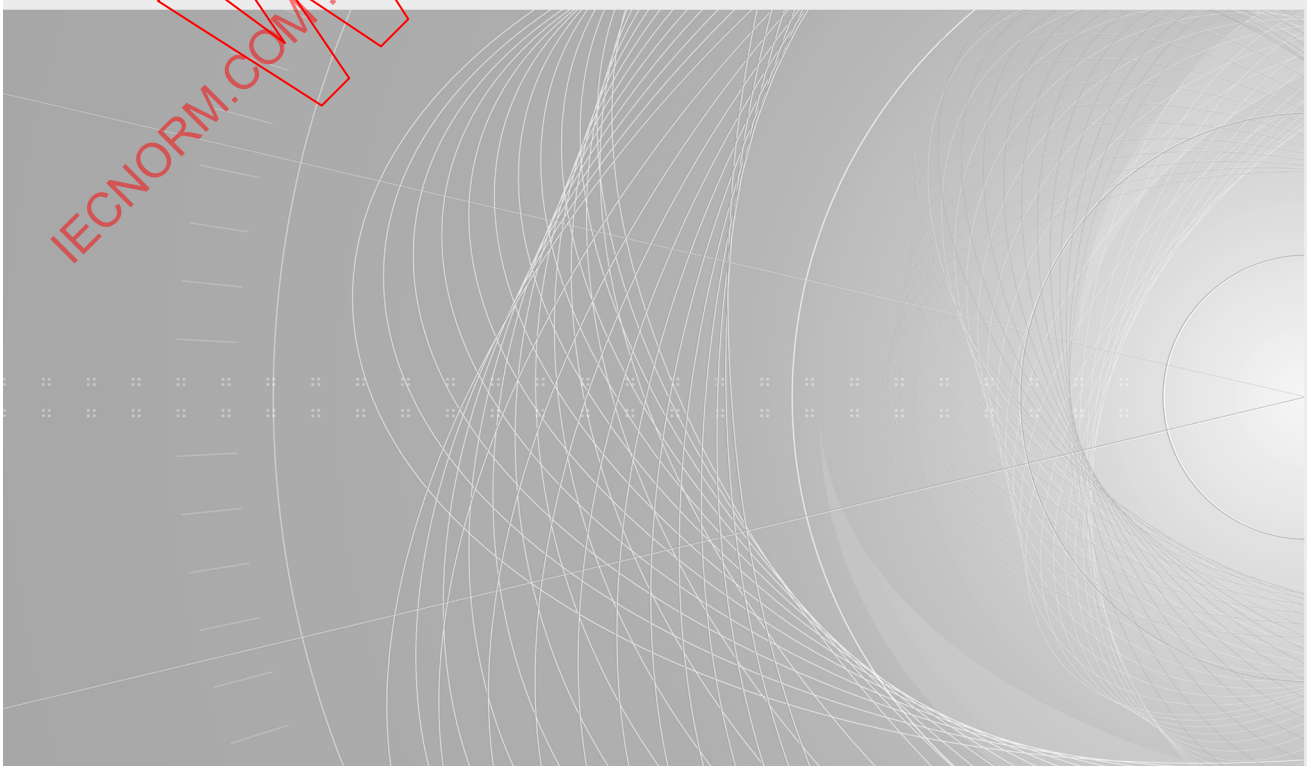
IEC 60335-2-40

Edition 5.0 2016-04

INTERNATIONAL STANDARD

AMENDMENT 1

Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers



IEC 60335-2-40:2013-12/AMD1:2016-04(en)

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 It also gives information on projects, replaced and withdrawn publications.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.

IEC 60335-2-40

Edition 5.0 2016-04

INTERNATIONAL STANDARD

AMENDMENT 1

Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 23.120

ISBN 978-2-8322-3311-5

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

FOREWORD

This amendment has been prepared by IEC Subcommittee 61D: Appliances for air-conditioning for household and similar purposes, 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
61D/333/FDIS	61D/334/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 publication will remain unchanged until the stability date indicated on the IEC website 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.

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

NOTE The attention of the National Committees is drawn to the fact that this amendment is intended to make the information available before a full revision of IEC 60335-2-40 will be launched.

1 Scope

Replace the second paragraph by the following:

This part of IEC 60335 deals with the safety of electric **heat pumps**, including **sanitary hot water heat pumps**, **air conditioners**, and **dehumidifiers** incorporating motor-compressors and **hydronic fan coil units**, their maximum **rated voltages** being not more than 250 V for single phase appliances and 600 V for all other appliances. **Partial units** are within the scope of this International Standard.

Replace the first sentence in the sixth paragraph by the following:

This standard does not take into account refrigerants other than those classified as A1, A2L, A2 or A3 under ISO 817 or ANSI/ASHRAE 34.

3 Terms and definitions

3.101
heat pump

Add the following Note 2:

Note 2 to entry: A **heat pump** can contain a combination of **condensing unit or condenser unit** and an **evaporating unit** or **evaporator unit** and can be equipped to operate in a reverse cycle mode.

3.103
air conditioner

Add the following Note 3:

Note 3 to entry: An **air conditioner** can contain a combination of **condensing unit** or **condenser unit** and an **evaporating unit** or **evaporator unit**.

Replace the term and definition by the following:

3.120
fan coil
air handling unit

Replace the term and definition by the following:

3.120
hydronic fan coil unit
factory-made assembly which provides the function of forced circulation of air for heating and/or cooling, which may also include the function of **dehumidification** and/or filtering of air, but which does not include the source of cooling or heating

Note 1 to entry: **Hydronic fan coil units** can include provision for electric resistance heating. **Heat exchanger** coils are intended for hydronic heating and cooling only.

3.121
flammable refrigerant

Replace the definition by the following:

refrigerant listed under ISO 817 or ASHRAE 34 with a classification of A2L, A2 or A3

Add the following new definitions:

3.129
condenser
heat exchanger in which refrigerant vapor is condensed by removal of heat

3.130
condensing unit
factory-made assembly that includes one or more motor-compressors, **condenser** in cooling mode and motor-driven fan, blower or pump to circulate the heat transfer fluid through the **condenser** with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to an **evaporator unit**. A **condensing unit** can also be equipped to operate in the reverse cycle mode. A **condensing unit** can include expansion device(s).

3.131
condenser unit
factory-made assembly that includes one or more **condensers** in cooling mode and motor-driven fan, blower or pump to circulate the heat transfer fluid through the **condenser** with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to an **evaporating unit**. A **condenser unit** can also be equipped to operate in the reverse cycle mode.

Note 2 to entry: A **condenser unit** does not include a motor compressor or expansion device.

3.132
evaporating unit
factory-made assembly that includes one or more motor-compressors, **evaporator** in cooling mode, expansion device(s), and motor-driven fan, blower or pump to circulate fluid through the **evaporator** with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to a **condenser unit**. An **evaporating unit** can also be equipped to operate in the reverse cycle mode and can include provision for electric resistance heating or similar sources of auxiliary heat.

3.133
evaporator unit
factory-made assembly that includes one or more **evaporators** in cooling mode, and may include a motor-driven fan, blower or pump to circulate fluid through the **evaporator** with associated operational controls in addition to the necessary wiring

Note 1 to entry: These units are intended for field connection to a **condensing unit**. An **evaporator unit** can also be equipped to operate in the reverse cycle mode and can include provision for electric resistance heating or similar sources of auxiliary heat. An **evaporator unit** can include expansion device(s).

Note 2 to entry: An **evaporator unit** does not include a motor compressor.

3.134
partial unit
condensing unit, **evaporating unit**, **condenser unit**, or **evaporator unit** which are part of a total assembly of a **heat pump**, **air-conditioner**, or **sanitary hot water heat pumps** where not all assemblies to create the complete **refrigeration system** are specified by the manufacturer

Note 1 to entry: **Partial units** are evaluated for safety as stand-alone.

3.135
installed height
h_{inst}
height of the bottom of the appliance relative to the floor of the room after installation

Note 1 to entry: The installed height is given in metres.

3.136
release offset
h_{rel}
distance from the bottom of the appliance to an opening where refrigerant can leave the appliance in the event of a refrigerant leak

Note 1 to entry: The release offset is given in metres.

3.137
refrigerant charge
m_c
actual **refrigerant charge** of a single refrigerating system

Note 1 to entry: The **refrigerant charge** is expressed in kg.

3.138
maximum refrigerant charge
m_{max}
maximum refrigerant charge for a single **refrigerating system** as result from a calculation for room area or similar

Note 1 to entry: The **maximum refrigerant charge** is expressed in kg.

7 Marking and instructions

7.1

In the addition, replace the second dash by the following:

– **refrigerant charge**;

In the addition, replace the third dash by the following:

– refrigerant as designated under ISO 817 or ANSI/ASHRAE 34;

In the addition, replace the fifth dash by the following:

– maximum operating pressure in the water and/or brine circuit for the **heat exchanger** for **hydronic fan coil units**;

In the first paragraph below the warning, replace the second sentence by the following:

The X in the marking shall be determined in m^2 according to Clause GG.2 for unventilated areas; and the X in the marking shall not be required if the **refrigerant charge** (m_c) of the appliance is up to m_1 according to GG.1.1.

Add the following new subclauses:

7.103 For appliances made up of more than one factory made assembly specified by the manufacturer to be used together, instructions shall be provided for completing the assembly to ensure compliance with the requirements.

7.104 For **partial units**, the instructions or markings shall include the following additional information.

– For **evaporating units** and **condensing units**, the instructions or markings shall include wording to assure that the maximum operating pressure is considered when connecting to any **condenser unit** or **evaporator unit**.
– For **evaporating units**, **condensing units and condenser units**, the instructions or markings shall include refrigerant charging instructions.

– A warning to assure that **partial units** shall only be connected to an appliance suitable for the same refrigerant.

– This unit <model xxx> is a partial unit air conditioner, complying with partial unit requirements of this International Standard, and must only be connected to other units that have been confirmed as complying to corresponding partial unit requirements of this International Standard.

– The electrical interfaces shall be specified with purpose, voltage, current, and safety class of construction.

– The **SELV** connection points, if provided, are to be clearly indicated in the instructions. The connection point should be marked with the "read the instructions" symbol per ISO 7000-0790 (2004-01) and the Class III symbol according to IEC 60417-5180 (2003-02).

11 Heating

Replace the second dashed item of 11.2 by the following:

– *flow rates for liquid source or sink equipment shall be the minimum specified in the manufacturer's instructions except for hydronic **fan coil** units where the flow rates and liquid temperatures shall be the maximum specified in the manufacturer's instructions;*

Add the following new subclause:

11.2.3 For the evaluation and testing of **partial units**, the following test setup and conditions are to be applied.

– **evaporator units** and **condenser units** are tested as individual units at the maximum ambient temperature stated in the instructions. If not stated in the instructions, these units shall be tested at an ambient temperature that is equal to the saturated temperature of the refrigerant at the marked maximum allowable operating pressure (± 0,1 MPa) minus 10 K (± 1 K).

– **condensing units** are tested in the cooling mode only, at the maximum specified ambient temperature with 9 K (± 1 K) sub-cooling and the maximum specified evaporating pressure with 11 K (± 1 K) superheat. For **condensing units** provided with expansion device(s), the superheat/sub-cooling is to be as under the normal control of the expansion device(s).

– **evaporating units**, intended for cooling only, are tested in the cooling mode only with a condensing pressure that is equal to the marked maximum allowable operating pressure (± 0,1 MPa) with 9 K (± 1 K) sub-cooling.

– **evaporating units** that are intended for reverse cycle operation are tested in the heating mode only, at the maximum specified evaporating pressure.

NOTE Testing for condensing and evaporating units requires connection to calorimeter stand or similar device capable of controlling the refrigerant entering and leaving conditions as specified in the test above. Condenser and evaporator units do not require a calorimeter stand or similar device.

15 Moisture resistance

15.101 Spillage test

Replace the fourth paragraph by the following:

*A solution of 0,25 l of water containing approximately 1 % NaCl is poured onto the unit in a manner which is most likely to cause entrance of water into or on electrical controls or **uninsulated live parts**.*

22 Construction

22.115 *Replace this subclause by the following:*

The **refrigerant charge** (m_c) of all **refrigerating systems** within the appliance employing **flammable refrigerants** shall not exceed m_3 as defined in Annex GG.

The construction of the **refrigerating system** using **flammable refrigerants** shall comply with the requirements in Annex GG for

- the **maximum refrigerant charge** (m_{max}),
- the minimum floor area A_{min},
- mechanical ventilation,
- **refrigerating systems** employing secondary circuits.

22.116

Add, in the first paragraph of 22.116, after "in areas within the appliance",

"and connected ducts".

Add the following Note 2 after the existing Note and renumber the Note as Note 1:

"NOTE 2 Ignition sources can be electrical components which produce sparks or arcs or hot surfaces under normal conditions. Examples are brush-type motors, light switches, relays, electric heaters, or UV lights".

Add the following new subclauses:

22.119 Condensing units and **evaporating units** shall be equipped with a **pressure-limiting device** or equivalent to assure that the equipment does not exceed the **maximum allowable pressure**.

NOTE 1 Applies to partial unit types, condensing units and evaporating units only.

For **partial units**, the interconnection circuits for signal communication between each unit shall be of the same type.

NOTE 2 SELV level connection is recommended.

22.120 Partial units shall be provided with a means of connection to the supply mains and shall not be powered by an electrical circuit from another appliance.

Annex AA – Examples for operating temperatures of the appliance

Replace the table heading by the following:

Function of appliance	Classification	Heating				Cooling			
		Outdoor assembly °C (inlet)		Indoor assembly °C (outlet)		Outdoor assembly °C (inlet)		Indoor assembly °C (outlet)	
		DB [a]	WB [b]	DB [a]	WB [b]	DB [a]	WB [b]	DB [a]	WB [b]

Annex DD – Instruction manual for servicing refrigerant containing appliances

DD.2.1 General

Add the following text to the 2nd indent in the first dash:

– In case of field charge, the effect on refrigerant charge caused by the different pipe length has to be quantified.

Replace the second dash by the following:

– the **maximum refrigerant charge** (m_{max});

Replace the fifth dash by the following:

– the minimum floor area of the room or the special requirements for the room in which an appliance containing **flammable refrigerants** can be located as defined in Annex GG, except where the **refrigerant charge** (m_c) is less than or equal to m_1 ($m_c \leq m_1$);

Add the following new dash after the 5th dash:

– detailed instructions on how to install the appliance to ensure that the release height h_0 of the installed appliance is not lower than h_0 used for the calculation of A_{min};

Add the following new dash to the end of DD.2.1:

– a warning that ducts connected to an appliance shall not contain an ignition source.

DD.3.8 Checks to the refrigeration equipment

In the second paragraph, replace the first dash by the following:

– *the actual **refrigerant charge** is in accordance with the room size within which the refrigerant containing parts are installed;*

Annex FF – Leak simulation tests

FF.1 General

Replace "charge amount" *by* "**refrigerant charge**".

FF.2.1

Replace "total appliance charge" *by* "**refrigerant charge**".

FF.2.4

Replace in the equation symbol "*m*" *by* "m_c".

Replace the explanation of m after the equation by the following:

m_c is the **refrigerant charge** in kg;

Annex GG – Charge limits, ventilation requirements and requirements for secondary circuits

Replace symbol "M" *by symbol* "m_c" *in 19 occurrences.*

GG.1 General

Replace the first dash by the following:

– the **refrigerant charge** (m_c) used in the appliance,

Add, after the third dash, the following new paragraph:

Symbol m_c denotes the **refrigerant charge** of a single **refrigerating system**. Where multiple **refrigerating systems** are servicing the same space, the **refrigerating system** with the largest **refrigerant charge** shall be used.

GG.1.1

In the first paragraph, replace the words "mass charge amount employed" *by* "**refrigerant charge** (m_c)".

GG.1.2

In Note 1, replace "charge amount" *by* "**refrigerant charge**" *in two occurrences.*

*In Note 1, replace "*charge" *by* "**refrigerant charge**".

In Note 3, replace "charge amount" *by* "**refrigerant charge**".

GG.2 Requirements for charge limits in unventilated areas

Replace the term "charge amount" *by* "**refrigerant charge**" *in five occurrences.*

In the fifth paragraph, replace the term "maximum charge" *by* "**maximum refrigerant charge**".

In the fifth paragraph, replace the definition of h_0 by the following:

h_0 is the release height, the vertical distance in metres from the floor to the point of release when the appliance is installed (see Figure GG.5).

$h_0 = (h_{inst}+h_{rel})$ or 0,6 m whichever is higher.

h_{rel} is the **release offset** in metres from the bottom of the appliance to the point of release (see Figure GG.5). Cumulative openings smaller than 5 cm² and openings with a single dimension of not more than 0,1 mm are not considered as openings where leaking refrigerant can escape. Openings for routing of wires and tubing which are not sealed openings shall include the total area of the opening without consideration of the area occupied by the tubing or wire.

h_{inst} is the **installed height** in metres of the unit (see Figure GG.5).
Reference **installed heights** are given below:

h_{inst} = 0,0 m for portable and floor mounted

h_{inst} = 1,0 m for window mounted

h_{inst} = 1,8 m for wall mounted

h_{inst} = 2,2 m for ceiling mounted

If the minimum **installed height** given by the manufacturer is higher than the reference **installed height**, then in addition A_{min} and m_{max} for the reference **installed height** have to be given by the manufacturer. An appliance may have multiple reference **installed heights**. In this case, A_{min} and m_{max} calculations shall be provided for all applicable reference **installed heights**.

Add the following text before Notes1 and 2:

*For appliances serving one or more rooms with an air duct system, the lowest opening of the duct connection to each conditioned space or any opening of the indoor unit greater than 5 cm², at the lowest position to the space, shall be used for h_0. However, h_0 shall not be less than 0,6 m. A_{min} shall be calculated as a function of the opening heights of the duct to the spaces and the **refrigerant charge** for the spaces where leaked refrigerant may flow to, considering where the unit is located. All spaces shall have a floor area more than A_{min}.*

Add after Notes 1 and 2 the following Notes 3 and 4:

NOTE 3 For **factory sealed appliances**, the nameplate marked the **refrigerant charge** can be used to calculate A_{min}.

NOTE 4 For field charged products, calculation of A_{min} can be based on the installed **refrigerant charge** not to exceed the factory specified maximum **refrigerant charge**.

GG.3 Requirements for charge limits in areas with mechanical ventilation

In the note, replace the term "charge amount" *by* "**refrigerant charge**".

GG.4 Requirements for mechanical ventilation within the appliance enclosure

Replace the first sentence in the first paragraph by the following:

The refrigerating circuit is provided with a separate enclosure that does not allow flow from inside the enclosure to the room.

Delete the 4th sentence of the 1st paragraph.

Replace the formula and the explanations by the following:

$$Q_{min} = S \times 15\ (24{,}5 \times m_c/M)\ \text{(with a minimum of 2 m}^3\text{/h)}$$

where

S is a safety factor of 4;

M is the molar mass of **refrigerant** in g/mol;

Q_{min} is the minimum required volume flow of the ventilation in m³/h;

m_c is the **refrigerant charge**;

24,5 is the gas constant in l/mol;

15 is the conversion from per minute to per hour with 4 minutes scenario.

In the note, replace the term "charge amount" *by* "**refrigerant charge**".

Add the following Note 2 after the Note and renumber the Note as Note 1:

NOTE 2 For blends, the molar mass is the mole fraction weighted average of the molar masses of the components.

GG.8 Non fixed factory sealed single package units with a charge amount of $m_1 < M \leq 2 \times m_1$

In the title, replace the words "**charge amount**" *by* "**refrigerant charge**".