BSI Standards Publication

Household and similar electrical appliances — Safety

Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

Documents
Document Sharing Hub

National foreword

This British Standard is the UK implementation of EN IEC 60335-2-40:2024+A11:2024. It is derived from IEC 60335-2-40:2022, incorporating corrigendum October 2024. It supersedes BS EN IEC 60335-2-40:2023+A11:2023, which is withdrawn.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum October 2024 is indicated in the text by ⟦AC1⟩ ⟨AC1⟧.

The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags. Tags indicating changes to text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by ⟦A11⟩ ⟨A11⟧.

The UK participation in its preparation was entrusted to Technical Committee CPL/61/4, Room air-conditioners.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication has been prepared under a mandate given to the European Standards Organizations by the European Commission and the European Free Trade Association. It is intended to support requirements of the EU legislation detailed in the European Foreword. A European Annex, usually Annex ZA or ZZ, describes how this publication relates to that EU legislation.

For the Great Britain market (England, Scotland and Wales), if UK Government has designated this publication for conformity with UKCA marking (or similar) legislation, it may contain an additional National Annex. Where such a National Annex exists, it shows the correlation between this publication and the relevant UK legislation. If there is no National Annex of this kind, the relevant Annex ZA or ZZ in the body of the European text will indicate the relationship to UK regulation applicable in Great Britain. References to EU legislation may need to be read in accordance with the UK designation and the applicable UK law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

For the Northern Ireland market, UK law will continue to implement relevant EU law subject to periodic confirmation. Therefore

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

Annex ZA/ZZ in the European text, and references to EU legislation, are still valid for this market.

UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

© The British Standards Institution 2024
Published by BSI Standards Limited 2024

ISBN 978 0 539 21146 7

ICS 23.120

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2024.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 60335-2-40:2024+A11

November 2024

ICS 23.120

Supersedes EN IEC 60335-2-40:2023; EN IEC 60335-2-40:2023/A11:2023

English Version

Household and similar electrical appliances - Safety - Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers (IEC 60335-2-40:2022 + COR1:2024)

Appareils électrodomestiques et analogues - Sécurité - Partie 2-40: Exigences particulières pour les pompes à chaleur électriques, les climatiseurs et les déshumidificateurs
(IEC 60335-2-40:2022 + COR1:2024)

Sicherheit elektrischer Geräte für den Hausgebrauch und ähnliche Zwecke - Teil 2-40: Besondere Anforderungen für elektrisch betriebene Wärmepumpen, Klimageräte und Raumluft-Entfeuchter
(IEC 60335-2-40:2022 + COR1:2024)

This European Standard was approved by CENELEC on 2024-08-12. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2024 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN IEC 60335-2-40:2024 E

Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

European foreword

This document (EN IEC 60335-2-40:2024) consists of the text of IEC 60335-2-40:2022 + COR1:2024 prepared by IEC/TC 61 “Safety of household and similar electrical appliances”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2025-08-12
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2027-08-12

This document supersedes EN IEC 60335-2-40:2023 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN-CENELEC shall not be held responsible for identifying any or all such patent rights.

This document is read in conjunction with EN IEC 60335-2-40:2024/A11:2024.

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annexes ZZA and ZZB, which are an integral part of EN IEC 60335-2-40:2024/A11:2024.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN and CENELEC websites.

Endorsement notice

The text of the International Standard IEC 60335-2-40:2022 + COR1:2024 was approved by CEN-CENELEC as a European Standard without any modification.

Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

European foreword to amendment A11

This document (EN IEC 60335-2-40:2024/A11:2024) has been prepared by CLC/TC 61 “Safety of household and similar electrical appliances”.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2025-08-12
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2027-08-12

The numbering system for European clauses, subclauses, notes, tables, figures and annexes that are additional to those in the IEC standard are prefixed with the letter “Z”.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN-CENELEC shall not be held responsible for identifying any or all such patent rights.

This document is read in conjunction with EN IEC 60335-2-40:2024.

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annexes ZZA and ZZB, which are an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN and CENELEC websites.

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

CONTENTS

FOREWORD 5
INTRODUCTION 8
1 Scope 9
2 Normative references 10
3 Terms and definitions 11
4 General requirement 19
5 General conditions for the tests 19
6 Classification 20
7 Marking and instructions 20
8 Protection against access to live parts 26
9 Starting of motor-operated appliances 26
10 Power input and current 26
11 Heating 26
12 Void 29
13 Leakage current and electric strength at operating temperature 29
14 Transient overvoltages 29
15 Moisture resistance 29
16 Leakage current and electric strength 31
17 Overload protection of transformers and associated circuits 31
18 Endurance 31
19 Abnormal operation 31
20 Stability and mechanical hazards 38
21 Mechanical strength 38
22 Construction 39
23 Internal wiring 51
24 Components 51
25 Supply connection and external flexible cords 52
26 Terminals for external conductors 53
27 Provision for earthing 53
28 Screws and connections 53
29 Clearances, creepage distances and solid insulation 53
30 Resistance to heat and fire 53
31 Resistance to rusting 55
32 Radiation, toxicity and similar hazards 55
Annexes 62
Annex D (normative) Thermal motor protectors 62
Annex I (normative) Motors having basic insulation that is inadequate for the rated voltage of the appliance 62
Annex AA (informative) Examples for operating temperatures of the appliance 63
Annex BB (normative) Selected information about refrigerants 64
Annex CC (informative) Transportation, marking and storage for units that employ flammable refrigerants 68

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

Annex DD (normative) Requirements for installation, service, maintenance and repair, and decommissioning manuals of appliances using flammable refrigerants 69
Annex EE (normative) Pressure tests 78
Annex FF (normative) Leak simulation tests 80
Annex GG (normative) Charge limits, ventilation requirements and requirements for secondary circuits 82
Annex HH (informative) Competence of service personnel 115
Annex II (Void) 117
Annex JJ (normative) Allowable openings of relays and similar components to prevent ignition of A2L refrigerants 118
Annex KK (normative) Test method for hot surface ignition temperature for A2L 120
Annex LL (normative) Refrigerant detection systems for flammable refrigerants 124
Annex MM (normative) Refrigerant sensor location confirmation test 135
Annex NN (normative) Flame arrest enclosure verification test for A2L refrigerants 138
Annex OO (Void) 140
Annex PP (normative) Leak detection system confirmation test for flammable refrigerants 141
Annex QQ (normative) Methods for determining releasable charge 147
Bibliography 170

Figure 101 – Example of label for field charged units 57
Figure 102 – Arrangement for heating test of appliances with supplementary air heater 59
Figure 103 – Supply circuit for locked-rotor test of a motor of the single-phase type – Revise as needed for three-phase test 60
Figure 104 – Power spectral density profile for vibration test in 21.101 60
Figure 105 – Dimensional details for the weight in the area of the pressure ball 60
Figure 106 – Measurement before and after the test 61
Figure GG.1 – Unventilated area 112
Figure GG.2 – Mechanical ventilation 112
Figure GG.3 – Relevant heights h_{inst}, h_0 and h_{rel} for calculation of A_{min} and m_{max} 113
Figure GG.4 – Airflow direction 114
Figure KK.1 – Front view of test apparatus labels 120
Figure KK.2 – Test apparatus with dimensions 121
Figure KK.3 – Top view of test apparatus 122
Figure LL.1 – Example of test chamber design 130

Table 101 – Power spectral density profile for vibration test 38
Table 102 – UVC spectral irradiance measurement location 56
Table AA.1 – Examples for operating temperatures of the appliance 63
Table BB.1 – Selected information about refrigerants 64
Table DD.1 – Mandatory clauses in each manual 69
Table GG.1 – Outline of Annex GG (informative) 83
Table GG.2 – Circulation airflow 88
Table GG.3 – Appliance with packaging 95

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

Table GG.4 – Appliance without packaging 95
Table GG.5 – Minimum air velocity 107
Table GG.6 – Refrigerant leak rate ($\dot{m}_{leak}$) 110
Table LL.1 – Relationship among alarm set point, tolerance and test gas (informative) 126
Table LL.2 – Gas and vapour concentrations 128
Table LL.3 – Example of the test chamber design 131

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

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.

IEC 60335 has been prepared by subcommittee 61D: Appliances for air-conditioning for household and similar purposes, of IEC technical committee 61: Safety of household and similar electrical appliances. It is an International Standard.

This seventh edition cancels and replaces the sixth edition published in 2018. This edition constitutes a technical revision.

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

– Clause 1 – added **thermoelectric heat pumps** to the scope and increased maximum **rated voltage** to 300 V for single phase appliances;
– Clause 7 – revised requirements for marking on the appliance and packaging, including a symbol for minimum floor area and modifying the symbol for **flammable refrigerants** to include the safety group per ISO 817;
– Clause 11 and Clause 19 – restructured for alignment with Part 1 and added requirements for **supplementary air heaters**;

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

- Clause 13 and Clause 16 – revised requirement for leakage current for **stationary class I motor-operated appliances**;
- Clause 21 – added requirements for **particle foam material** and revised requirements for transport testing;
- Clause 22 – removed limit on the sum of **refrigerant charges** for appliances with multiple **refrigerating systems**, and revised requirements for avoiding ignition sources, **leak detection systems**, **safety shut-off valves**, and **particle foam material**;
- Clause 23 – added requirements to avoid contact between wires and refrigerant piping;
- Clause 24 – revised requirements for motor-compressors;
- Clause 30 – added requirements for resistance to heat of **particle foam material**;
- Annex BB – revised Table BB.1 with refrigerant information and added a link to ISO 817 refrigerant data;
- Annex DD – revised requirements for information in the manual for appliances with **flammable refrigerants**;
- Annex EE – revised requirements for pressure testing;
- Annex FF – revised requirements for leak simulation tests;
- Annex GG – added requirements for applying **releasable charge**, added additional coverage for A2 and A3 refrigerants, including new charge limits for appliances with **circulation airflow** and for **enhanced tightness refrigerating systems**, and revised requirements for **enhanced tightness refrigerating systems** using **A2L refrigerant**;
- Annex LL – revised requirements for **refrigerant detection systems**;
- Annex MM – revised simulated leak rate;
- Annex OO – deleted annex for conditioning internal wiring using UV light.
- Annex PP – new coverage of **leak detection system** confirmation test;
- Annex QQ – new coverage of method for determining **releasable charge**.

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

Draft	Report on voting
61D/491/FDIS	61D/493/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/publications.

This part 2-40 is to be used in conjunction with IEC 60335-1:2010, its Amendment 1:2013 and its Amendment 2:2016.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to IEC 60335-1.

This part 2-40 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for electrical heat pumps, air-conditioners and dehumidifiers.

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.

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

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 associated noun are also in bold.

The following differences exist in the countries indicated below:

- 6.1: Class 0I appliances are allowed (Japan).
- 11.8: The temperature of the wooden walls in the test casing is limited to 85 °C (Sweden).

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 document will remain unchanged until the stability date indicated on the IEC website under 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.

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.

Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

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.

Guidance documents concerning the application of the safety requirements for appliances can be accessed via TC 61 supporting documents on the IEC website

https://www.iec.ch/tc61/supportingdocuments

This information is given for the convenience of users of this International Standard and does not constitute a replacement for the normative text in this standard.

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 instructions. It also covers abnormal situations that can be expected in practice.

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 can 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 publications, basic safety publications and group safety publications 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.

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.

〈A11〉 With this European amendment A11, EN IEC 60335-2-40:2023+A11:2023 is superseded.

This European amendment A11 supplements or modifies the corresponding clauses of the standards below:

— EN 60335-1:2012+A11:2014+A13:2017+A1:2019+A14:2019+A2:2019+A15:2021+A16:2023 (Part 1)

— EN IEC 60335-2-40:2024 (Part 2) 〈A11〉

Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

1 Scope

This clause of Part 1 is replaced by the following.

This part of IEC 60335 deals with the safety of electric **heat pumps**, **sanitary hot water heat pumps** and **air conditioners**, incorporating motor-compressors as well as **hydronic fan coils units**, **dehumidifiers** (with or without motor-compressors), **thermoelectric heat pumps** and **partial units**. Their maximum **rated voltage** being not more than 300 V for single phase appliances and 600 V for multi-phase appliances.

〈A11〉 These appliances are used for the household environment and commercial purposes.

NOTE Z101 Examples of appliance for household environment are appliances for typical housekeeping functions used in the household environment that can also be used by non-expert users for typical housekeeping functions:

— in shops, offices and other similar working environments;

— in farmhouses;

— by clients in hotels, motels and other residential type environments;

— in bed and breakfast type environments.

NOTE Z102 Household environment includes the dwelling and its associated buildings, the garden, etc. 〈A11〉

The appliances referenced above can consist of one or more factory-made assemblies. If provided in more than one assembly, the separate assemblies are used together, and the requirements are based on the use of matched assemblies.

NOTE 101 A definition of 'motor-compressor' is given in IEC 60335-2-34, which includes the statement that the term motor-compressor is used to designate either a hermetic motor-compressor or semi-hermetic motor-compressor.

NOTE 102 Requirements for containers intended for storage of the heated water included in **sanitary hot water heat pumps** are, in addition, covered by IEC 60335-2-21.

〈A11〉 Appliances and machines intended to be used by expert or trained users in shops, in light industry and on farms, and appliances and machines which are declared to be for commercial use by lay persons are within the scope of this document.

NOTE Z103 Additional requirements for such appliances are given in Annex ZE.

NOTE Z104 Guidance on the relevance of the Pressure Equipment Directive is given in Annex ZAA.

This document deals with the reasonably foreseeable hazards presented by appliances and machines that are encountered by all persons.

However, in general, it does not take into account:

— children playing with the appliance;

— the use of the appliance by **very young children**;

— the use of the appliance by **young children** without supervision.

It is recognized that very vulnerable people can have needs beyond the level addressed in this document.

This document deals with specific requirements on noise emitted from these appliances if the generated noise is L_{pA} > 70 dB(A) and it is considered to be a relevant hazard.

NOTE Z105 Additional information for such appliances are given in Annex ZE and Annex ZAB. 〈A11〉

This standard does not take into account refrigerants other than group A1, A2L, A2 and A3 as defined by ISO 817. **Flammable refrigerants** are limited to those of a molar mass of more than or equal to 42 kg/kmol based on WCF (worst case formulation) as specified in ISO 817.

AVA Documents Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

As far as practical, this standard deals with common hazards presented by appliances that are encountered in normal use and assumes that installation, servicing, decommissioning, and disposal are safely handled by competent persons and accidental release of refrigerants is avoided. However, it does not prescribe the criteria to ensure competence of persons during installation, servicing and disposal. Safety requirements during disposal are not specified in this standard.

NOTE 103 Annex HH provides informative requirements on competence of persons. Criteria for competence of personnel for the purpose of certification schemes can be found in ISO 22712[1].

Unless specifications are covered by this standard, including the annexes, requirements for refrigerating safety are covered by:

– ISO 5149-1:2014, ISO 5149-1:2014/AMD1:2015, and ISO 5149-1:2014/AMD2:2021,
– ISO 5149-2:2014 and ISO 5149-2:2014/AMD1:2020,
– ISO 5149-3:2014 and ISO 5149-3:2014/AMD1:2021.

Supplementary heaters, or a provision for their separate installation, are within the scope of this standard, but only heaters which are designed as a part of the appliance package, the controls being incorporated in the appliance.

NOTE 104 Attention is drawn to the fact that

- for appliances intended to be used in vehicles or on-board ships or aircraft, additional requirements can be necessary;
- in many countries, additional requirements are specified, for example, by the national health authorities responsible for the protection of labour and the national authorities responsible for storage, transportation, building constructions and installations.

NOTE 105 This standard does not apply to

- humidifiers intended for use with heating and cooling equipment (IEC 60335-2-88);
- appliances designed exclusively for industrial processing;
- 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).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60068-2-52, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-7:2015, *Explosive atmospheres − Part 7: Equipment protection by increased safety "e"*

IEC 60079-7:2015/AMD1:2017

IEC 60079-14:2013, *Explosive atmospheres − Part 14: Electrical installations design, selection and erection*

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

IEC 60335-2-34:2021, *Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors*

IEC 60335-2-51, *Household and similar electrical appliances – Safety – Part 2-51: Particular requirements for stationary circulation pumps for heating and service water installations*

IEC 60695-1-10, *Fire hazard testing – Part 1-10: Guidance for assessing the fire hazard of electrotechnical products – General guidelines*

[1] Under preparation. Stage at the time of publication: ISO FDIS 22712:2022

AVA Documents Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60730-2-6, *Automatic electrical controls – Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements*

IEC 62471:2006, *Photobiological safety of lamps and lamp systems*

ISO 817, *Refrigerants – Designation and safety classification*

ISO 527-3, *Plastics − Determination of tensile properties − Part 3: Test conditions for films and sheets*

ISO 1302:2002[2], *Geometrical Product Specifications (GPS) – Indication of surface texture in technical product documentation*

ISO 2578, *Plastics – Determination of time-temperature limits after prolonged exposure to heat*

ISO 5149-1:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Definitions, classification and selection criteria*
ISO 5149-1:2014/AMD1:2015
ISO 5149-1:2014/AMD2:2021

ISO 5149-2:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation*
ISO 5149-2:2014/AMD1:2020

ISO 5149-3:2014, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site*
ISO 5149-3:2014/AMD1:2021

ISO 5151:2017, *Non-ducted air conditioners and heat pumps – Testing and rating for performance*
ISO 5151:2017/AMD1:2020

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

ISO 13253, *Ducted air-conditioners and air-to-air heat pumps – Testing and rating for performance*

ISO 13256 (all parts), *Water-source heat pumps – Testing and rating for performance*

ISO 13355:2016, *Packaging − Complete, filled transport packages and unit loads − Vertical random vibration test*

ISO 14903, *Refrigerating systems and heat pumps – Qualification of tightness of components and joints*

ISO 15042, *Multiple split-system air-conditioners and air-to-air heat pumps – Testing and rating for performance*

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

[2] Withdrawn.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

3.1.4 *Addition:*

Note 101 to entry: If the appliance comprises electrical accessories, including fans, the **rated power input** is based upon the total maximum **electrical power input** with all accessories energized, when operating continuously under the appropriate environmental conditions. If the **heat pump** can be operated in the heating or cooling mode, the **rated power input** is based upon the input in the heating or in the cooling mode, whichever is the greater.

3.1.9 *Replacement:*

normal operation
conditions that apply when the appliance is mounted or installed as in normal use and is operating under the most severe operating conditions specified by the manufacturer

3.5.4 *Addition:*

Note 101 to entry: Appliances connected to water pipes or refrigerant pipes that are secured to the building are also **fixed appliances**.

3.8.101
particle foam material
closed cell material moulded from thermoplastic particles (e.g. beads) with expanding agent

3.101
heat pump
appliance which takes up heat at a certain temperature and releases heat at a higher temperature

Note 1 to entry: When operated to provide heat (e.g., for space heating or water heating), the appliance is said to operate in the heating mode; when operated to remove heat (for example, for space cooling), it is said to operate in the cooling mode.

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.

3.102
sanitary hot water heat pump
heat pump intended to transfer heat to water suitable for human consumption

3.103
air conditioner
encased assembly or assemblies designed as an appliance to provide delivery of conditioned air to an enclosed space, room or zone

Note 1 to entry: It includes an electrically operated **refrigerating system** for cooling and possibly dehumidifying the air.

Note 2 to entry: It can have means for heating, circulating, cleaning and humidifying the air.

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

3.104
dehumidifier
encased assembly designed to remove moisture from its surrounding atmosphere

Note 1 to entry: It includes an electrically operated **refrigerating system** and the means to circulate air. It also includes a drain arrangement for collecting and storing and/or disposing of the condensate.

3.108
wet-bulb temperature
WB
temperature indicated when the temperature-sensitive element in a wetted wick has reached a state of constant temperature (evaporative equilibrium)

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

3.109
dry-bulb temperature
DB
temperature indicated by a dry, temperature-sensitive element shielded from the effects of radiation

3.110
evaporator
heat exchanger in which refrigerant liquid is vaporized by absorption of heat

3.111
heat exchanger
device specifically designed to transfer heat between two physically separated fluids (gas or liquid)

3.112
indoor heat exchanger
heat exchanger designed to transfer heat to the indoor parts of the building or to the indoor hot water supplies (e.g. sanitary water) or to remove heat therefrom

3.113
outdoor heat exchanger
heat exchanger designed to remove or release heat from the heat source (for example, ground water, outdoor air, exhaust air, water or brine)

3.114 Supplementary heaters

3.114.1
supplementary heater
electric heater that supplements or replaces the output of the refrigerant circuit for the purpose of heating air or water

3.114.2
supplementary water heater
supplementary heater specifically for the purpose of heating water

3.114.3
supplementary air heater
supplementary heater specifically for the purpose of heating air in conjunction with, or instead of, the refrigerating circuit

Note 1 to entry: **Supplementary air heaters** include electric heaters provided as part of an appliance with cooling-only refrigerant circuits.

3.115
pressure-limiting device
mechanism that automatically responds to a predetermined pressure by stopping the operation of the pressure-imposing element

3.116
pressure-relief device
pressure actuated valve or rupture member which functions to relieve excessive pressure automatically

3.117
appliances accessible to the general public
appliances intended to be located in residential buildings or in commercial buildings in a location without restricted access

3.118
appliances not accessible to the general public
appliances which are located in a secured location with restricted access (e.g. machine rooms, rooftop and the like, or at a level above 2,5 m)

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

3.119
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.

3.120
flammable refrigerant
refrigerant classified as safety group A2L, A2 or A3 according to ISO 817

3.121
refrigerating system
combination of interconnected refrigerant containing parts constituting one closed refrigerant circuit in which refrigerant is circulated for the purpose of extracting heat at the low temperature side to reject heat at the high temperature side by changing the state of the refrigerant

3.122
maximum allowable pressure
the maximum pressure for which the equipment is designed, as specified by the manufacturer

Note 1 to entry: **Maximum allowable pressure** constitutes a limit to the operating pressure of a **refrigerating system**, hydronic circuit or sanitary hot water tank whether the equipment is working or not, see Clause 21.

3.123
low-pressure side
part(s) of a **refrigerating system** operating at the **evaporator** pressure

3.124
high-pressure side
part(s) of a **refrigerating system** operating at the **condenser** pressure

3.125
service port
means to access the refrigerant in a **refrigerating system** for the purpose of charging or servicing the system, typically a valve, tube extension or entry location

3.126
factory sealed single package unit
factory assembly of components of **refrigerating system** fixed on a common mounting to form a discrete unit in which all **refrigerating system** parts have been sealed tight by welding, brazing or a similar permanent connection during the manufacturing process

3.127
pre-charged pipe sets
interconnecting refrigerant lines which are supplied with the unit and supplied with a **refrigerant charge** for the purpose of completing the **refrigerating system** in the field for appliances that are made up of more than one subassembly and are assembled in the field to complete the **refrigerating system**

3.128
condenser
heat exchanger in which refrigerant vapour is condensed by removal of heat

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

3.129
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).

3.130
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.

3.131
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.

3.132
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.

3.133
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 **refrigerating system** are specified by the manufacturer

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

3.134
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.

AVA Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

3.135
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.

3.136
refrigerant charge
m_c
actual **refrigerant charge** of a single **refrigerating system**

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

3.137
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.

3.138
refrigerant detection system
sensing system which gives an output signal in response to a pre-set concentration of refrigerant in the environment

Note 1 to entry: A **refrigerant detection system** may have multiple **refrigerant sensors**.

3.139
auto ignition temperature
AIT
lowest temperature at or above which a chemical can spontaneously ignite in a normal atmosphere, without an external source of ignition, such as a flame or spark

[SOURCE: ISO 5149-1:2014, definition 3.7.7, modified – "of a substance" has been deleted"]

3.140
hot surface ignition temperature
highest temperature at which a refrigerant does not ignite when tested in accordance with Annex KK

3.141
A2L refrigerant
refrigerant classified as safety group A2L according to ISO 817

3.142
lower flammability limit
LFL
minimum concentration of the refrigerant that is capable of propagating a flame through a homogeneous mixture of the refrigerant and air

Note 1 to entry: Data is listed in Annex BB.

[SOURCE: ISO 817:2014, 3.1.24, modified – "under the specified test conditions at 23,0 °C and 101,3 kPa" and Notes to entry deleted]

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

3.143
enhanced tightness refrigerating system
refrigerating system in which the indoor units are designed and fabricated to ensure a high level of confidence that large refrigerant leak rates will not occur in **normal operation** and abnormal operation

3.144
refrigerant distribution assembly
separate refrigerant assembly which is installed in the interconnecting refrigerant lines for the purpose of distributing refrigerant flow to one or more indoor units

3.145 Void

3.146
circulation airflow
mechanically induced airflow movement within the space or duct-connected spaces

3.147 Void

3.148 Void

3.149 Void

3.150
UV-C lamp
source made to produce ultraviolet radiation in the range of 100 nm to 280 nm wavelengths

Note 1 to entry: There are several types of such lamps used for photobiological, photochemical and biomedical purposes.

3.151 Void

3.152
UV-C germicidal lamp system
auxiliary device which utilizes **UV-C lamps** that directly generate germicidal radiation

Note 1 to entry: **UV-C germicidal lamp systems** are typically used to supplement the normal unit air filters for enhanced air purification and surface cleaning of the evaporator coil and surrounding area.

3.153
UV-C spectral irradiance
measured electromagnetic radiation power density at a particular wavelength of 254 nm at a specified distance

Note 1 to entry: The spectral irradiance E_{254} is measured in μW/cm^2.

3.154
UV-C barrier
additional guard or shield that prevents UV-C light from exiting the unit or damaging internal non-metallic materials

3.155
transcritical refrigerating system
refrigerating system where evaporation occurs below the critical point and heat rejection can occur above the critical point of the refrigerant (e.g. R744)

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

3.156
releasable charge
m_{rl}
mass of refrigerant that can be released into the indoor space from a **refrigerating system** in the event of a leak

Note 1 to entry: Any part of the **refrigerant charge** that leaks to the outdoor is excluded from the **releasable charge**.

3.157
operating state
function that the appliance is in at a specific time during **normal operation**

Note 1 to entry: Examples include standby, cooling mode, heating mode and defrosting.

3.158
releasable charge limited system
refrigerating system in which the **releasable charge** is limited by design measures

EXAMPLE Systems relying on closing **safety shut-off valves** when the compressor is off are examples of **releasable charge limited systems** not relying on **leak detection systems**.

EXAMPLE Systems relying on measuring temperature, pressure, ultrasonic leak detection, or other working parameters to detect a leak are examples of **releasable charge limited systems** not relying on **refrigerant detection systems**.

3.159
safety shut-off valve
valve for the purpose of limiting the amount of **releasable charge**

3.160
leak detection system
sensing system which responds to refrigerant leaking from a **refrigerating system**

EXAMPLE A **refrigerant detection system** is an example of a **leak detection system**.

Note 1 to entry: A **leak detection system** can include gas sensing, ultrasonic or other such methods demonstrated to be sufficiently effective.

3.161
potential leak point
any point in the **refrigerating system** that can be a weak point due to manufacturing processes, exposure to damage, sharpness of a bend, or similar stresses

EXAMPLE **Potential leak points** can include parts under stress or vibration.

3.162
pressure vessel
any refrigerant-containing part of a refrigerating system other than

– compressors,
– pumps,
– component parts of sealed absorption systems,
– evaporators, each separate section of which does not exceed 15 l of refrigerant-containing volume,
– coils,
– piping and its valves, joints, and fittings,
– control devices, and
– pressure-containing components (including headers) having an internal diameter or largest cross sectional dimension not greater than 152 mm.

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

[SOURCE: ISO 5149-1:2014, 3.4.7]

3.163
refrigerant sensor
assembly in which the sensing element is housed and that may also contain associated circuit components

[SOURCE: IEC 60079-29-1:2016, 3.3.2 modified – "sensor" replaced by "refrigerant sensor"]

3.164
limited life refrigerant sensor
refrigerant sensor which is expected to fail within the life of the appliance

3.165
thermoelectric heat pump
solid-state **heat pump**, activated by an electric current, which takes up heat at a certain temperature and releases heat at a higher temperature

Note 1 to entry: A Peltier element is an example of such technology.

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:*

The testing of Clause 21 may be carried out on separate samples. The testing of Clauses 11, 19 and 21 shall require that pressure measurements be made at various points in the ***refrigerating system****.*

NOTE 101 For reference purposes, the temperatures on the refrigerant piping can be measured during the test of Clause 11.

If the tests of Annex FF (Leak simulation tests) and Annex QQ (Methods for determining ***releasable charge****) are carried out, at least one additional specially prepared sample is required.*

If the tests of Annex LL are carried out, additional ***refrigerant sensors*** *are needed.*

If the test of Annex NN has to be carried out, an additional appliance may be used.

Tests of Clause 15 may be conducted on a separate sample. The test of Subclauses 19.104.2 through 19.104.8 may be run in any sequence within Clause 19.

5.6 *Addition:*

Any controls which regulate the temperature or humidity of the conditioned space are rendered inoperative during the test.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

5.7 *Addition:*

The tests and test conditions of Clauses 10 and 11 are carried out under the most severe operating conditions within the operating temperature range specified by the manufacturer. Annex AA provides examples of such temperature conditions.

5.10 *Addition:*

For split units, the refrigerant lines shall be installed in accordance with the installation instructions. The length of pipe shall be between 5 m and 7,5 m. Where the installation instructions specify a maximum pipe length of less than 5 m, the length of pipe shall be the maximum length specified in the installation instructions, and where the installation instructions specify a minimum pipe length of more than 7,5 m, the length of pipe shall be the minimum length specified in the installation instructions. The thermal insulation of the refrigerant lines shall be applied in accordance with the installation instructions.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 *Modification:*

Appliance shall be of **class I**, **class II** or **class III**.

6.2 *Addition:*

Appliances shall be classified according to degree of protection against harmful ingress of water in accordance with IEC 60529:

– appliances or parts of appliances intended for outdoor use shall be at least IPX4;
– appliances intended only for indoor use (excluding laundry rooms) may be IPX0;
– appliances intended to be used in laundry rooms shall be at least IPX1.

6.101 Appliances shall be classified according to the accessibility either as **appliance accessible to the general public** or as **appliance not accessible to the general public**.

Compliance is checked by inspection.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Modification:*

Replace the second dash by:

– symbol for nature of supply including number of phases, unless for single phase operation;

Addition:

– **rated frequency**;
– **refrigerant charge** for each **refrigerating system**;
– refrigerant designation in accordance with ISO 817;
– **maximum allowable pressure** for the storage tank (for **sanitary hot water heat pumps**);

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

– **maximum allowable pressure** in the water and/or brine circuit for the **heat exchanger** for **hydronic fan coil units**;
– **maximum allowable pressure** for the refrigerant circuit; if the **maximum allowable pressures** for the suction and discharge side differ, a separate marking is required;
– for **pre-charged pipe sets**
  - refrigerant designation in accordance with ISO 817;
  - the **refrigerant charge** in the line set;
  - **maximum allowable pressure**;
  - if charged with a flammable refrigerant, the flame symbol ISO 7010-W021 (2011-05) including the safety group per ISO 817;
– ratings in watts and voltage of a **UV-C germicidal lamp system** if employed.

Appliances shall be marked with all of the designations and the rated inputs of the **supplementary heaters** for which they are intended to be used, and shall have provision for identifying the actual heater that is field installed.

Unless it is evident from the design, the enclosure of the appliance shall be marked, by words or by symbols, with the direction of the fluid flow.

If a **flammable refrigerant** is used, a warning symbol (flame symbol: ISO 7010-W021 (2011-05)) including the safety group per ISO 817 as described in 7.6 shall be placed within sight of the marking of the refrigerant designation on the appliance. The height of the symbol shall be at least 10 mm, and the symbol need not be in colour.

NOTE 101 The refrigerant designation is typically found on the name plate of the appliance.

Appliances using **flammable refrigerants** shall be marked with the flame symbol ISO 7010-W021 (2011-05) including the safety group per ISO 817. The height of the triangle used for the symbol shall be at least 30 mm. The required markings shall be provided on all units which contain compressors.

If not already visible when accessing a **service port** and if a **service port** is provided, the **service port** shall be marked to identify the type of refrigerant. If the refrigerant is flammable, symbol ISO 7010-W021 (2011-05) including the safety group per ISO 817 shall be included, without specifying the colour.

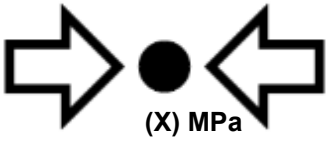
If a **flammable refrigerant** is used, the symbols for "read operator's manual" (symbols ISO 7000-0790 (2004-01)) and "service indicator; read technical manual" (ISO 7000-1659 (2004-01)) shall be placed on the appliance in locations visible to the persons required to know the information. The height of the symbol shall be at least 10 mm.

Appliances which are not **fixed appliances**, using a **flammable refrigerant** with a **refrigerant charge** (m_c) of the appliance greater than m_1 according to GG.1.2, shall be marked with symbol ISO 7000-0434A (2004-01) immediately followed by the minimum room floor area symbol IEC 60417-6412 (2019-03), where "A" is the minimum room area in m^2 as determined according to Annex GG. The markings shall be placed on the outside of the appliance such that it is visible during normal operation.

Appliances employing **refrigerating systems** with **maximum allowable pressures** greater than 7 MPa shall be marked with symbol ISO 7000-1701 (2004-01) followed by the text "(X) MPa" and the "read operator's manual", ISO 7000-0790 (2004-01). Where: "X" is the **maximum allowable pressure**.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

7.6 *Addition:*

	[symbol ISO 7000-1659 (2004-01)]	service indicator; read technical manual
safety group per ISO 817	[symbol ISO 7010-W021 (2011-05) plus the safety group per ISO 817 not less than 1/3 of the height of the symbol adjacent to the symbol]	warning; flammable material
	[symbol ISO 7000-1701 (2004-01)]	pressure
	[symbol IEC 60417-6040 (2010-08)]	ultraviolet radiation, instructional safeguard
	[symbol IEC 60417-6412 (2019-03)]	minimum room floor area

7.12.1 *Addition:*

In particular, the following information shall be supplied:

a) that the appliance shall be installed in accordance with national wiring regulations;

b) the dimensions of the space necessary for correct installation of the appliance including the minimum permissible distances to adjacent structures;

c) for appliances with **supplementary air heaters**, the minimum clearance from the appliance to combustible surfaces;

d) a wiring diagram with a clear indication of the connections and wiring to external control devices and **supply cord**;

e) the range of external static pressures at which the appliance was tested (add-on **heat pumps** and ducted appliances with **supplementary air heaters** only);

f) the method of connection of the appliance to the electrical supply and interconnection of separate components;

g) indication of which parts of the appliance are suitable for outdoor use, if applicable;

h) details of type and rating of fuses, or rating of circuit breakers;

i) details of supplementary heating elements that may be used in conjunction with the appliance, including fitting instructions either with the appliance or with the **supplementary heater**;

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

j) maximum and minimum water or brine operating temperatures;

k) maximum and minimum water or brine operating pressures;

l) maximum and minimum operating indoor and outdoor air temperatures;

m) instructions on charging of refrigerants when addition of charge is required by the manufacturer for completing the **refrigerating system**.

n) when the symbol IEC 60417-6412 (2019-03) is used, a warning that the appliance shall be installed, operated and stored in a room with a floor area not less than the minimum room area.

Open storage tanks of **heat pumps** for water heating shall be accompanied by an instruction sheet which shall state that the vent shall not be obstructed.

〈A11〉 The installation instructions for appliances that are intended to be permanently connected to fixed wiring, and have a leakage current not exceeding 10 mA, shall state that the installation of a residual current device (RCD) having a rated residual operating current not exceeding 30 mA is advisable.

For **appliances not accessible to the public** and which are intended to be permanently connected to fixed wiring and which may have a leakage current exceeding 10 mA, the installation instructions shall specify the rating of the residual current device (RCD) to be installed.

For **appliances not accessible to the general public** the restrictions for the installation location shall be described in the installation instructions. 〈A11〉

7.12.101 For **appliances not accessible to the general public**, the classification according to 6.101 shall be included.

Compliance is checked by inspection.

7.12.102 For **appliances** using **flammable refrigerants**, an installation manual, service, maintenance and repair manual, and decommissioning manual, either as separate or combined manuals, shall be made available and include the information given in Annex DD.

Compliance is checked by inspection.

Additional guidance on transportation, marking and storage for units that employ **flammable refrigerants** is given in Annex CC.

7.15 *Addition:*

A marking may be located on a panel that can be removed for installation or service, providing that the panel shall be in place for the intended operation of the appliance.

7.101 A marking shall be provided for a replaceable fuse or a replaceable overload **protective device** provided as a part of a product or remote control assembly. It shall be visible when the cover or door of the compartment is open. This marking shall specify

– the rating of the fuse in amperes, the type and voltage rating, or

– the manufacturer and model designation of the replaceable overload **protective device**.

Compliance is checked by inspection.

7.102 If the appliance is intended for permanent connection to fixed wiring with aluminium wires, the marking shall so state.

Compliance is checked by inspection.

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.

Compliance is checked by inspection.

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

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 IEC 60335-2-40, and must only be connected to other units that have been confirmed as complying to corresponding **partial unit** requirements of IEC 60335-2-40.

– 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).

Compliance is checked by inspection.

7.105 For appliances using **flammable refrigerants** that have safety features depending upon the proper function of a **leak detection system**, the instructions or unit markings shall contain the substance of the following:

"This unit is equipped with a **leak detection system** for safety. For leak detection to be effective, the unit must be electrically powered at all times after installation, other than when servicing."

If any remote located **refrigerant sensor** is employed to detect leaked refrigerant, such remote located **refrigerant sensor** shall also apply this marking or be accompanied by such instructions.

Compliance is checked by inspection.

7.106 For appliances using **flammable refrigerants** that have safety features depending upon the proper function of electrically powered safety measures, the instructions or unit markings shall contain the substance of the following:

"This unit is equipped with electrically powered safety measures. For the safety measures to be effective, the unit must be electrically powered at all times after installation, other than when servicing."

If any mechanical ventilation unit is employed to dilute leaked refrigerant and is not integrated in the appliance, such unit shall also apply this marking or be accompanied by such instructions.

Compliance is checked by inspection.

7.107 For **flammable refrigerants**, when addition of charge is required by the installation instructions for completing the **refrigerating system**, the manufacturer shall provide a label that allows the installer to note the resulting total **refrigerant charge** for each **refrigerating system**. See Figure 101 for an example of a label for field charged units.

Compliance is checked by inspection.

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

7.108 For appliances using **flammable refrigerants**, excluding appliances with **A2L refrigerant charge** not exceeding m_1, the flame symbol ISO 7010-W021 (2011-05) including the safety group per Annex BB described in 7.6 shall be visible on the packaging of the appliance if the appliance is charged with refrigerant.

The perpendicular height of the symbol shall be at least 30 mm.

Compliance is checked by inspection.

7.109 Appliances employing **UV-C germicidal lamp systems** shall be marked with **ultraviolet radiation** hazard symbol IEC 60417-6040 (2010-08) and the Read operator's manual symbol ISO 7000-0790 (2004-01) in the following locations:

– doors and access panels that provide direct access to an area within the appliance where the measured **UV-C spectral irradiance** is greater than 1,7 μW/cm^2;
– **user maintenance** access panels,
– **UV-C barriers**.

Compliance is checked by inspection.

7.110 For appliances that employ **UV-C germicidal lamp systems**, the instructions shall include the substance of the following:

– this appliance contains a **UV-C lamp**;
– read the maintenance instructions before opening the appliance;
– details for cleaning and other **user maintenance** of the appliance. They shall state that prior to cleaning or other maintenance, the appliance must be disconnected from the supply mains;
– the method, frequency of cleaning, and necessary precautions to be taken;
– precautions to be taken when replacing UV-C emitters and starters, if applicable;
– unintended use of the appliance or damage to the housing can result in the escape of dangerous UV-C radiation. UV-C radiation may, even in small doses, cause harm to the eyes and skin;
– appliances that are obviously damaged must not be operated;
– the appliance must be disconnected from the supply before replacing the **UV-C lamp**;
– doors and access panels bearing the **ultraviolet radiation** hazard symbol which can have **UV-C spectral irradiance** greater than 1,7 μW/cm^2 are provided with an interlock switch to interrupt the power to the **UV-C lamps** for your safety. Do not over-ride;
– before opening doors and access panels bearing the **ultraviolet radiation** hazard symbol for conducting the **user maintenance**, it is recommended to disconnect the power;
– **UV-C barriers** bearing the **ultraviolet radiation** hazard symbol should not be removed;
– for appliances with **UV-C lamps**, information on the replacement of **UV-C lamps** shall be given, including the model and/or part number;
– if field installed, the factory specified **UV-C germicidal lamp systems** approved for use with the appliance shall be specified in the instructions by the specific model number;
– do not operate **UV-C lamps** outside of the appliance.

Compliance is checked by inspection

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

7.111 Appliances employing **refrigerating systems** with **maximum allowable pressures** greater than 7 MPa shall be marked within sight of the refrigerant service ports with the following:

– the symbol ISO 7000-1701 (2004-01) including the text "(X) MPa", where; "X" is not less than the **maximum allowable pressure**.

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

〈A11〉 **8.1.1** *Addition*

Add, at the end of the paragraph starting with "Test probe B and probe 18…", *the following*:

"Test probe 18 of EN 61032:1998 is not applied to **appliances not accessible to the general public**." 〈A11〉

8.1.5 *Addition:*

For appliances which have a dedicated installation panel or cover and which cannot be installed without them, compliance is checked according to 5.10 (after installation according to the installation instructions).

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable.

11 Heating

This clause of Part 1 is applicable except as follows.

11.1 *Addition:*

If the temperature of the motor winding exceeds the value specified in Table 3 or if there is doubt with regard to the classification of the insulation system employed in a motor, compliance is checked by the tests of Annex C.

11.2 *Replacement:*

11.2.1 *Appliances are installed in one or more test rooms in accordance with the installation instructions. In particular,*

– *clearances to adjacent surfaces specified by the manufacturer shall be maintained;*

– *adjustable limit controls are set at the maximum cut-out setting and the minimum differential permitted by the control adjusting means.*

*For appliances provided with **supplementary air heaters**, an additional test casing as described in 11.2.5 is used.*

11.2.2 *For heating tests of ducted appliances with **supplementary air heaters**, an inlet duct is connected to the inlet air opening of the appliance (assuming that the appliance is intended to be so applied). The duct shall be the same size as the flanges, if flanges are provided. If flanges are not provided, the duct shall be the same size as the inlet opening.*

AVA Documents Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

*An appliance that includes or has provision for **supplementary air heater** is fitted with an outlet duct in accordance with Figure 102a or Figure 102b, depending on the direction of the airflow.*

The inlet duct is provided with an adjustable restricting means by which the airflow can be reduced.

The restriction should be uniform across the duct's cross-sectional area, so that the full heating coil surface will be exposed to the airflow except when the restriction is closed.

For non-ducted appliances, other means may be used to uniformly restrict the inlet.

The distance from the air outlet opening of the appliance to the furthest point on the test duct, perpendicular to the outlet opening, shall be no more than value of:

– *for upflow appliances, $(AB)^{0,5}$ as shown in Figure 102a or the minimum distance specified by the manufacturer, whichever is lower;*
– *for downflow appliances, 300 + $(AB)^{0,5}$ as shown in Figure 102b or the minimum distance specified by the manufacturer, whichever is lower.*

NOTE 101 For horizontal ducted products, reference Figure 102b, rotated 90 degrees counter clockwise.

NOTE 102 Appliances can be specified by the manufacturer for use in applications with limited space for the appliance and connected ducts.

EXAMPLE 1 For upflow appliances intended for use in manufactured (mobile) homes, the combined height of the appliance and ducts is typically limited to 2,1 m (7 ft) minus the specified clearance to combustible material.

EXAMPLE 2 For downflow appliances intended for use in manufactured (mobile) homes, the distance from the air outlet opening to the furthest point on the test duct, perpendicular to the outlet opening, is typically reduced to not less than 25,4 + $(AB)^{0,5}$.

11.2.3 *A ducted appliance which does not include **supplementary air heaters** is fitted with an outlet duct sized to fit the casing flanges, or opening without flanges, or locations marked for flanges, and arranged to discharge away from the return air inlet.*

The hot air outlet duct is provided with a restricting means to obtain the maximum static pressure given in the instructions.

11.2.4 For the evaluation and testing of **partial units**, the following test set-up 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 dew point temperature of the refrigerant at the marked **maximum allowable 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 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 101 Testing for **condensing units** 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 units** and **evaporator units** do not require a calorimeter stand or similar device.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

11.2.5 Test casing

The test casing consists of plywood walls having a thickness of about 20 mm, with dull black painted inside surfaces and all joints sealed. The distances between the casing and the surfaces of the appliance and the outlet duct, if any, are equal to the minimum clearances according to the instructions.

For appliances not specified for installation with minimum clearances, as an alternative to the plywood test casing in direct contact with the appliance, glass fibre insulating material having a thickness of at least 25 mm and a density of at least 16 kg/m^3 shall be wrapped closely around the appliance and the outlet duct, and thermocouples shall be placed in direct contact with the enclosure.

11.3 *Modification:*

Replace the 1st paragraph and NOTE 1 with:

Temperatures other than those of windings are determined by means of thermocouples which are sized and so chosen and positioned that they have the minimum effect on the temperature of the part under test.

NOTE 101 Thermocouples having wires with a diameter not exceeding 0,3 mm are generally considered to have minimum effect on temperature when measuring small parts such as electronic components.

11.3 *Addition:*

The temperatures in the duct are to be measured by means of a thermocouple grid consisting of nine thermocouples of identical length, wired in parallel to form a grid with a thermocouple located centrally in each of nine equal duct areas in a plane perpendicular to the axis of the airflow. For non-ducted appliances, the thermocouple grid shall be located within 25 mm of the outlet air opening and perpendicular to the opening. The temperature of the air measured by the thermocouple grid shall not exceed 92 °C.

11.4 *Replacement:*

*Appliances are operated under **normal operation** at a supply voltage between 0,94 times the lowest **rated voltage** and 1,06 times the highest **rated voltage**, the voltage chosen being that which gives the most unfavourable result.*

11.5 *This subclause of Part 1 is not applicable.*

11.6 *This subclause of Part 1 is not applicable.*

11.7 *Addition:*

Where an appliance can be operated in the cooling mode as well as the heating mode, a test is conducted in each mode.

Appliances with defrost facilities are additionally submitted for a defrost test in the most unfavourable conditions.

All appliances are operated continuously until steady conditions are achieved, except for defrost tests.

Appliances are operated under normal operation with flow rates which give the most unfavourable result.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

NOTE 101 Consideration can be given to air or liquid flow rates, air or liquid temperatures, (air) static pressure, compressor operation conditions, etc.

11.8 *Addition:*

Temperatures shall not exceed the temperature limit according to this formula:

$$\textit{Temperature limit [°C]} = 25\ °C + \textit{Table 3 value} \quad (101)$$

NOTE 101 Formula (101) calculates the temperature limit from the temperature rise as defined in Table 3.

Table 3 − Maximum normal temperature rises

Modification:

In the first row, change "Windings" *to* "Windings other than windings of sealed motor-compressors".

Addition:

Parts	***Temperature rise*** *K*
Windings of sealed motor-compressors [aa]	
– *with synthetic insulation*	*115*
– *with non-synthetic insulation*	*105*
Duct and discharge plenum at points of specified zero clearance to test enclosure	*67*
[aa] *Not required for motor-compressors that comply with IEC 60335-2-34 (including its Annex AA).*	
NOTE 2 Addition: **Heat pumps**, air-conditioners and other appliances covered by this standard can have other ambient temperature than normal household appliances, for example some products are used outdoors	

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable except as follows.

13.2 *Modification:*

*For **stationary class I motor-operated appliances**, the leakage current shall not exceed 3,5 mA, or 2 mA per kilowatt **rated power input**, whichever is higher. The maximum value shall not exceed 10 mA for **appliances accessible to the general public** and 30 mA for **appliances not accessible to the general public**.*

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is replaced by the following.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

15.1 Electrical components of appliances shall be protected against the ingress of water which may be present in the appliance as a result of rain, overflow from the drain pan, or defrosting.

Compliance is checked by the tests of 15.2, followed immediately by the overflow test of 15.3; and this is followed by the defrost test of ⟦AC1⟩ *11.7* ⟨AC1⟧*, and the tests of Clause 16.*

Following these tests, an inspection is made within the enclosures. The water which may have entered the enclosure shall not have reduced ***clearances*** *and* ***creepage distances*** *below the minimum values specified in Clause 29.*

If ducts leading to the outside of a building are used, the test of 15.2 is carried out on the terminations of such ducts in an arrangement simulating the actual installation, according to the instructions.

For appliances intended to be mounted through a wall or a window, or for a split unit, the test of 15.2 is carried out on that part or unit which, according to the instructions, is intended to be mounted outside the building.

The motor-compressor is not operated and ***detachable parts*** *are removed during the tests of 15.2 and 15.3.*

15.2 *Appliances other than IPX0 are subjected to the tests of IEC 60529:1989 as follows:*

- *IPX1 appliances as described in 14.2.1;*
- *IPX2 appliances as described in 14.2.2;*
- *IPX3 appliances as described in 14.2.3;*
- *IPX4 appliances as described in 14.2.4;*
- *IPX5 appliances as described in 14.2.5;*
- *IPX6 appliances as described in 14.2.6;*
- *IPX7 appliances as described in 14.2.7.*

For the IPX7 test, the appliance is immersed in water containing 1 % NaCl.

15.3 *The appliance is installed in its position of normal use. The drain pan discharge pipe is blocked, and the pan carefully filled to the brim without splashing. The drain pan is then subjected to a continuous overflow, the rate of which is adjusted to approximately 17 cm^3/s per 1 m^3/s airflow, and the fan(s) switched on. The test is continued for a period of 30 min, or until all water drains from the appliance.*

15.101 Spillage test

Indoor floor or wall-mounted ***appliances accessible to the general public*** *are tested as follows.*

The appliance is installed according to the installation instructions but not operated.

Covers which provide access for manual operation of electrical controls are set in the open position, unless such covers are of the self-closing type.

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****.*

After spillage is completed, the appliances shall withstand the tests of Clause 16.

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

The spillage test is not applicable to units if the minimum linear dimension of a horizontal or near horizontal top surface of the cabinet is 75 mm or less.

A unit whose top, when installed, has a height of greater than 2 m need not be tested.

NOTE The intent is that a 75 mm diameter glass cannot be placed on the surface of the appliance and spill.

16 Leakage current and electric strength

This clause of Part 1 is applicable except as follows.

16.2 *Modification:*

*For **stationary class I motor-operated appliances**, the leakage current shall not exceed 3,5 mA, or 2 mA per kilowatt **rated power input**, whichever is higher. The maximum value shall not exceed 10 mA for **appliances accessible to the general public** and 30 mA for **appliances not accessible to the general public**.*

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 *Modification:*

Add after the second paragraph:

Failure of the transfer medium flow, or of any control devices, shall not result in a hazard.

Replace the 1st and 2nd paragraphs of the test specification by the following:

Appliances are subjected to the tests specified in 19.2 to 19.10, 19.101, 19.102, 19.103, and 19.104 as applicable.

19.2 *Addition:*

*This subclause of Part 1 is not applicable for appliances with **supplementary air heaters**.*

19.3 *Addition:*

*This subclause of Part 1 is not applicable for appliances with **supplementary air heaters**.*

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

19.4 *Addition:*

*The appliance is operated under the conditions in Clause 11 and at **rated voltage**, with any form of operation or any defect that can be expected during normal use. Only one fault condition is reproduced at a time, the tests being made consecutively.*

Examples of fault conditions are

– *the timer, if any, stopping in any position;*

– *disconnection and reconnection of one or more phases of the supply;*

– *open-circuiting or short-circuiting of components, like relays, contactors, timers, **thermostats**, etc.*

In general, tests are limited to those cases which are expected to give the most unfavourable results.

19.7 *Modification:*

Replace the first paragraph, ending with "...other appliances" *by:*

The motors, other than motor-compressors and stationary circulation pumps in compliance with IEC 60335-2-51, are mounted on a support of wood or similar material. The motor rotors are locked; fan blades and brackets are not removed.

*The motors are supplied at their supplied voltage when the appliance is supplied at **rated voltage** or at the upper limit of the **rated voltage range**, in a circuit as shown in Figure 103. Care shall be taken to complete the earthing system to permit the correct operation of the RCCB/RCBO.*

*Under these conditions, the motor is operated for 15 days (360 h) or until a **protection device** permanently opens the circuit, whichever is the shorter period.*

During the test, the ambient temperature is maintained at 23 °C ± 5 °C.

If the temperature of the motor windings does not exceed 90 °C when steady conditions are established, the test is considered to be ended.

During the test, the temperature of the enclosure shall not exceed 150 °C and the temperature of the windings shall not exceed the values shown in Table 8.

Three days (72 h) after the beginning of the test, the motor shall withstand an electric strength test as specified in 16.3.

*At the end of the test, the leakage current, when measured as specified in 16.2 but with a test voltage of twice the **rated voltage** between all windings and the enclosure, shall not exceed 2 mA.*

NOTE 101 Only for this test specified in 19.7 of 60335-2-40, the motor is locked and operated for 15 days (360 h) or until a protection device permanently opens the circuit. It is not the intention to repeat the 15-day locked rotor test up to two more times for motors having capacitors in the circuit of an auxiliary winding. Hence for all tests according to 19.7 of Part 1, the motor is operated under the conditions specified in 19.7 of IEC 60335-1, including the time specifications.

Add after the last paragraph:

If the motor-compressor has not been type-tested against the requirements of IEC 60335-2-34, then it shall be subject to the following test.

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

A sample shall be provided with the rotor locked and being filled with oil and refrigerant as intended. The sample shall then be subjected to the tests specified in 19.101, 19.102, 19.103 and 19.105 of IEC 60335-2-34:2021, if applicable, and shall comply with the requirements in 19.104 of IEC 60335-2-34:2021.

19.8 *Replacement:*

*Three phase motors other than motor compressors are operated under the conditions of Clause 11 at **rated voltage** or at the upper limit of the **rated voltage range** with one phase disconnected, until steady conditions are obtained or the **protective device** operates.*

19.9 This subclause of Part 1 is not applicable for motor-compressors, stationary circulation pumps in compliance with IEC 60335-2-51, and fans.

19.11.4 *Modification:*

Add before the first paragraph:

The first paragraph of Part 1 is not applicable if unintentional operation does not cause any hazards.

Replace the second paragraph by the following:

*Appliances incorporating a **protective electronic circuit** are subjected to the tests of 19.11.4.1 to 19.11.4.7. The tests are carried out after the **protective electronic circuit** has operated during the relevant tests of Clause 19, except 19.2, 19.6, 19.11.3, 19.102 and 19.103.*

*If the appliance incorporates more than one **protective electronic circuit**, each **protective electronic circuit** shall be tested individually with the appliance operated under **normal operation** at any temperature within the working range.*

*Components protected by a **protective electronic circuit** that has been previously tested and shown to comply with the requirements of 19.11.4 of its standard need not to be retested in the final application.*

NOTE 101 Components can be for example motor compressors, fans and circulating pumps.

NOTE 102 Test results of 19.11.4.1, 19.11.4.2 and 19.11.4.3 can possibly be influenced by the wiring and the metal housing of the final application. Therefore, the best moment to perform these tests is once in the final application.

NOTE 103 **Protective electronic circuit** (PEC) operation is understood as the operation that stops the component(s) operation controlled by the PEC with the intention to prevent the hazardous situation.

Add, after the last paragraph of the test specification, the following:

For these tests, it can be necessary to provide specially prepared component samples, e.g. compressors with locked rotor.

19.11.4.8 *Modification:*

Add to the first sentence:

"at any temperature within the working range."

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

19.13 *Modification:*

Table 9 – Maximum abnormal temperature rise

Addition:

Part	***Temperature rise*** *K*
Surfaces of product, discharge plenum, and duct at points of specified zero clearance to test casing	*150*
Surfaces of test casing where clearance more than zero to combustible material is specified	*150*

Footnote a of Table 9 is not applicable.

19.14 *Modification:*

Add before the note:

Locking in the "on" position of the main contacts of a contact intended for switching on and off the heating element(s) in normal use is considered to be a fault condition, unless the appliance is provided with at least two sets of contacts connected in series. For example, by providing two contactors operating independently of each other or by providing one contactor having two independent armatures operating two independent sets of main contacts.

19.101 *The appliance is operated under the conditions in Clause 11 at* ***rated voltage*** *or at the upper limit of the* ***rated voltage range****, at an ambient temperature of 23 °C ± 5 °C. When steady conditions are attained, the heat transfer medium flow of the* ***outdoor heat exchanger*** *is restricted or shut off, whichever is the most unfavourable without the appliance being non-operative.*

After this test, ***protective devices*** *that may have operated are reset, and the test is repeated, with the heat transfer medium flow, fluid or air, of the* ***indoor heat exchanger****, restricted or shut off, whichever is the most unfavourable without the appliance being non-operative. In the case of appliances with defrosting systems, the heat transfer medium flow rate is additionally shut off at the beginning of the defrosting phase.*

Appliances incorporating a motor common to both the ***indoor*** *and* ***outdoor heat exchangers*** *are subjected to the above test, the motor being disconnected once steady conditions are attained.*

19.102 *The* ***indoor heat exchanger*** *of appliances using water as a heat transfer medium is subjected to the following test.*

The appliance is operated under the conditions specified for Clause 10 at ***rated voltage*** *or at the upper limit of the* ***rated voltage range*** *at the maximum water temperature specified by the manufacturer. The indoor water temperature shall be raised 15 K at a rate of 2 K/min and this temperature maintained for 30 min, after which the water temperature is lowered to its original value at the same rate.*

19.103 *Air to air appliances are operated under the conditions specified in Clause 11.*

The ***dry-bulb temperature*** *is then reduced to a value 5 K below the minimum value specified by the manufacturer.*

The test is repeated except that the ***dry-bulb temperature*** *is increased to a value 10 K above the maximum temperature specified by the manufacturer, but not to exceed 55 °C.*

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

*The appliances are operated at **rated voltage** or at the upper limit of the **rated voltage range**.*

19.104 Appliances with supplementary air heaters

19.104.1 General

*Appliances provided with **supplementary air heaters** or provisions for **supplementary air heaters** are subjected to the test of 19.104.2 through 19.104.8 under the conditions specified in Clause 11 unless otherwise indicated.*

*All appliances with **supplementary air heaters** shall be configured with inlet and outlet ducts as applicable and instrumented in accordance with the applicable subclauses of Clause 11.*

*Appliances are tested in the **operating state** and configuration which give the most unfavourable results.*

*Appliances are operated at an ambient temperature of 23 °C ± 5 °C and **rated voltage** or at the upper limit of the **rated voltage range** of the **supplementary air heaters**.*

*Tests shall be conducted with all the **supplementary air heater** heating elements activated as allowed by the unit controls with the thermostats over-ridden. If the unit controls do not allow all **supplementary air heater** heating elements to be activated by over-riding the thermostats, then the test shall be conducted with the thermostats over-ridden and the air temperature reduced to a value which causes all the elements to switch on.*

*For appliances with **supplementary air heaters**, the heat provided by the **heat pump** may be simulated by use of an alternate heating source equal to the capacity of the **heat pump** when operated under the conditions of Clause 11. If at any condition during the tests of Subclause 19.104 the **heat pump** operation is interrupted by a protective control, the alternate heat source shall be interrupted in the same way.*

19.104.2 Restricted inlet – 1st limit cut-out

*To test limit cut-out conditions, the airflow conditions specified are established, the indoor airflow is reduced by restricting the inlet air opening to a rate resulting in not more than 1 K/min outlet air temperature rise until a **self-resetting thermal cut-out** device operates for the first time as a result of slowly restricting the free area of the inlet.*

The outlet air temperature, measured by means of the thermocouple grid, shall not exceed 90 °C.

19.104.3 Restricted inlet – minimum airflow

*To test heating operation conditions, after the airflow conditions specified are established, the indoor airflow is reduced by restricting the inlet air opening to such an extent that the temperature of the air in the outlet is 3 K below the temperature obtained after a **self-resetting thermal cut-out** device operates for the first time as a result of slowly restricting the free area of the inlet.*

The appliance shall be operated until steady state conditions are established or for 1 h, whichever is longer. During the test, the temperatures are monitored continuously and shall not exceed the values shown in Table 3.

*To facilitate this test, the **self-resetting thermal cut-out** which has operated in 19.104.2 may be short-circuited, if necessary.*

NOTE Tests of Clause 19.104.4 can be conducted immediately after the tests of 19.104.2.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

19.104.4 Restricted inlet – restrict inlet to fully blocked

*To test restricted inlet conditions, after the airflow conditions specified are established, the indoor airflow is reduced by restricting the inlet air opening at a rate resulting in not more than 1 K/min outlet air temperature rise until a **self-resetting thermal cut-out** device operates.*

*The restriction shall be halted after any **protective device** operates until steady state conditions are established. After steady state conditions are reached, the restriction is resumed. The test shall continue until the inlet is fully restricted.*

The temperatures are monitored continuously. Temperatures shall not exceed the values shown in (Table 3 + 30 K) during the first hour and Table 3 thereafter.

19.104.5 Fan failure

To test fan failure conditions, after steady state conditions are attained, heat transfer medium flow of the indoor heat exchanger is restricted or shut off, whichever is the most unfavourable without the appliance being non-operative.

Temperatures shall not exceed the values shown in 19.13.

19.104.6 Blocked outlet

To test blocked outlet conditions, when steady conditions are attained, the appliance outlet air opening is totally closed off and operation continued until maximum temperatures are determined.

This test with the outlet air opening closed shall not be conducted on any unit with free air discharge openings located more than 1,2 m above the floor level when the unit is installed as intended.

Temperatures shall not exceed the values in 19.13.

19.104.7 Curtain drape

All appliances provided with **supplementary air heaters** and with free air discharge openings are subjected to the following test in each mode of operation.

This test shall not be conducted on any unit with free air discharge openings located more than 1,8 m above the floor level when the unit is installed as intended.

Appliances are operated under the conditions specified in Clause 11, with any controls which limit the temperature during the test of Clause 11 short-circuited, and with the appliance covered.

The covering is made with felt strips each having a width of 100 mm and lined with a single layer of textile material.

The felt has a specified mass of 4 kg/m^2 ± 0,4 kg/m^2 and a thickness of 25 mm.

The textile material consists of a prewashed double-hemmed cotton sheet having a mass between 140 g/m^2 and 175 g/m^2 in the dry condition.

Thermocouples are attached to the back of small blackened disks of copper or brass, 15 mm in diameter and 1 mm thick.

AVA Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

The disks are spaced 50 mm apart and placed between the textile material and the felt on the vertical centre line of each strip.

The disks are supported in such a way as to prevent them from sinking into the felt.

The strips are applied with the textile material in contact with the appliance so that they cover the whole vertical dimension of the front, pass over the top and extend down the rear surface.

If the appliance is constructed to stand away from the wall or if it is for fixing to a wall so that the gap between the heater and the wall exceeds 30 mm and the horizontal components of the distance between any two fixing points or spacers or between such points and the end of the appliance exceed 100 mm, the rear surface of the appliance shall be completely covered.

Otherwise, the rear surface is covered over a distance approximately equal to one-fifth of the vertical dimension of the heater.

The strips are applied to each half of the appliance in turn and then to the complete appliance.

During the test, the temperature shall not exceed 150 °C except that an overshoot of 25 K is permitted during the first hour.

*Thermal **protective devices** are allowed to operate.*

19.104.8 Back up protection test

*If a **self-resetting thermal cut-out** operates during the tests of 19.104, then the **self-resetting thermal cut-out** shall be by-passed and the tests of 19.104.4 through 19.104.7 shall be repeated.*

For the test of 19.104.4, the rate of restriction shall be such that the opening is totally blocked at the end of 30 min.

Temperatures shall not exceed the values in 19.13.

19.105 For **dehumidifiers** in which the compressor is enclosed by a non-metallic material which isolates it from the forced air stream providing air to the heat exchanger, the following test shall apply.

The test shall be conducted under each of the following conditions:

– *with 75 % of the charge removed;*
– *with the system pressure less than 0,12 MPa, but not less than 0,10 MPa with the appliance de-energized.*

*The appliance shall be operated under the conditions of Clause 11 at the lower limit of the **rated voltage range** and an ambient temperature of 23 °C ± 5 °C. The appliance shall be operated until all components and the enclosure temperatures stabilize or are declining, but for not less than 24 hours, or until the operation of the compressor is terminated by a non-self-resetting **protective device**. Any self-resetting **protective device** that actuates during this test shall be allowed to cycle as intended.*

Temperatures of non-metallic parts shall not exceed the relative thermal index of the material in accordance with IEC 60695-1-10.

Compliance is checked by test.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows:

20.1 *Addition:*

Fixed appliances that are only fixed into position by water piping, refrigerant piping or other piping are also subjected to this test.

Such pipes are not connected to the appliance during this test.

〈A11〉 **20.2** *Addition:*

Add, after the second dashed item in the compliance criteria, the following sentence:

"Test probe 18 of EN 61032:1998 is not applied to **appliances not accessible to the general public**." 〈A11〉

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 *Addition:*

Pressure vessels shall comply with the requirements of ISO 5149-2:2014, Subclause 4.4.2.

The pressure test in Annex EE applies to parts other than **pressure vessels**.

21.2 *Modification:*

Add the following sentence after second paragraph:

*For **accessible** parts made of **particle foam material** used as **supplementary insulation** or **reinforced insulation**, the following test is done without any consideration of the insulation thickness.*

21.101 Appliances using **flammable refrigerants** shall withstand the effects of vibration during transport.

The appliance is tested in its final packaging for transport, fixed to the vibration table, and shall withstand a random vibration test for 180 min according to ISO 13355:2016 with the power spectral density profile specified in Table 101.

Table 101 – Power spectral density profile for vibration test

Frequency Hz	Level $(m/s^2)^2/Hz$
1	0,004 8
4	0,961 7
16	0,961 7
40	0,096 2
80	0,096 2
200	0,001 0
In between values are to be interpolated as shown in Figure 104. NOTE The RMS value is 5,1 m/s^2.	

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

Where testing to ISO 13355:2016 is impractical due to limitations of available test facilities/equipment within the industry, the appliance shall be tested by a transport test representative of shipping mode such as truck, rail, air, and/or ocean. Truck transport test is mandatory. Rail, air, and/or ocean transport tests are optional.

The product shall be transported for a distance of not less than 2 times the longest expected transportation route as determined by the manufacturer in consideration of the product marketplace and distribution. For truck transport, at least 3 categories of roads shall be used, representing the expected transportation route with at least 10 % of the total distance for each road category.

Compliance is checked by the following:

– *the use of detection equipment having an equivalent sensitivity of 3 g/year of refrigerant shall reveal no leaks;*
– *damage of parts other than the refrigerating circuit is allowed.*

NOTE The test can be carried out on the appliance charged with a non-flammable refrigerant or a non-hazardous gas when pressurized to the saturated vapour pressure corresponding to a temperature of 23 °C.

22 Construction

This clause of Part 1 is applicable except as follows.

22.6 *Addition:*

The electrical insulation shall not be affected by snow which might enter the appliance enclosure.

22.14 *Addition:*

This requirement does not apply to the metallic fins of **heat exchangers**.

22.24 *Replacement:*

Bare heating elements shall be supported so that, in case of rupture or sagging, the heating conductor cannot come into contact with accessible metal parts nor give rise to a hazard. Bare heating elements shall not be used with wood or wood composite enclosures.

Compliance is checked by inspection and, if necessary, by cutting the element in the most unfavourable place. No force shall be applied to the conductor after it has been cut.

This test shall be made after the tests of Clause 29.

22.46 *Modification*:

Add the following after the 1st paragraph:

If the **protective electronic circuit** software is a part of the **normal operation** control, inspection of software shall be limited to relevant source code of safety controls or related software controls.

22.101 Appliances intended to be fixed shall be so designed that they can be securely fixed and maintained in position.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

Compliance is checked by inspection and in case of doubt, after installation of the appliance in accordance with the installation instructions.

22.102 Appliances provided with supplementary heaters

22.102.1 Appliances provided with **supplementary air heaters** shall be provided with at least two **thermal cut-outs**. The **thermal cut-out** intended to operate first shall be either a **self-resetting thermal cut-out** or a **non-self-resetting thermal cut-out**; the other **thermal cut-out** shall be a **non-self-resetting thermal cut-out**.

Compliance is checked by inspection and during the tests of Clause 19.

22.102.2 Appliances provided with **supplementary water heaters** shall incorporate a **non-self-resetting thermal cut-out**, providing **all-pole disconnection** that operates separately from water **thermostats**. However, for appliances intended to be connected to fixed wiring, the neutral conductor need not be disconnected.

Compliance is checked by inspection and during the tests of Clause 19.

NOTE Anti-frost heaters are not considered to be **supplementary water heaters**, if it is not possible to heat up the water to a temperature higher than 80 °C at the highest operating temperature within 6 h, with the temperature switch short circuited and with water flow stopped.

22.102.3 Thermal cut-outs of the capillary type shall be so designed that the contacts open in the event of leakage from the capillary tube.

Compliance is checked by inspection and test.

22.103 The sensing and switching elements of electromechanical non-self-resetting cut-outs shall be functionally independent of other control devices. If the switching element of a non-self-resetting cut-out is operating a relay or contactor, the relay or contactor may also be operated by other control devices. **Protective electronic circuits** are covered by Clause 19.

Compliance is checked by inspection.

22.104 Containers of **sanitary hot water heat pumps** shall withstand the water pressure occurring in normal use.

*Compliance is checked by subjecting the containers and **heat exchangers**, if any, to a water pressure which is raised to the value specified below at a rate of 0,13 MPa per second and is maintained at that value for 5 min.*

The water pressure is

– *twice the **maximum allowable pressure** for closed containers;*
– *0,15 MPa for open containers.*

After the test, no water shall have leaked out and the containers shall not have ruptured.

NOTE If the container of **sanitary hot water heat pumps** incorporates a **heat exchanger**, the container and the **heat exchanger** are subjected to the pressure test in accordance with the relevant standard.

22.105 In the case of closed containers of **sanitary hot water heat pumps**, the formation of an air or vapour cushion of more than 2 % of the capacity, but not more than 10 %, shall be provided.

Compliance is checked by inspection and, where necessary, by measurements.

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

22.106 **Pressure-relief devices**, whether incorporated in the container of **sanitary hot water heat pumps** or supplied separately, shall prevent the pressure in the container from exceeding the **maximum allowable pressure** by more than 0,1 MPa.

Compliance is checked by subjecting the container to a slowly increasing water pressure and by observing the pressure at which the relief device operates.

22.107 The outlet system of open containers of **sanitary hot water heat pumps** shall be free from obstructions that could limit the water flow to such an extent that the pressure in the container would exceed the **maximum allowable pressure**.

Vented containers of **sanitary hot water heat pumps** shall be so constructed that the container is always open to the atmosphere through an aperture of at least 5 mm in diameter or 20 mm^2 in area, with a width of at least 3 mm.

Compliance is checked by inspection and measurement.

NOTE The first requirement is considered to be met if the area of the water outlet from the heated part of the container of **sanitary hot water heat pumps** is equal or greater than the area of the water inlet to the heated part.

22.108 Storage tanks of **sanitary hot water heat pumps** shall be resistant to vacuum pressure impulses which can occur in normal use.

Compliance is checked by subjecting containers which are not vented, in accordance with 22.104, to a vacuum of 33 kPa for 15 min.

After the test, the container shall show no deformation which might result in a hazard.

Anti-vacuum valves, if any, are not rendered inoperative.

NOTE This test can be carried out on separate containers.

22.109 Wiring connected to a **non-self-resetting thermal cut-out** designed to be replaced after its operation shall be so secured that replacement of the **thermal cut-out** itself or to a heating element assembly on which the **thermal cut-out** is mounted will not damage other connections or internal wiring.

Compliance is checked by inspection and, if necessary, by manual test.

22.110 **Non-self-resetting thermal cut-outs** designed to be replaced after their operation shall open the circuit in the intended manner without short-circuiting **live parts** of different potential and without causing **live parts** to come into contact with the enclosure.

Compliance is checked by the following test.

The appliance is operated five times, each time with a new non-self-resetting thermal cut-out, any other thermally operated control devices being short-circuited.

*Each time, the **thermal cut-out** shall operate appropriately.*

During the test, the enclosure of the appliance is connected to earth through a 3 A fuse; this fuse shall not blow.

After this test, the supplementary heating elements shall withstand an electric strength test as specified in 16.3.

AVA Documents
Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

22.112 The construction of the **refrigerating system** shall comply with the requirements of ISO 5149-2:2014, Subclauses 4.2, 4.3, 5.2.1, 5.2.2, 5.2.4, 5.2.5, 5.2.15, 5.2.6.1, 5.2.6.3, 5.2.7, 5.2.8, 5.2.9.1, 5.2.9.3, and 5.2.9.4.and ISO 5149-2:2014/AMD1:2020, Subclauses 4.1, 5.2.3, 5.2.9.2.

NOTE A **safety shut-off valve** is an isolating valve for the purpose of ISO 5149-2.

Compliance is checked by inspection.

22.113 When a **flammable refrigerant** is used, refrigerant piping shall be protected or enclosed to avoid mechanical damage. The refrigerant piping shall be protected to the extent that it will not be handled or used for carrying during moving of the appliance. Refrigerant piping located within the appliance enclosure is considered to be protected from mechanical damage.

Compliance is checked by inspection.

22.114 When a **flammable refrigerant** is used, low temperature solder alloys, such as lead/tin alloys, shall not be used for pipe connections or any other refrigerant pressure containing purposes.

Compliance is checked by inspection.

22.115 The **refrigerant charge** (m_c) in each **refrigerating system** employing **flammable refrigerant** 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.

Compliance is checked by inspection.

22.116 Arcs and sparks from electric components

22.116.1 Appliances using **flammable refrigerants** shall be constructed so that any leaked refrigerant will not flow or stagnate so as to cause a fire or explosion hazard in areas within the appliance or connected ducts where electrical components, which could be a source of ignition and which could function during **normal operation** or as a result of a leak, are located.

NOTE Thermal cut-outs and similar devices are not considered to function during **normal operation**.

Separate components, such as **thermostats**, which are charged with less than 0,5 g of a flammable gas are not considered to cause a fire or explosion hazard in the event of leakage of the gas within the component itself.

*Electrical components, which are potential ignition sources that could function under **normal operation** or as a result of a leak, are not considered a source of ignition if they comply with at least one of the following requirements:*

a) *not be located in an area where a potentially flammable gas mixture will accumulate as demonstrated by the test of Annex FF;*

b) *have equipment protection level according to 22.116.2;*

c) *are sealed components in compliance with the tests of 22.116.3, and protected from impact by the appliance enclosure;*

d) *are located in an enclosure which complies with IEC 60079-15:2017, Clauses 7 through 10, for restricted breathing enclosures suitable for use with group IIA gases or the refrigerant used;*

e) *are located in an enclosure which complies with Annex NN. Applicable to appliances with A2L **refrigerants** only;*

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024

f) *are in compliance with Annex JJ. Applicable to appliance with **A2L refrigerants** only;*

g) *are in compliance with 22.116.4. Applicable to appliance with **A2L refrigerants** only;*

h) *electrostatic air cleaners or similar devices tested and found to comply with 22.116.5. Applicable to appliance with **A2L refrigerants** only;*

i) ***refrigerant sensors** tested and found to comply with Clause LL.11.*

22.116.2 Components are not considered to be ignition sources if they comply with the requirements for equipment protection level Ga, Gb, or Gc as defined in IEC 60079-14 for the refrigerant used in the appliance or the relevant gas group (IIA, IIB, or IIC) to which the refrigerant belongs. However, the following requirements do not apply:

– marking requirements of the applicable standard in IEC 60079 (all parts);

– the impact tests of IEC 60079-0;

– the IP test of IEC 60079-0;

– the drop test of IEC 60079-0;

– the creepage and **clearance** requirements in IEC 60079-7.

NOTE 1 Most refrigerants belong to group IIA gases, however R-E170 belongs to group IIB gases.

NOTE 2 Examples of relevant protection principles that can be applied:

- Non incendive components "nC" in IEC 60079-15:2017.
- Flameproof "dc" in IEC 60079-1:2014 (formerly enclosed break device "nC" in IEC 60079-15:2010).
- Increased safety "ec" in IEC 60079-7:2015/AMD1:2017 (formerly non sparking low power equipment "nA" in IEC 60079-15:2010).
- Intrinsic safety "ic" in IEC 60079-11:2011 (formerly energy limited apparatus "nL" in IEC 60079-15:2010).
- Sealed device "nC" in IEC 60079-15:2017.
- Hermetically sealed device "nC" in IEC 60079-15:2017.
- Restricted breathing enclosure "nR" in IEC 60079-15:2017.

Compliance is checked by inspection or testing as required by the relevant IEC 60079 series standard.

22.116.3 *Three samples of the component shall be conditioned in a climate chamber for 168 h at the maximum operating temperature during the test of Clause 11 plus 12 K, but not less than 75 °C. This conditioning is followed by 24 h at the minimum operating temperature during the test of Clause 11 reduced by at least 5 K.*

The test temperature in the climate chamber shall be maintained within 2 K for the duration of the test.

The components shall be stabilized at a temperature of 25 °C. The entire components shall then be rapidly immersed in water at a temperature of (50 ± 2) °C to a depth of at least 25 mm below the surface for at least 60 s.

No bubbles shall emerge from the inside of the samples during this test.

22.116.4 For **A2L refrigerants**, devices capable of 100 000 cycles per Clause 24 switching AC loads in compliance with one of the following are not considered a potential ignition source:

– for resistive loads where the impedance has a power factor higher than 0,99: Breaking current per contact is not more than 48A during **normal operation**;

– for inductive loads where the power factor is not more than 0,99, the apparent power (S) of the switched inductive electrical load per phase in kVA is less than or equal to:

  - $L_e = 5 \times (6{,}7/S_u)^4$ when breaking all phases of a 3 phase load;
  - $L_e = 2{,}5 \times (6{,}7/S_u)^4$ all others.

Documents
Document Sharing Hub
Full document details: BS EN IEC 60335-2-40:2024+A11:2024

where

L_e is the maximum allowed apparent power of the switched inductive electrical load in kilovoltamperes (kVA);

S_u is the burning velocity of a refrigerant in centimetres per second (cm/s).

Compliance is checked by measurement.

22.116.5 For appliances with **A2L refrigerants**, electrostatic air cleaners and similar devices which can produce electrical arcing during **normal operation** that could ignite the refrigerant used, and which are installed in the unit airstream or connecting ducts, are not considered as a potential ignition source if the airflow is monitored and the energy source of the electric arcing is switched off when the airflow is below the minimum airflow according to Clause GG.9.

Compliance is checked by inspection and, if necessary, by an appropriate test.

22.116.6 For the purpose of determining the maximum quenching diameter (d_q) in Annex JJ and the maximum switched inductive electrical load L_e (see 22.116.4), the effect of humidity on burning velocity (S_u) shall be taken into consideration.

The burning velocity (S_u) shall be the highest value of

– as specified in ISO 817; or

– as measured in humid air at 27 °C ± 0,5 °C dew point at 101,3 kPa containing 21,0 % ± 0,1 % O_2 excluding water vapour determined at the nominal composition as specified in ISO 817.

NOTE The 27 °C dew point equates to an absolute humidity of 0,022 7 kg water vapour per 1 kg dry air.

This test can be done at the temperature higher than 27 °C. The required dew point is only for humidity.

The burning velocity (S_u) at 27 °C dew point may be determined by extrapolation of the measurement at 23 °C and 50 % relative humidity and the burning velocity (S_u) as provided by ISO 817. The extrapolation shall be based on the measured value increased by the measurement uncertainty to the burning velocity (S_u) at 23 °C and 50 % relative humidity. If the burning velocity (S_u) is not measurable at dry condition, the burning velocity shall be measured at 27 °C dew point.

22.117 Hot surfaces

22.117.1 Temperatures on surfaces that can be exposed to leakage of **flammable refrigerants** in excess of 25 % of ***LFL*** as determined in Annex FF shall not exceed the maximum allowable surface temperature given in Annex BB.

For A2 and A3 refrigerants not listed in Annex BB, the maximum allowable surface temperature is the ***AIT***.

For **A2L refrigerants** not listed in Annex BB, the maximum allowable surface temperature is determined by the higher of ***AIT*** or, if tested per Annex KK, the **hot surface ignition temperature** reduced by 100 K.

*Compliance is checked by measuring the appropriate surface temperatures during the tests of Clauses 11 and 19, except those which during the tests of Clause 19 are terminated in a non-self-resetting way. Compliance for **A2L refrigerants** is checked by measuring the appropriate surface temperatures during the tests of Clause 11.*

AVA Documents Document Sharing Hub

Full document details: BS EN IEC 60335-2-40:2024+A11:2024