 is applicable, except as follows.

~~**3.101**~~
~~**motor-compressor**~~
~~appliance consisting of the mechanical mechanism of the compressor and the motor, both of which are enclosed in the same sealed **housing**, with no external shaft seals, and with the motor operating in a refrigerant atmosphere with or without oil~~

~~Note 1 to entry: The **housing** may be permanently sealed, such as by welding or brazing (**hermetic motor-compressor**), or may be sealed by gasketted joints (**semi-hermetic motor-compressor**). A terminal box, a terminal box cover, and other electrical components or an electronic control system may be included.~~

[1] There exists a consolidated edition 4.2:2019 that includes Edition 4 and its Amendment 1 and Amendment 2.

Note 2 to entry: Hereafter, the term **motor-compressor** will be used to designate either a **hermetic motor-compressor** or **semi-hermetic motor-compressor**.

3.102
housing
sealed enclosure for the **motor-compressor**, which contains the compressor mechanism and the motor, and which is subjected to refrigerant pressures

3.103
thermal motor-protector
automatic control, built-in or fitted on a **motor-compressor**, that is specifically intended to protect the **motor-compressor** against over-heating due to running overload and failure to start

Note 1 to entry: This control carries **motor-compressor** current and is sensitive to one or both of the following:

– **motor-compressor** temperature;

– **motor-compressor** current.

Note 2 to entry: The control is capable of being reset (either manually or automatically) when its temperature falls to the reset value.

3.104
motor-compressor protection system
thermal motor protector and associated components, if any, or **protective electronic circuit** fully or partly separate or integrated into the **motor-compressor control system** and which is specifically intended to protect the **motor-compressor** against over-heating due to running overload or failure to start

Note 1 to entry: The control carries **motor-compressor** current and is sensitive to one or both of the following:

– **motor-compressor** temperature;

– **motor-compressor** current.

3.105
motor-compressor control system
system comprising one or more electrical or **electronic components,** or **electronic circuits** that provides at least one of the following:

– **motor-compressor** starting control functions;

– **motor-compressor** cooling capacity control functions

3.106
starting relay
electrically operated control device intended for integration or incorporation into a **motor-compressor** and used within the **motor-compressor** circuit to control the starting of single-phase **motor-compressors**

3.107
application category
back pressure relative to the evaporation temperature range over which the **motor-compressor** operates

Note 1 to entry: For the purpose of this standard, the following classifications of application categories are made relative to the evaporation temperature range:

– low back pressure (LBP): denotes an evaporation temperature range from –35 °C to –15 °C;

– medium back pressure (MBP): denotes an evaporation temperature range from –20 °C to 0 °C;

– high back pressure (HBP): denotes an evaporation temperature range from –5 °C to +15 °C.

3.108
transcritical refrigeration system
refrigeration system where the pressure in the high pressure side is above the pressure where the vapour and liquid states of the refrigerant can coexist in thermodynamic equilibrium

~~**3.109**~~
~~**design pressure**~~
~~gauge pressure that has been assigned to a **transcritical refrigeration system**~~

~~Note 1 to entry: It is specified for the high pressure side of a refrigeration system.~~

~~**3.110**~~
~~**pressure relief device**~~
~~pressure sensing device, intended to reduce pressure automatically when pressures within the refrigeration system exceed the preset pressure of the device~~

~~Note 1 to entry: This device has no provisions for setting by the end user.~~

~~**3.111**~~
~~**two-stage motor-compressor**~~
~~**motor-compressor** comprising two compressors and one motor in a single **housing**~~

3.1 Definitions relating to physical characteristics

3.1.101
design pressure
gauge pressure that has been assigned to a **transcritical refrigeration system**

Note 1 to entry: It is specified for the high pressure side of a refrigeration system.

3.1.102
application category
back pressure relative to the evaporation temperature range over which the **motor-compressor** operates

Note 1 to entry: For the purpose of this standard, the following classifications of **application categories** are made relative to the maximum evaporation temperature:

– very low back pressure (VLBP): denotes a maximum evaporation temperature of –25 °C;
– low back pressure (LBP): denotes a maximum evaporation temperature of –15 °C;
– medium back pressure (MBP): denotes a maximum evaporation temperature of 0 °C;
– high back pressure (HBP): denotes a maximum evaporation temperature of +15 °C;
– very high back pressure (VHBP): denotes a maximum evaporation temperature of +30 °C;
– subcritical R-744 back pressure (SC R-744BP): denotes a maximum evaporation temperature of –15 °C;

3.5 Definitions relating to types of appliances

3.5.101
motor-compressor
appliance consisting of the mechanical mechanism of the compressor and the motor, both of which are enclosed in the same sealed **housing**, with no external shaft seals, and with the motor operating in a refrigerant atmosphere with or without oil

Note 1 to entry: The **housing** may be permanently sealed, such as by welding or brazing (**hermetic motor-compressor**), or may be sealed by gasketed joints (**semi-hermetic motor-compressor**). A terminal box, a terminal box cover, and other electrical components or an electronic control system may be included.

Note 2 to entry: Hereafter, the term **motor-compressor** will be used to designate either a **hermetic motor-compressor** or **semi-hermetic motor-compressor**.

3.5.102
two-stage motor-compressor
motor-compressor comprising two compressors and one motor in a single **housing**