IEC 60335-2-34

Edition 5.0 2016-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

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

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

IEC 60335-2-34:2012-05/AMD2:2016-11(en-fr)

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
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
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
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 It also gives information on projects, replaced and withdrawn publications.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
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
The world's leading online dictionary of electronic and electrical terms containing 20 000 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
65 000 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
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 60335-2-34

Edition 5.0 2016-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

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

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 97.040.30

ISBN 978-2-8322-3731-1

FOREWORD

This amendment has been prepared by sub-committee 61C: Safety of refrigeration appliances for household and commercial use, of IEC technical committee 61: Safety of household and similar electrical appliances.

The text of this amendment is based on the following documents:

FDIS	Report on voting
61C/686/FDIS	61C/691/RVD

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

The committee has decided that the contents of this amendment and the base 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 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 contents of the corrigendun of June 2017 have been included in this copy.

_____

1 Scope

In the second paragraph, replace “480” *by* “600”.

6 Classification

6.101 *In the first paragraph of the requirement, replace* “not incorporating an” *by* “without an incorporated or associated”.

In the second paragraph of the requirement replace “incorporating an” *by* “with an incorporated or associated”.

13 Leakage current and electric strength at operating temperature

Add the following new subclause:

13.3 *Addition:*

In Table 4, add the following to table footnote a:

*The test voltage for 600 V multi-phase appliances is that specified for a **working voltage** > 250 V where U is taken as the **rated voltage**.*

16 Leakage current and electric strength

Replace the text by the following:

This clause of Part 1 is applicable except as follows.

16.3 *In Table 7 add the following to table footnote a:*

*The test voltage for 600 V multi-phase appliances is that specified for a **working voltage** > 250 V where U is taken as the **rated voltage**.*

19 Abnormal operation

19.11.2 *Replace the text of the addition by the following:*

*For simulation of the fault conditions, a **motor-compressor** with its incorporated or associated **electronic circuit** is connected to the substitute refrigeration circuit of Figure AA.1 and operated under the conditions given in Clause AA.5.The conditions applied are the step prior to that which caused the **protective device** to operate or the **motor-compressor** to stall during the tests of Clause AA.5.*

22 Construction

22.7 *Replace the text of the replacement by the following:*

Housings shall withstand the pressure expected in normal use.

Compliance is checked by the following tests.

*A **housing** which is exposed to high side pressure, including those in a **motor-compressor** incorporating a bypass valve, shall be subjected to a test pressure equal to:*

– *for subcritical refrigeration systems other than those using R-744, 3,5 times the saturated vapour pressure of the refrigerant at 70 °C, the test pressure being rounded up to the next 0,5 MPa (5 bar);*
– *for R-744 subcritical refrigeration systems, 3,5 times the saturated vapour pressure of the refrigerant at 27 °C, rounded up to the next 0,5 MPa (5 bar).*

NOTE 101 Example of test pressure calculation for R-22 (subcritical):

Saturated vapour pressure at 70 °C (gauge with respect to atmospheric pressure at STP) = 2,89 MPa (28,9 bar)

Test pressure = 3,5 × 2,89 MPa (28,9 bar)

= 10,1 MPa (101 bar)

= 10,5 MPa (105 bar) when rounded up to the next 0,5 MPa (5 bar).

– *for transcritical refrigeration systems, the highest of*

- *3 times the **design pressure**; or*
- *the test pressure declared by the manufacturer; or*
- *the test pressure specified in Table 101.*

The test values for some refrigerants are given in Table 101. For refrigerants not mentioned, the saturated vapour pressure at the temperatures detailed is obtained from refrigerant vapour pressure curves supplied by the refrigerant manufacture.

Table 101 – Minimum high side test pressures

Refrigerant formulae	Refrigerant number	Test pressure MPa	(bar)
Subcritical			
CCl_2F_2	R-12	6,5	(65)
CF_3CH_2F	R-134a	7,5	(75)
$CHClF_2$	R-22	10,5	(105)
CH_2F_2	R-32	17,0	(170)
$CH_3CH_2CH_3$	R-290	9,0	(90)
$CF_3CF=CH_2$	R-1234yf	7,0	(70)
$CF_3CH=CHF$	R-1234ze	5,5	(55)
$CH(CH_3)_3$	R-600a	3,5	(35)
CO_2	R-744	23,5	(235)
by weight 73,8 % R-12 + 26,2 % R-152a	R-500	7,5	(75)
by weight 48,8 % R-22 + 51,2 % R-115	R-502	11,0	(110)
by weight 44 % R-125 + 52 % R-143a + 4 % R-134a	R-404A	12,5	(125)
by weight 50 % R-125 + 50 % R-143a	R-507A	12,5	(125)
by weight 25 % R-125 + 52 % R-134a + 23 % R-32	R-407C	11,0	(110)
by weight 50 % R-125 + 50 % R-32	R-410A	16,5	(165)
Transcritical			
CO_2	R-744	42	(420)

NOTE The refrigerant test pressure data is based on NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version 9.1.

*In subcritical applications, a housing which is exposed only to low side pressure, including those in a **motor-compressor** incorporating a bypass valve, shall be subjected to a test pressure equal to*

– *for subcritical applications, other than those using R-744, the higher of*
  - *5 times the saturated vapour pressure of the refrigerant at 20 °C rounded up to the next 0,2 MPa (2 bar); or*
  - *2,5 MPa (25 bar);*
– *for subcritical applications using R-744, 5 times the saturated vapour pressure of the refrigerant at −6,5 °C rounded up to the next 0,2 MPa (2 bar).*

*In **transcritical refrigeration systems**, a **housing** which is exposed only to low side pressure shall be subjected to a test pressure that is equal to the highest of*

- *5 times the **design pressure**; or*
- *5 times the saturated vapour pressure of the refrigerant at 20 °C rounded up to the next 0,2 MPa (2 bar); or*
- *2,5 MPa (25 bar);or*
- *the test pressure specified in Table 102.*

The test values for some refrigerants are given in Table 102. For refrigerants not mentioned, the saturated vapour pressure at the temperatures detailed is obtained from refrigerant vapour pressure curves supplied by the refrigerant manufacture.

NOTE 102 Example of test pressure calculation for R-22 (subcritical):

Saturated vapour pressure at 20 °C (gauge with respect to atmospheric pressure at STP) = 0,81 MPa (8,1 bar)

Test pressure = 5 × 0,81 MPa (8,1 bar)

= 4,05 MPa (40,5 bar)

= 4,2 MPa (42 bar) when rounded up to the next 0,2 MPa (2 bar).

Table 102 – Minimum low side test pressures

Refrigerant formulae	Refrigerant number	Test pressure MPa	(bar)
Subcritical			
CCl_2F_2	R-12	2,5	(24)
CF_3CH_2F	R-134a	2,5	(24)
$CHClF_2$	R-22	4,2	(42)
CH_2F_2	R-32	7,0	(70)
$CH_3CH_2CH_3$	R-290	3,8	(38)
$CF_3CF=CH_2$	R-1234yf	2,6	(26)
$CF_3CH=CHF$	R-1234ze	2,5	(18)
$CH(CH_3)_3$	R-600a	2,5	(10)
CO_2	R-744	14,2	(142)
by weight 73,8 % R-12 + 26,2 % R-152a	R-500	3,0	(30)
by weight 48,8 % R-22 + 51,2 % R-115	R-502	4,6	(46)
by weight 44 % R-125 + 52 % R-143a + 4 % R-134a	R-404A	5,0	(50)
by weight 50 % R-125 + 50 % R-143a	R-507A	5,2	(52)
by weight 25 % R-125 + 52 % R-134a + 23 % R-32	R-407C	4,0	(40)
by weight 50 % R-125 + 50 % R-32	R-410A	6,8	(68)
Transcritical			
CO_2	R-744	28,2	(282)
NOTE The refrigerant test pressure data is based on NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version 9.1.			

NOTE 103 Further information relating to refrigerant number designations can be obtained from ISO 817.

For refrigerant blends, the saturated vapour pressure is taken as the pressure at the dew point temperature of 20 °C and 70 °C for low side and high side respectively.

*For two stage **motor-compressors** with direct discharge from the second stage, the **housing** is considered to be exposed to low side pressure.*

*For two stage **motor-compressors** without direct discharge from the second stage, the **housing** is considered to be exposed to high side pressure.*

The test shall be carried out on two samples. The test samples are filled with a liquid, such as water, to exclude air and are connected in a hydraulic pump system. The pressure is raised gradually until the required test pressure is reached. This pressure is maintained for 1 min during which time the sample shall not leak except as indicated below.

*Where gaskets are employed for sealing the **housing** of a **semi-hermetic motor-compressor**, leakage at gaskets is not considered as a failure, provided the leakage occurs at a pressure greater than 40 % of the required test pressure.*

If a leakage occurs, the test has to be repeated on a sample specially prepared by the manufacturer to avoid leakage at the gasket.

*For a **semi-hermetic motor-compressor** employing a bypass valve which relieves high side pressure into the low side at a predetermined pressure differential, the **housing** shall be capable of withstanding the required test pressure even though leakage occurs at gaskets.*

NOTE 104 All pressures are gauge pressures.

29 Clearances, creepage distances and solid insulation

29.1 *Add the following to the addition:*

For a **rated voltage** > 300 V and ≤ 346 V the rated impulse voltage is for

– overvoltage category I: 2 500 V;
– overvoltage category II: 4 000 V;
– overvoltage category III: 6 000 V.

Add the following new subclause:

29.3.4 *Addition:*

*For a **rated voltage** > 300 V and ≤ 346 V the minimum thickness for accessible parts of **reinforced insulation** consisting of a single layer is for*

– *overvoltage category I: 0,6 mm;*
– *overvoltage category II: 1,2 mm;*
– *overvoltage category III: 1,5 mm.*

NOTE 101 For multi-phase appliances, the line to neutral or line to earth voltage is used for **rated voltage**.

Annex AA – Running overload tests for motor-compressors classified as tested with Annex AA

AA.4 *Replace the first paragraph by the following:*

*The **motor-compressor** including the **motor-compressor protection system** and **motor-compressor control system**, if any, is connected to the substitute refrigeration circuit of Figure AA.1 and operated under the appropriate conditions given in Table AA.2. However, for R-744 refrigerant intended for use in a **transcritical refrigeration system**, for all tests the operating discharge pressure is 12 MPa and for test 4 the return gas temperature is +25 °C. The tests are continued until steady conditions are reached.*

Replace Table AA.2 including its title by the following:

Table AA.2 – Substitute refrigeration circuit conditions for operating under maximum load conditions

Test number	Applied voltage	Back pressure application category	Evaporation temperature °C	Condensation temperature °C	Motor-compressor ambient temperature °C	Return gas temperature °C
4	**Rated voltage**	Low back pressure (LBP) – max. load – max. cooling	–15	+65	+43	+43
5	**Rated voltage**	Low back pressure (LBP) – min. load – max. cooling	–35	+49	+43	+25
4	**Rated voltage**	Medium back pressure (MBP) – max. load – max. cooling	0	+65	+43	+25
5	**Rated voltage**	Medium back pressure (MBP) – min. load – max. cooling	–20	+55	+43	+25
4	**Rated voltage**	High back pressure (HBP) – max. load – max. cooling	+15	+65	+43	+25
5	**Rated voltage**	High back pressure (HBP) – min. load – max. cooling	–5	+55	+43	+25

In the second paragraph, replace "4, 5, 6 and 7," by "4 and 5".

Replace the text of the second paragraph first dashed item by the following:

– *the temperature rises of the **motor-compressor control system** and the **motor-compressor protection system** containing **electronic components** are measured and shall not exceed the values given in Table 3 of Part 1, reduced by 7 K;*

*In the second dash item of the second paragraph, replace "**motor-compressor protective electronic circuit"** by "**protective device**".*

AA.5 *Replace the first four paragraphs of the test specification by the following text and add Table AA.3 after the existing fifth paragraph of the test specification:*

*Starting from conditions defined in Table AA.2, increase the **motor-compressor** load by applying the steps in sequence as indicated in Table AA.3 until steady conditions are reached at each step or until one of following conditions occurs:*

– *a **protective device** operates to disconnect the **motor compressor** from the supply,*
– *the **motor-compressor** stalls and steady conditions are reached.*

Table AA.3 – Steps for increasing the load on the motor-compressor

Step	Procedure
1a	*For other than R-744 **transcritical refrigeration systems**, increase the condensing temperature to 70 °C*
1b	*For R-744 **transcritical refrigeration systems**, increase the discharge pressure in steps of approximately 0,05 MPa up to a discharge pressure of 13 MPa*
2	*Increase the evaporating temperature in steps of approximately 5 K for a* *– LBP application category: up to 0 °C* *– MBP application category: up to +10 °C* *– HBP application category: up to +20 °C*
3	*Increase the input voltage to the inverter in steps of approximately 6 % of the input voltage to the inverter at **rated voltage**, up to 1,12 times the input voltage to the inverter at **rated voltage***
4	*Starting from **rated voltage**, decrease the input voltage to the inverter in steps of approximately 5 % of the input voltage to the inverter at **rated voltage***

*In the second paragraph of the Note, replace "**motor-compressor protective electronic circuit**" by "**protective device**" in three places.*

Bibliography

Add the following text to the addition:

NIST Standard Reference Database 23, *NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version 9.1*