

# CONSOLIDATED VERSION



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



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

## CONSOLIDATED VERSION



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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 97.130.20

ISBN 978-2-8322-2671-1

**Warning! Make sure that you obtained this publication from an authorized distributor.**



# REDLINE VERSION



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

## 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 .....	12
6 Classification.....	13
7 Marking and instructions.....	14
8 Protection against access to live parts.....	15
9 Starting of motor-operated appliances .....	15
10 Power input and current .....	15
11 Heating .....	15
12 Void.....	15
13 Leakage current and electric strength at operating temperature.....	15
14 Transient overvoltages .....	15
15 Moisture resistance .....	15
16 Leakage current and electric strength.....	15
17 Overload protection of transformers and associated circuits .....	15
18 Endurance.....	16
19 Abnormal operation .....	16
20 Stability and mechanical hazards .....	21
21 Mechanical strength .....	21
22 Construction .....	21
23 Internal wiring.....	24
24 Components .....	24
25 Supply connection and external flexible cords .....	25
26 Terminals for external conductors.....	25
27 Provision for earthing .....	25
28 Screws and connections.....	25
29 Clearances, creepage distances and solid insulation .....	25
30 Resistance to heat and fire .....	26
31 Resistance to rusting.....	26
32 Radiation, toxicity and similar hazards.....	26
Annexes .....	28
Annex C (normative) Ageing test on motors .....	28
Annex D (normative) Thermal motor protectors.....	28
Annex AA (normative) Running overload tests for motor-compressors classified as tested with Annex AA.....	29
Annex BB (normative) Winding wire insulation compatibility tests .....	38

Annex CC (normative) Tie cords and insulation compatibility tests .....	40
Annex DD (normative) Non-sparking “n” electrical apparatus .....	42
Bibliography.....	43
Figure 101 – Supply circuit for the locked-rotor test of a single-phase motor- compressor.....	27
Figure AA.1 – Substitute refrigeration circuit.....	37
Table 101 – Minimum high side test pressures.....	22
Table 102 – Minimum low side test pressures.....	23
Table AA.1 – Substitute refrigeration circuit conditions for operating under running overload conditions.....	31
Table AA.2 – Substitute refrigeration circuit conditions for operating under maximum and minimum load conditions.....	34
Table BB.1 – Time temperature heating cycles .....	39
Table CC.1 – Time temperature heating cycles.....	41

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### 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.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

#### DISCLAIMER

**This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.**

**This Consolidated version of IEC 60335-2-34 bears the edition number 5.1. It consists of the fifth edition (2012-05) [documents 61C/508/FDIS and 61C/517/RVD] and its amendment 1 (2015-05) [documents 61C/597/FDIS and 61C/603/RVD]. The technical content is identical to the base edition and its amendment.**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through. A separate Final version with all changes accepted is available in this publication.**



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.

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).

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.

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 the base publication and its amendment 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).

**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.

~~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.

## 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**.

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.

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.

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

IEC 60851-4, *Methods of test for winding wires – Part 4: Chemical properties*

IEC 60851-5:2008, *Winding wires – Test methods – Part 5: Electrical properties*

ISO 7010, *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 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