

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Household and similar electrical appliances – Safety –  
Part 2-34: Particular requirements for motor-compressors  
(standards.iteh.ai)

Appareils électrodomestiques et analogues – Sécurité –  
Partie 2-34: Exigences particulières pour les motocompresseurs

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Part 2-34: Particular requirements for motor-compressors

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Partie 2-34: Exigences particulières pour les motocompresseurs

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## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references .....	10
3 Terms and definitions .....	10
4 General requirement.....	11
5 General conditions for the tests .....	11
6 Classification.....	13
7 Marking and instructions.....	14
8 Protection against access to live parts.....	14
9 Starting of motor-operated appliances .....	14
10 Power input and current .....	14
11 Heating .....	14
12 Void.....	14
13 Leakage current and electric strength at operating temperature.....	14
14 Transient overvoltages .....	14
15 Moisture resistance .....	15
16 Leakage current and electric strength.....	15
17 Overload protection of transformers and associated circuits.....	15
18 Endurance.....	15
19 Abnormal operation .....	15
20 Stability and mechanical hazards .....	20
21 Mechanical strength .....	20
22 Construction .....	20
23 Internal wiring.....	23
24 Components .....	23
25 Supply connection and external flexible cords .....	23
26 Terminals for external conductors.....	24
27 Provision for earthing .....	24
28 Screws and connections.....	24
29 Clearances, creepage distances and solid insulation .....	24
30 Resistance to heat and fire.....	25
31 Resistance to rusting.....	25
32 Radiation, toxicity and similar hazards.....	25
Annexes .....	26
Annex C (normative) Ageing test on motors .....	26
Annex D (normative) Thermal motor protectors.....	26
Annex AA (normative) Running overload tests for motor-compressors classified as tested with Annex AA.....	27
Bibliography.....	35

Figure 101 – Supply circuit for the locked-rotor test of a single-phase motor-compressor .....	25
Figure AA.1 – Substitute refrigeration circuit .....	34
Table 101 – Minimum high side test pressures .....	21
Table 102 – Minimum low side test pressures .....	22
Table AA.1 – Substitute refrigeration circuit conditions for operating under running overload conditions .....	29
Table AA.2 – Substitute refrigeration circuit conditions for operating under maximum and minimum load conditions .....	32

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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 part of International Standard 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 fifth edition cancels and replaces the fourth edition published in 2002 including its Amendment 1 (2004) and its amendment 2 (2008). It constitutes a technical revision.

The principal changes in this edition as compared with the fourth edition of IEC 60335-2-34 are as follows (minor changes are not listed):

- some notes have been deleted or converted to normative text (1, 6.103, 19.14, 22.7, Figure 101);
- manufacturer must declare the type of motor protection used (5.102, 6.104);
- tests to fault-test **motor-compressors** incorporating **electronic circuits** introduced (19.11.2, AA.5);

- application of the EMP tests clarified (19.11.4);
- testing of contactors and relays associated with **motor-compressors** introduced (19.14);
- tables 101 and 102 updated and corrected;
- running overload test conditions extended (AA.1, AA.2, AA.3, AA.4, AA.5).

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

FDIS	Report on voting
61C/508/FDIS	61C/517/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 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 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 electrical motor-compressors.

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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.

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 publication will remain unchanged until the stability 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.

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).

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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.

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.

For **motor-compressors**, testing in accordance with this standard is an option and cannot be required as a precondition for testing the complete appliance, for example by reference in Clause 24 of a part 2 of IEC 60335. However, testing of the appliance should be reduced if an incorporated **motor-compressor** including its protection system or control system, if any, complies with this 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.

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## 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 International Standard 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 480 V for other **motor-compressors**.

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.

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 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 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 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.

## 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 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**.

### 3.102

#### **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 equal to or less than  $-35\text{ °C}$  to  $-15\text{ °C}$ ;
- medium back pressure (MBP): denotes an evaporation temperature range from  $-20\text{ °C}$  to  $0\text{ °C}$ ;
- high back pressure (HBP): denotes an evaporation temperature range from  $-5\text{ °C}$  to equal to or greater than  $+15\text{ °C}$ .

**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**

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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

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

**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:**

*At least one additional sample is required for the tests of clause 19, however further samples may also be provided or are needed.*

*For the test of 22.7, two samples of the **housing** are required.*

**5.7 Replacement:**

*Tests are carried out in an ambient temperature of  $20\text{ °C} \pm 5\text{ °C}$ .*

### 5.8.2 Addition:

**Motor-compressors with self-resetting motor-compressor protection systems, and designed for more than one rated voltage, are subjected to the tests of 19.101 and 19.103 at the highest voltage.**

### 5.10 Addition:

For the tests of Clause 19, the additional sample or samples shall be identical in all respects to the test sample, charged with oil, if necessary, and vapour refrigerant. The sample has to be provided with the **motor-compressor protection system, starting relay, start capacitor, run capacitor and control system, if any, as specified by the manufacturer, except that the rotor shall have been locked by the manufacturer.**

The manufacturer or responsible agent shall provide the following information for each type of **motor-compressor** submitted for the tests:

- type (synthetic or cellulosic) of winding insulation;
- refrigerant identification:
  - a) for a single component refrigerant, by at least one of the following:
    - chemical name;
    - chemical formula;
    - refrigerant number;
  - b) for a blended refrigerant, at least one of the following:
    - chemical name and nominal proportion of each of the components;
    - chemical formula and nominal proportion of each of the components;
    - refrigerant number and nominal proportion of each of the components;
    - refrigerant number of the refrigerant blend;
- types and quantity of oil to be used if the test samples which use oil are not already charged;
- **application category or application categories for motor-compressors** classified as being tested with Annex AA;
- whether a **supply cord** can be connected directly to terminals on the **motor-compressor**;
- for **motor-compressors** intended for appliances with a **transcritical refrigeration system**, the test pressure for the high pressure side if higher than the minimum test pressure.

### 5.11 Replacement:

For **motor-compressors** which can be used in appliances where the **supply cord** is connected directly to terminals on the **motor-compressor**, the test sample shall be provided with a **supply cord**.

NOTE 101 Any additional samples required for testing need not be provided with a **supply cord**.

**5.101 Motor-compressors, including those with crank-case heaters, are tested as motor-operated appliances.**

**5.102** With regard to 6.104, **protective devices** other than the declared device under test shall be disabled during the tests of Annex AA and Clause 19. If multiple **protective devices** are declared, each shall be tested independently.

## 6 Classification

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

**6.101 Motor-compressors** not incorporating an **electronic circuit** are classified as being tested with Annex AA or without Annex AA.

**Motor-compressors** incorporating an **electronic circuit** are classified as being tested with Annex AA.

**Motor-compressors** using refrigerant R744 shall not be classified as being tested with Annex AA.

**Motor-compressors** can be classified as being tested with Annex AA only if the **motor-compressor** in combination with the **motor-compressor protection system** or **motor-compressor control system**, if any, can be configured to operate so as to deliver maximum cooling capacity, independently of any input sensors that are only provided as part of the final application.

NOTE **Motor-compressors** classified as being tested without Annex AA and their protection system or control system, if any, are normally subjected to a heating test as a complete system in the final application in accordance with the appropriate appliance standard.

*Compliance is checked by*

- the tests of this standard including the tests in Annex AA, for **motor-compressors** tested with Annex AA;
- the tests of this standard but not including the tests in Annex AA, for **motor-compressors** tested without Annex AA.

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**6.102 Motor compressors** are classified as being

- intended for direct connection of the appliance **supply cord** to the **motor-compressor** terminals, or
- not intended for direct connection of the appliance **supply cord** to the **motor-compressor** terminals.

NOTE 1 **Motor-compressors** can in both cases be delivered with or without the external components necessary for connection of the **supply cord**.

NOTE 2 **Motor-compressors** intended for direct connection of the appliance **supply cord** to their terminals can also be used without the **supply cord** being connected directly to their terminals.

NOTE 3 If the **motor-compressor** is used without the relevant components or with components different from those specified by the manufacturer, additional testing in accordance with the appropriate appliance standard can be necessary.

*Compliance is checked by inspection and by the relevant tests.*

**6.103 Motor-compressors** are classified as being protected by **protective electronic circuits** or not being protected by **protective electronic circuits**.

This does not preclude the **protective electronic circuits** being provided in the end product, in which case many of the tests of this standard shall be conducted on the end product.

*Compliance is checked by inspection and by the relevant tests.*