

INTERNATIONAL STANDARD

NORME INTERNATIONALE



GROUP SAFETY PUBLICATION
PUBLICATION GROUPEE DE SÉCURITÉ

**Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-012: Particular requirements for climatic and environmental testing and other temperature conditioning equipment**

**Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
Partie 2-012: Exigences particulières pour les appareils d'essais climatiques et d'environnement, et autres appareils de conditionnement de température**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2019 IEC, Geneva, Switzerland

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

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

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

About IEC publications

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

IEC publications search - webstore.iec.ch/advsearchform

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

IEC Just Published - webstore.iec.ch/justpublished

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

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC

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

A propos des publications IEC

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

Recherche de publications IEC -

webstore.iec.ch/advsearchform

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

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.



IEC 61010-2-012

Edition 2.0 2019-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE



GROUP SAFETY PUBLICATION
PUBLICATION GROUPEE DE SÉCURITÉ

**Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-012: Particular requirements for climatic and environmental testing and other temperature conditioning equipment**

**Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
Partie 2-012: Exigences particulières pour les appareils d'essais climatiques et d'environnement, et autres appareils de conditionnement de température**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 19.080

ISBN 978-2-8322-6713-4

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

| | |
|---|----|
| FOREWORD | 4 |
| INTRODUCTION | 7 |
| 1 Scope and object | 10 |
| 2 Normative references | 11 |
| 3 Terms and definitions | 11 |
| 4 Tests | 17 |
| 5 Marking and documentation | 23 |
| 6 Protection against electric shock | 32 |
| 7 Protection against mechanical HAZARDS | 34 |
| 8 Resistance to mechanical stresses | 36 |
| 9 Protection against the spread of fire | 37 |
| 10 Equipment temperature limits and resistance to heat | 38 |
| 11 Protection against HAZARDS from fluids and solid foreign objects | 42 |
| 12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure | 57 |
| 13 Protection against liberated gases and substances, explosion and implosion | 58 |
| 14 Components and subassemblies | 60 |
| 15 Protection by interlocks | 62 |
| 16 HAZARDS resulting from application | 64 |
| 17 RISK assessment | 65 |
| Annexes | 66 |
| Annex K (normative) Insulation requirements not covered by 6.7 | 67 |
| Annex L (informative) Index of defined terms | 68 |
| Annex AA (informative) Useful symbols | 70 |
| Annex BB (informative) Protection of people who are inside WALK-IN EQUIPMENT | 73 |
| Annex CC (informative) Safety requirements for components and piping | 75 |
| Annex DD (informative) Equipment containing FLAMMABLE REFRIGERANTS – Information and marking requirements | 80 |
| Annex EE (normative) Non-sparking "n" electrical device | 83 |
| Bibliography | 84 |
| | |
| Figure 101 – Schema of a REFRIGERATING SYSTEM incorporating a CONDENSER | 8 |
| Figure 102 – Flow chart illustrating the selection process | 9 |
| Figure 103 – Details of scratching TOOL tip | 52 |
| | |
| Table 1 – Symbols | 24 |
| Table 101 – Time-temperature conditions | 30 |
| Table 102 – Maximum temperatures for MOTOR-COMPRESSORS | 40 |
| Table 103 – Minimum temperature for the determination of SATURATED-VAPOUR PRESSURE of the REFRIGERANT | 47 |
| Table 104 – REFRIGERANT flammability parameters | 56 |
| Table AA.1 – Useful symbols | 70 |

Table CC.1 – Parameters of pressure vessels according to EN 14276-1 76
Table CC.2 – Parameters of piping according to EN 14276-2 77
Table CC.3 – Components and piping requirements 78
Table CC.4 – Minimum wall thickness for copper and steel tubing 79

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT
FOR MEASUREMENT, CONTROL, AND LABORATORY USE –****Part 2-012: Particular requirements for climatic and environmental
testing and other temperature conditioning equipment**

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.

International Standard IEC 61010-2-012 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

It has the status of a group safety publication in accordance with IEC Guide 104.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

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

- a) alignment with changes introduced by Amendment 1 of IEC 61010-1:2010;
- b) changes related to the use of small capitals for defined terms only;
- c) clarifications for cooling tests in 4.4.2.10;

- d) requirements for overtemperature protection in 10.101, including deletion of the second part of the sentence in item b), and the deletion of item c);
- e) changes pertaining to the accurate employment of terms "temperature", "operating temperature", "working temperature", "application temperature", "room temperature" and "ambient temperature" in 3.5.104, 3.5.105, 4.3.1, 4.3.2, 5.4.2, 8.2.1, 8.2.2, 11.7.2.101.2, 11.7.2.101.3, 13.2.102, 14.102, 15.101, 15.102, 15.103, Introduction and many other locations. For the purpose of clarification, the definition of 3.5.114, CONTROLLED TEMPERATURE, is added.

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

| | |
|-------------|------------------|
| FDIS | Report on voting |
| 66/687/FDIS | 66/688/RVD |

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61010 series, published under the general title, *Safety requirements for electrical equipment for measurement, control, and laboratory use*, can be found on the IEC website.

IEC 61010-2-012 is to be used in conjunction with the latest edition of IEC 61010-1. It was established on the basis of the third edition (2010) and its Amendment 1 (2016), hereinafter referred to as Part 1.

This Part 2-012 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for climatic and environmental testing and other temperature conditioning equipment*.

Where a particular subclause of Part 1 is not mentioned in this Part 2-012, that subclause applies as far as is reasonable. Where this Part 2-012 states "addition", "modification", "replacement", or "deletion", the relevant requirement, test specification, or note in Part 1 should be adapted accordingly.

In this standard:

- 1) the following print types are used:
 - requirements and definitions: in roman type;
 - NOTES: in smaller roman type;
 - *conformity and tests: in italic type;*
 - terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS.
- 2) subclauses, figures, tables and notes which are additional to those in Part 1 are numbered starting from 101. Additional annexes are lettered starting from AA.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://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 standard using a colour printer.

INTRODUCTION

This Part 2-012, along with Part 2-010 and Part 2-011, taken together, address the specific HAZARDS associated with the heating and cooling of materials by equipment and are organized as follows:

| | |
|-----------------|---|
| IEC 61010-2-010 | Specifically addresses the HAZARDS associated with equipment incorporating heating systems. |
| IEC 61010-2-011 | Specifically addresses the HAZARDS associated with equipment incorporating REFRIGERATING SYSTEMS. |
| IEC 61010-2-012 | Specifically addresses the HAZARDS associated with equipment incorporating both heating and REFRIGERATING SYSTEMS that interact with each other such that the combined heating and REFRIGERATING SYSTEM yield additional or more severe HAZARDS for the two systems than if treated separately. It also addresses the HAZARDS associated with the treatment of materials by other factors like irradiation, excessive humidity, CO ₂ and MECHANICAL MOVEMENT, etc. |

Guidance for the application of the appropriate Part 2 standard(s)

When the equipment includes only a material heating system, and no REFRIGERATING SYSTEM or other environmental factors apply, then Part 2-010 applies without needing Part 2-011 or Part 2-012. Similarly, when the equipment includes only a REFRIGERATING SYSTEM, and no material heating system or other environmental factors apply, then Part 2-011 applies without needing Part 2-010 or Part 2-012. However, when the equipment incorporates both a material heating system, and a REFRIGERATING SYSTEM or the materials being treated in the intended application introduce significant heat into the REFRIGERATING SYSTEM, a determination should be made as to whether the interaction between the two systems will generate additional or more severe HAZARDS than if the systems were evaluated separately (CONTROLLED TEMPERATURE, see flow chart for selection process). If the interaction of the heating and cooling functions yields no additional or more severe HAZARDS, then both Part 2-010 and Part 2-011 apply for their respective functions. Conversely, if additional or more severe HAZARDS result from the combining of the heating and cooling functions, or if the equipment incorporates additional material treatment factors, then Part 2-012 applies, but not Part 2-010 or Part 2-011.

What HAZARDS are applicable for a REFRIGERATING SYSTEM?

The typical HAZARDS for a REFRIGERATING SYSTEM (see Figure 101) consisting of a MOTOR-COMPRESSOR, a CONDENSER, an expansion device and an EVAPORATOR include but are not limited to:

- The maximum temperature of LOW-PRESSURE SIDE (return temperature) to the MOTOR-COMPRESSOR. A MOTOR-COMPRESSOR incorporates a REFRIGERANT cooled motor and it should be established that the maximum temperatures of the LOW-PRESSURE SIDE under least favourable condition do not exceed the insulation RATINGS within the motor.
- The maximum pressure of LOW-PRESSURE SIDE at the inlet to the MOTOR-COMPRESSOR. The housing of the MOTOR-COMPRESSOR is exposed to this pressure and so the design RATING of the MOTOR-COMPRESSOR housing should accommodate the worst-case pressures whilst providing the correct safety margin for a pressure vessel.
- The maximum temperature of HIGH-PRESSURE SIDE to the CONDENSER. The temperatures of the HIGH-PRESSURE SIDE under most unfavourable conditions may present a temperature HAZARD if the OPERATOR is exposed to them or if the electrical insulation is degraded.
- The maximum pressure of HIGH-PRESSURE SIDE at the outlet to the MOTOR-COMPRESSOR. The REFRIGERANT components downstream of the MOTOR-COMPRESSOR up to the expansion device are exposed to this pressure and so the design RATING of these components should accommodate the worst-case pressures whilst providing the appropriate safety margin for a pressure vessel.

- The maximum CONTROLLED TEMPERATURES, namely, the SOAKED TEMPERATURE CONDITIONS, from which the heat is being extracted, may impact the maximum temperature of LOW-PRESSURE SIDE to the MOTOR-COMPRESSOR as well as present a temperature HAZARD if the OPERATOR is exposed to them or if the electrical insulation is degraded. Whether this CONTROLLED TEMPERATURE is derived from an integral heating function of the device or from the heat dissipated from the material being cooled, the impact under worst case conditions should be evaluated.
- The current draw of the equipment should be established when including the worst-case running conditions of the REFRIGERATING SYSTEM including any defrost cycles that may apply.

The worst-case conditions should be determined for the equipment and will include both the least favourable NORMAL USE conditions as well as the most unfavourable testing results under SINGLE FAULT CONDITIONS.

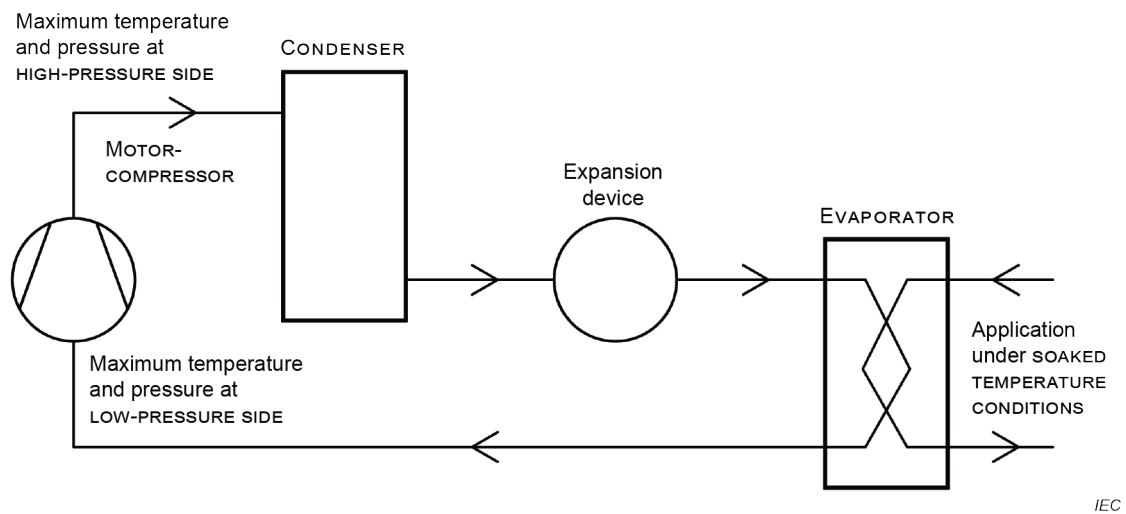
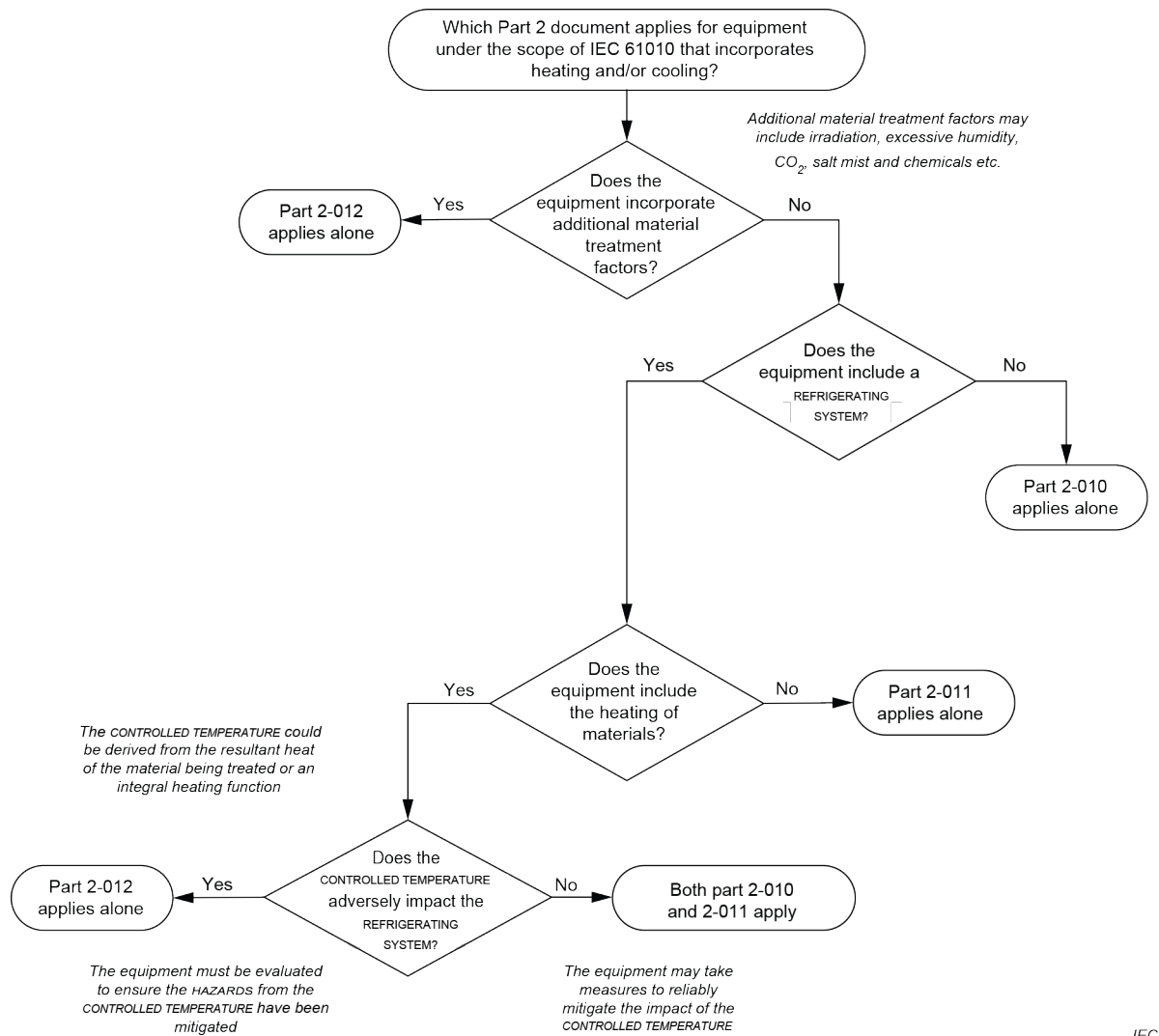


Figure 101 – Schema of a REFRIGERATING SYSTEM incorporating a CONDENSER

The selection process is illustrated in the following flow chart (see Figure 102).



IEC

Figure 102 – Flow chart illustrating the selection process

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL AND LABORATORY USE –

Part 2-012: Particular requirements for climatic and environmental testing and other temperature conditioning equipment

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

Replace the second paragraph by the following:

This part of IEC 61010 specifies safety requirements for electrical equipment and its accessories within the categories a) through c), wherever it is intended to be used, whenever that equipment incorporates one or more of the following characteristics:

- A REFRIGERATING SYSTEM that is acted on or impacted by an integral heating function such that the combined heating and REFRIGERATING SYSTEM generates additional and/or more severe HAZARDS than those for the two systems if treated separately.
- The materials being treated in the intended application introduce significant heat into the REFRIGERATING SYSTEM, so that the REFRIGERATING SYSTEM in the application yields additional and/or more severe HAZARDS than those for the REFRIGERATING SYSTEM if operated at the maximum RATED ambient temperature alone.
- An irradiation function for the materials being treated presenting additional HAZARDS.
- A function to expose the materials being treated to excessive humidity, carbon dioxide, salt mist, or other substances which can result in additional HAZARDS.
- A function of MECHANICAL MOVEMENT presenting additional HAZARDS.
- Provision for an OPERATOR to walk in to the operating area to load or unload the materials being treated.

Addition:

Add the following text after the last paragraph:

NOTE 101 Examples of such equipment include environmental testing and plant growth TEST CHAMBERS, refrigerating CIRCULATORS which incorporate heating, and recirculating coolers for extracting heat.

It is possible that all or part of the equipment falls within the scope of one or more other Part 2 standards of IEC 61010 as well as within the scope of this standard. In that case, the requirements of those other Part 2 standards also apply. This document is intended for application when one or more of the additional HAZARDS described in the above dashed listed items are introduced. However, when the equipment incorporates only a REFRIGERATING SYSTEM or only a heating function or a combination of the two without introducing the additional HAZARDS described in the above list, then IEC 61010-2-011 or IEC 61010-2-010 or both, as appropriate, apply instead of this Part 2-012.

See further information in the flow chart (Figure 102) for selection process and guidance in the Introduction.

NOTE 102 Subclause 3.1.107 and Annex BB provide the definition and requirements for the protection of people who are inside WALK-IN EQUIPMENT.

1.1.2 Equipment excluded from scope

Addition:

Add the following items after item j):

- aa) equipment for the heating, cooling, and ventilation of laboratories;
- bb) sterilizing equipment.

1.2 Object

1.2.1 Aspects included in scope

Addition:

Add the following items after item g):

- aa) biohazards (see 13.101);
- bb) hazardous chemical substances (see 13.102).

2 Normative references

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

Addition:

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

IEC 60079-20-1, *Explosive atmospheres – Part 20-1: Material characteristics for gas and vapour classification – Test methods and data*

IEC 60335-2-34:2012, *Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors*

IEC 60335-2-34:2012/AMD1:2015

IEC 60335-2-34:2012/AMD2:2016

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs* (available at <https://www.iso.org/obp>)

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

3.1 Equipment and states of equipment

Addition:

Add the following new terms and definitions:

3.1.101**BATH**

complete device intended for application of CONTROLLED TEMPERATURES to SPECIMENS by immersion in a temperature-controlled liquid HEAT TRANSFER MEDIUM

3.1.102**CIRCULATOR**

equipment intended for application of CONTROLLED TEMPERATURES to an APPLICATION SYSTEM by external circulating of a temperature-controlled liquid HEAT TRANSFER MEDIUM

3.1.103**TEST CHAMBER**

ENCLOSURE or space in some part of which specified conditions can be achieved, in particular, temperature, humidity, irradiation, low air pressure, mould growth and salt spray

3.1.104**COMBINED TEST CHAMBER**

special TEST CHAMBER combined with the function of MECHANICAL MOVEMENT, for example, for vibration, shock, impact, and similar dynamic tests

3.1.105**INCUBATOR**

special TEST CHAMBER, primarily for incubation of microorganisms and tissue culture

3.1.106**SHAKER**

equipment to disperse or dissolve one substance in another by MECHANICAL MOVEMENT without the use of blades or stirrers that might destroy the structure of the substance, in particular, shaking BATH and shaking INCUBATOR

3.1.107**WALK-IN EQUIPMENT**

TEST CHAMBER or INCUBATOR, the door of which allows the OPERATOR to enter and remain inside the equipment even with the door closed

3.1.108**DRYING-OUT**

period to wait or procedure to be carried out before operation to return the equipment to NORMAL CONDITION if it has been transported or stored in humid conditions, or moved from a cold environment to a much warmer one where condensation could occur, and could cause the equipment to then fail to meet all the safety requirements of this document

3.1.109**STANDSTILL**

period to wait or procedure to be carried out before operation to return the equipment to NORMAL CONDITION if it has been transported, moved, shaken, tilted or inverted and which could cause the equipment to then fail to meet all the safety requirements of this document

3.2 Parts and accessories

Addition:

Add the following new terms and definitions:

3.2.101**RESISTANCE-HEATING DEVICE**

part of resistance-heating equipment, comprising one or more heating resistors, typically composed of metallic conductors or an electrically conductive compound suitably insulated and protected

[SOURCE: IEC 60050-426:2008, 426-08-08, modified – "resistance-heating unit" has been replaced with "resistance-heating equipment".]

3.2.102**REFRIGERATING SYSTEM**

combination of interconnected REFRIGERANT-containing parts constituting one closed REFRIGERANT circuit in which the REFRIGERANT is circulated for the purpose of extracting and rejecting heat

[SOURCE: ISO 5149-1:2014, 3.1.9, modified – the term "(heat pump)" has been deleted from the term and the words "(i.e. cooling and heating)" have been deleted from the definition and the note.]

3.2.103**CASCADE SYSTEM**

REFRIGERATING SYSTEM consisting of two or more independent refrigeration circuits where the CONDENSER of one system rejects heat directly to the EVAPORATOR of another

[SOURCE: EN 378-1:2008, 3.1.12, modified – "REFRIGERATING SYSTEM consisting of" has been included.]

3.2.104**MOTOR-COMPRESSOR**

refrigerating subassembly consisting of the mechanical mechanism of the compressor and the motor, both of which are enclosed in the same sealed housing, with no external shaft seals, and with the motor operating in a REFRIGERANT atmosphere with or without oil

Note 1 to entry: The housing may be permanently sealed, such as by welding or brazing (hermetic MOTOR-COMPRESSOR), or may be sealed by gasketed joints (semi-hermetic MOTOR-COMPRESSOR). A TERMINAL box, a TERMINAL boxcover, and other electrical components or an electronic control system may be included.

[SOURCE: IEC 60335-2-34:2012, 3.101, modified – "appliance" has been replaced by "refrigerating subassembly".]

3.2.105**CONDENSER**

heat exchanger in which vaporized REFRIGERANT is liquified by removal of heat

[SOURCE: ISO 5149-1:2014, 3.4.4, modified – "refrigerant vapour" has been replaced by "vaporized REFRIGERANT".]

3.2.106**CONDENSING UNIT**

specific refrigerating subassembly combination for a given REFRIGERANT, consisting of one or more MOTOR-COMPRESSORS, CONDENSERS, liquid receivers (when required) and the regularly furnished accessories

3.2.107**EVAPORATOR**

heat exchanger in which liquid REFRIGERANT is vaporized by absorption of heat

[SOURCE: IEC 60335-2-40:2018, 3.110, modified – "refrigerant liquid" has been replaced by "liquid refrigerant".]

3.2.108

HIGH-PRESSURE SIDE

part of a REFRIGERATING SYSTEM operating approximately at the CONDENSER pressure

[SOURCE: ISO 5149-1:2014, 3.1.7]

3.2.109

LOW-PRESSURE SIDE

part of a REFRIGERATING SYSTEM operating approximately at the EVAPORATOR pressure

[SOURCE: ISO 5149-1:2014, 3.1.8]

3.2.110

CIRCULATING PUMP

pressure and/or suction pump transporting the liquid HEAT TRANSFER MEDIUM in a BATH or CIRCULATOR

3.2.111

CIRCULATING FAN

propeller fan or centrifugal impeller designed to circulate the air in a TEST CHAMBER or an INCUBATOR with or without any air duct

3.2.112

HUMIDIFIER

electric device that generates a water mist or steam and releases it into a room, greenhouse or other ENCLOSURE

3.2.113

BATH TANK

open or enclosed vessel containing the HEAT TRANSFER MEDIUM, in a BATH or CIRCULATOR

3.2.114

LIQUID CONNECTION

pipe fitting through which liquid is expelled from or discharged into a vessel or a heat exchanger

3.2.115

VENTILATOR

device for replacing air inside a TEST CHAMBER or an INCUBATOR with outside air

3.2.116

TEMPERATURE-LIMITING DEVICE

temperature-actuated device that is designed to prevent unsafe temperatures

[SOURCE: EN 378-1:2008, 3.6.5]

3.2.117

LIQUID LEVEL CUT OUT

liquid level-actuated device designed to prevent unsafe liquid levels

[SOURCE: EN 378-1:2008, 3.6.12]

3.2.118

PRESSURE-LIMITING DEVICE

pressure-actuated device (for example, a high-pressure switch) which is designed to stop the operation of the pressure-imposing element and may also operate an alarm

3.2.119**PRESSURE-RELIEF DEVICE**

valve or disc designed to relieve excessive pressure automatically

[SOURCE: ISO 5149-1:2014, 3.6.7, modified – "pressure relief valve or bursting disc device" has been replaced with "valve or disc" in the definition.]

3.2.120**FLAMMABLE LIQUID**

liquid capable of producing a flammable gas or vapour which, when mixed with air in certain proportions, will form an EXPLOSIVE GAS ATMOSPHERE under any foreseeable operating conditions

3.2.121**HEAT TRANSFER MEDIUM**

medium used to transfer heat to the material being processed

3.2.122**REFRIGERANT**

fluid used for heat transfer in a REFRIGERATING SYSTEM, which absorbs heat at a low temperature and a low pressure of the fluid and rejects heat at a higher temperature and a higher pressure of the fluid, usually involving changes of state of the fluid

[SOURCE: ISO 817:2014, 3.1.35, modified – the term "phase" has been replaced with "state" in the definition.]

3.2.123**FLAMMABLE REFRIGERANT**

REFRIGERANT with a flammability classification of A2L, A2 or A3 in accordance with ISO 817

[SOURCE: IEC 60335-2-24:2010 and IEC 60335-2-24:2010/AMD2:2017, 3.109]

3.2.124**SPECIMEN**

any material, substance, or product designated to be processed, for example, in a BATH, TEST CHAMBER or an INCUBATOR

3.2.125**APPLICATION SYSTEM**

system or device intended to work with a CIRCULATOR to carry out a functional purpose

3.5 Safety terms

Addition:

Add the following new terms and definitions:

3.5.101**SATURATED-VAPOUR PRESSURE**

<of REFRIGERANT> vapour pressure at which the liquid and vapour can exist in equilibrium at a given temperature

3.5.102**MAXIMUM ALLOWABLE PRESSURE****PS**

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

Note 1 to entry: This note applies to the French language only.

[SOURCE: EN 378-1:2008, 3.3.2]

3.5.103

RATED PRESSURE

MAXIMUM ALLOWABLE PRESSURE for pressure components of equipment with regard to their ability to withstand pressures as specified by the manufacturer

3.5.104

ACTIVE COOLING CONTROL RANGE

ACC RANGE

CONTROLLED TEMPERATURE range that is achieved by an active REFRIGERATING SYSTEM

Note 1 to entry: This note applies to the French language only.

3.5.105

FLASH POINT

lowest liquid temperature at which, under certain standardized conditions, a liquid gives off vapours in quantity such as to be capable of forming an ignitable vapour/air mixture

Note 1 to entry: At the FLASH POINT, the vapour may cease to burn when the ignition source is removed.

[SOURCE: IEC 60050-426:2008, 426-02-14]

3.5.106

FIRE POINT

lowest temperature at which a substance ignites and continues to burn for at least 5 s after a small flame has been applied to its surface under standardized conditions

3.5.107

AUTO IGNITION TEMPERATURE

lowest temperature at which a substance will spontaneously ignite in a normal atmosphere without an external ignition source, such as a flame or spark

Note 1 to entry: Once ignited, the substance will continue to burn until it is either completely consumed or the temperature of the remainder of the substance is reduced to or below its FIRE POINT.

3.5.108

LOWER EXPLOSIVE LIMIT

LEL

concentration of flammable gas or vapour in air, below which an EXPLOSIVE GAS ATMOSPHERE will not be formed

Note 1 to entry: This note applies to the French language only.

[SOURCE: IEC 60050-426:2008, 426-02-09]

3.5.109

EXPLOSIVE GAS ATMOSPHERE

mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour which, after ignition, permits self sustaining flame propagation

[SOURCE: IEC 60050-426:2008, 426-01-07]

3.5.110

SOAKED TEMPERATURE CONDITION

temperature conditions when the ambient temperature of the equipment under test (EUT) equals to $\pm 2,0$ °C of maximum ambient of 1.4.1 for NORMAL USE, storage or transport, and the CONTROLLED TEMPERATURE of the EUT equals to $\pm 2,0$ °C of the maximum ACC RANGE with the MOTOR-COMPRESSOR running or, the maximum RATED CONTROLLED TEMPERATURE with the MOTOR-COMPRESSOR off

Note 1 to entry: This note applies to the French language only.

3.5.111

MECHANICAL MOVEMENT

motion of materials being processed, for example in a SHAKER or COMBINED TEST CHAMBER

3.5.112

MOVEMENT FREQUENCY

number of complete cycles of MECHANICAL MOVEMENT

3.5.113

MOVEMENT AMPLITUDE

maximum radius, distance, or angle of the MECHANICAL MOVEMENT

3.5.114

CONTROLLED TEMPERATURE

temperature where the EVAPORATOR is located and to which the LOW-PRESSURE SIDE of the equipment is exposed, as a result of heat transfer either by active heating or from the APPLICATION SYSTEM or SPECIMEN

Note 1 to entry: For a heat pump system, where a four-way valve is used to shift between heat and cool, the function of CONDENSER and EVAPORATOR is exchanged.

4 Tests

This clause of Part 1 is applicable except as follows:

4.3 Reference test conditions

4.3.1 Environmental conditions

Addition:

Add the following text after item d):

Since the temperatures, pressures and current draw for a REFRIGERATING SYSTEM are significantly impacted by ambient temperatures in a non-linear way, linear extrapolation of test data is not possible. Therefore, tests to establish the temperatures, pressures, and current draw for a REFRIGERATING SYSTEM shall be conducted under the following environmental conditions:

- 1) an ambient temperature of 40 °C, or the maximum RATED ambient temperature, if higher;
- 2) the temperature of water supply is the maximum as specified by the manufacturer (see 5.4.3);
- 3) a relative humidity not exceeding the limits of 1.4.1 d), or the maximum RATED relative humidity at the maximum RATED ambient temperature, if higher.

If, as permitted by Note 2 of 1.4.1, a REFRIGERATING SYSTEM has an ambient temperature RATING below 40 °C, the NORMAL CONDITION tests shall be performed in an environment that matches the maximum RATED ambient temperature, and then repeated at an ambient temperature of 40 °C. See 4.3.2.114.

4.3.2 State of equipment

4.3.2.1 General

Replacement:

Replace the first paragraph and note by the following: