OHUTUSNÕUDED ELEKTRILISTELE MÕÕTMIS-, JUHTIMIS- JA LABORATOORIUMISEADMETELE. OSA 2-011: ERINÕUDED KÜLMUTUSSEADMETELE

Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-011: Particular requirements for refrigerating equipment

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 61010-2-011:2021 +A11:2021 sisaldab Euroopa standardi EN IEC 61010-2-011:2021 ja selle muudatuse A11:2021 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 61010-2-011 :2021+A11:2021 consists of the English text of the European standard EN IEC 61010-2-011:2021 and its amendment A11:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas. Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 19.11.2021, muudatus A11 19.11.2021.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation. Date of Availability of the European standard is 19.11.2021, for A11 19.11.2021.
Muudatusega A11 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [A11] [A11]. Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags [A11] [A11]. The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 19.080

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61010-2-011 + A11

November 2021, November 2021

ICS 19.080

Supersedes EN 61010-2-011:2017 and all of its amendments and corrigenda (if any)

English Version

Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-011: Particular requirements for refrigerating equipment (IEC 61010-2-011:2019)

Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire - Partie 2-011: Exigences particulières pour appareils de réfrigération (IEC 61010-2-011:2019)

Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 2-011: Besondere Anforderungen für Kühlgeräte (IEC 61010-2-011:2019)

This European Standard was approved by CENELEC on 2019-04-26. Amendment A11 was approved by CENELEC on 2021-08-02. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard and its amendment the status of a national standard without any alteration.

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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

European foreword

The text of document 66/676/CDV, future edition 2 of IEC 61010-2-011, prepared by IEC/TC 66 "Safety of measuring, control and laboratory equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61010-2-011:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-05-19
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-11-19

This document supersedes EN 61010-2-011:2017 and all of its amendments and corrigenda (if any).

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This document has been prepared under a Standardization Request given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For the relationship with EU Directive(s) / Regulation(s), see informative Annex ZZ, which is an integral part of EN IEC 61010-2-011:2021/A11:2021.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61010-2-011:2019 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60079-20-1	NOTE	Harmonized as EN 60079-20-1
IEC 60204-1	NOTE	Harmonized as EN 60204-1
IEC 61010-2-020	NOTE	Harmonized as EN 61010-2-020
ISO 4126-1	NOTE	Harmonized as EN ISO 4126-1
ISO 4126-2	NOTE	Harmonized as EN ISO 4126-2

A11 Amendment A11 European foreword

This document (EN IEC 61010-2-011:2021/A11:2021) has been prepared by CLC/TC 66X “Safety of measuring, control, and laboratory equipment”.

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)	2022-05-19
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2024-11-19

This document amends EN IEC 61010-2-011:2021.

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IEC 61010-2-011

Edition 2.0 2019-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

GROUP SAFETY PUBLICATION
PUBLICATION GROUPÉE DE SÉCURITÉ

Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-011: Particular requirements for REFRIGERATING EQUIPMENT

Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
Partie 2-011: Exigences particulières pour APPAREILS DE REFRIGERATION

IEC 61010-2-011:2019-03(en-fr)

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IEC 61010-2-011

Edition 2.0 2019-03

INTERNATIONAL STANDARD

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Safety requirements for electrical equipment for measurement, control, and laboratory use –
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Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
Partie 2-011: Exigences particulières pour APPAREILS DE REFRIGERATION

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-011: Particular requirements for REFRIGERATING 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.
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International Standard IEC 61010-2-011 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) introduction of new defined terms or modified terms to align with Part 2-012 and other source documents. Editorial changes to use small capitals only for defined terms. Note the difference of defined term ABNORMAL OPERATION (3.107) in 4.3.2.101 and abnormal operation in 11.7.104.3 and 11.7.104.5;
c) clarifications for cooling tests in 4.4.2.10;

d) changes pertaining to the accurate employment of the following terms: temperature, operating temperature, application temperature, CONTROLLED TEMPERATURE, room ambient and ambient temperature;

e) use of defined term REFRIGERATING SYSTEM to replace cooling system;

f) move text of 4.4.2.101 to 4.3.2.101, since the purpose of ABNORMAL OPERATION, as defined, is to simulate failure of the ambient conditions of 1.4.1 but not of the SINGLE FAULT CONDITION of the equipment;

g) use of the term equipment to replace unit, apparatus, appliance, where applicable;

h) in 5.1.2 dd) PS for high and low sides for each REFRIGERANT stage are required only under NORMAL CONDITION;

i) use of defined term NORMAL CONDITION to replace normal operation;

j) use of defined term OPERATOR to replace user.

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

CDV	Report on voting
66/676/CDV	66/683/RVC

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.

This Part 2-011 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 2-011 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for REFRIGERATING EQUIPMENT.*

Where a particular subclause of Part 1 is not mentioned in this Part 2-011, that subclause applies as far as is reasonable. Where this Part 2-011 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 and additional list items are lettered 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.

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INTRODUCTION

This Part 2-011, along with Part 2-010 and Part 2-012, 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.

Guidance for the application of the correct 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 of Figure 102 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 excess of temperature of the low-pressure side (return temperature) to the MOTOR-COMPRESSOR is higher than admissible. A MOTOR-COMPRESSOR incorporates a REFRIGERANT cooled motor and it should be established that the maximum temperatures of low-pressure side under least favourable condition do not exceed the insulation RATINGS within the motor.

– The excess of pressure of the low-pressure side at the inlet to the MOTOR-COMPRESSOR is higher than admissible. 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 excess of temperature of the high-pressure side to the condenser is higher than admissible. The temperatures of the high-pressure side under the most unfavourable conditions can present a temperature HAZARD if the OPERATOR is exposed, or an electrical HAZARD if insulation is degraded.

– The excess of pressure of the high-pressure side to the condenser is higher than admissible. 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 correct safety margin for a pressure vessel.
– The maximum CONTROLLED TEMPERATURES where the heat is being extracted from, may impact the maximum temperature of the low-pressure side to the MOTOR-COMPRESSOR as well as present a temperature HAZARD if the OPERATOR is exposed, or an electrical HAZARD if 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.

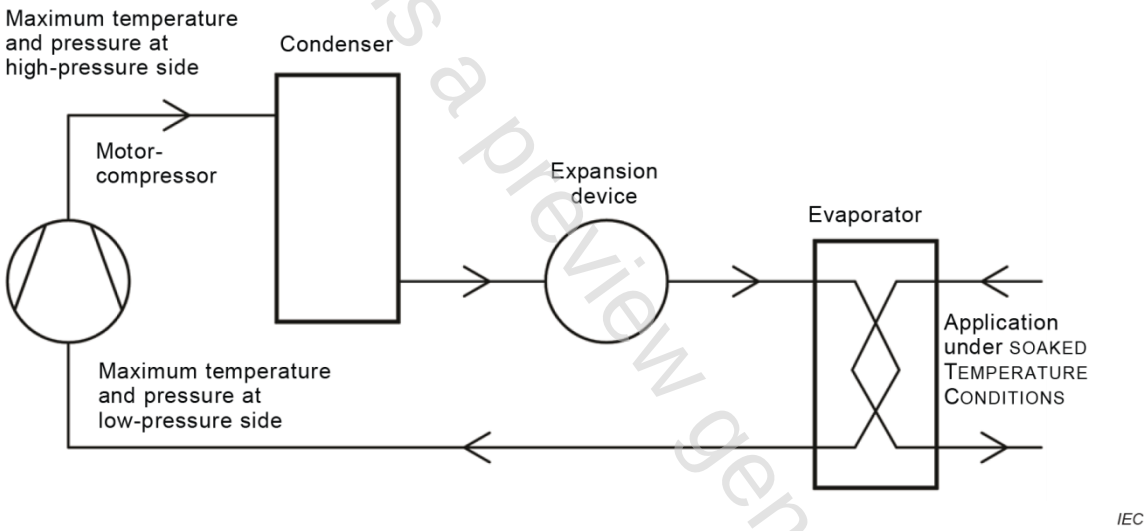

Figure 101 – Schema of a REFRIGERATING SYSTEM incorporating a condenser

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

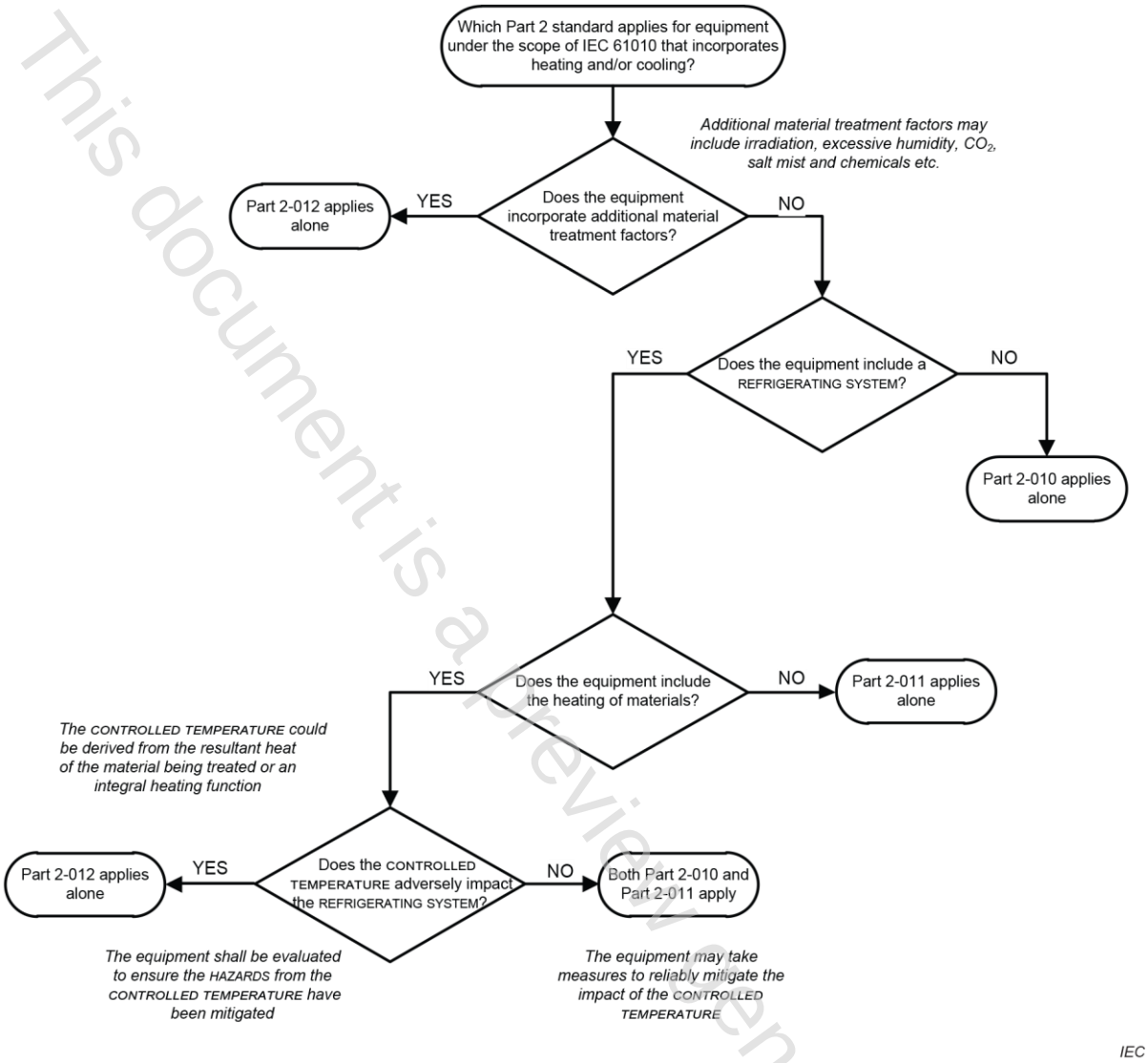

Figure 102 – Flow chart illustrating the selection process

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

Part 2-011: Particular requirements for REFRIGERATING 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 2 of IEC 61010 specifies particular safety requirements for the following types a) to c) of electrical equipment and their accessories, wherever they are intended to be used, whenever that equipment incorporates REFRIGERATING SYSTEMS as an integral part of, or separate from, the equipment and the equipment is in direct control of the REFRIGERATING SYSTEM.

This document details all the requirements when up to 150 g of FLAMMABLE REFRIGERANT are used per stage of a REFRIGERATING SYSTEM. Additional requirements beyond the current scope of this document apply if a REFRIGERANT charge of FLAMMABLE REFRIGERANT exceeds this amount.

Addition:

Add the following text after the last paragraph:

NOTE 101 Examples for REFRIGERATING EQUIPMENT include, but are not limited to, laboratory equipment such as laboratory refrigerators, freezers, refrigerated display cabinets.

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 will also apply. In particular, if equipment is intended to be used as a centrifuge, the requirements of IEC 61010-2-020 apply. However, when the equipment incorporates a refrigerating system and a heating function where the combination of the two introduces additional or more severe HAZARDS than if treated separately, then it is possible that IEC 61010-2-012 is applicable instead of this Part 2-011.

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

1.1.2 Equipment excluded from scope

Addition:

Add the following new item after item j):

or equipment incorporating:

aa) a transcritical REFRIGERANT SYSTEM (system that uses CO_2) or a system that uses ammonia (NH_3) as the REFRIGERANT.

1.2 Object

1.2.1 Aspects included in scope

Replacement:

Replace the first paragraph by the following:

The object of this document is to ensure that the design and methods of construction of REFRIGERATING EQUIPMENT provide adequate protection for OPERATORS, bystanders, trained service personnel, and the surrounding area against the specific HAZARDS that relate to REFRIGERATING SYSTEMS.

Addition:

Add the following note after the existing note:

NOTE 101 A list of HAZARDS typically associated with REFRIGERATING SYSTEMS and REFRIGERANTS is included in Annex BB.

2 Normative references

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

Addition:

Add the following references to the list:

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

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/AMD2:2017

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

〈A11〉 EN 809, *Pumps and pump units for liquids - Common safety requirements*

EN 837-1, *Pressure gauges - Part 1: Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing*

EN 837-2, *Pressure gauges - Part 2: Selection and installation recommendations for pressure gauges*

EN 837-3, *Pressure gauges - Part 3: Diaphragm and capsule pressure gauges - Dimensions, metrology, requirements and testing*

EN 1736, *Refrigerating systems and heat pumps - Flexible pipe elements, vibration isolators, expansion joints and non-metallic tubes - Requirements, design and installation*

EN 1779:1999, *Non-destructive testing - Leak testing - Criteria for method and technique selection*

EN 12178, *Refrigerating systems and heat pumps - Liquid level indicating devices - Requirements, testing and marking*

EN 12263, *Refrigerating systems and heat pumps - Safety switching devices for limiting the pressure - Requirements and tests*

EN 12284, *Refrigerating systems and heat pumps - Valves - Requirements, testing and marking*

EN 12693, *Refrigerating systems and heat pumps - Safety and environmental requirements - Positive displacement refrigerant compressors*

EN 13136, *Refrigerating systems and heat pumps - Pressure relief devices and their associated piping - Methods for calculation*

EN 13445-1, *Unfired pressure vessels - Part 1: General*

EN 13445-2, *Unfired pressure vessels - Part 2: Materials*

EN 13445-3, *Unfired pressure vessels - Part 3: Design*

EN 13445-4, *Unfired pressure vessels - Part 4: Fabrication*

EN 13445-5, *Unfired pressure vessels - Part 5: Inspection and testing*

EN 13445-6, *Unfired pressure vessels - Part 6: Requirements for the design and fabrication of pressure vessels and pressure parts constructed from spheroidal graphite cast iron*

EN 13445-8, *Unfired pressure vessels - Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys*

EN 13445-10, *Unfired pressure vessels - Part 10: Additional requirements for pressure vessels of nickel and nickel alloys*

EN 13480-1, *Metallic industrial piping - Part 1: General*

EN 13480-2, *Metallic industrial piping - Part 2: Materials*

EN 13480-3, *Metallic industrial piping - Part 3: Design and calculation*

EN 13480-4, *Metallic industrial piping - Part 4: Fabrication and installation*

EN 13480-5, *Metallic industrial piping - Part 5: Inspection and testing*

EN 13480-6, *Metallic industrial piping - Part 6: Additional requirements for buried piping*

EN 13480-8, *Metallic industrial piping - Part 8: Additional requirements for aluminium and aluminium alloy piping*

EN 14276-1, *Pressure equipment for refrigerating systems and heat pumps - Part 1: Vessels - General requirements*

EN 14276-2, *Pressure equipment for refrigerating systems and heat pumps - Part 2: Piping - General requirements*

EN 61770, *Electric appliances connected to the water mains - Avoidance of backsiphonage and failure of hose-sets*

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

IEC 60204-1, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

ISO 4126-1, *Safety devices for protection against excessive pressure — Part 1: Safety valves*

ISO 4126-2, *Safety devices for protection against excessive pressure — Part 2: Bursting disc safety devices* 〈A11〉

3 Terms and definitions

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

Addition:

Add the following new terms and definitions:

3.101
REFRIGERATING EQUIPMENT
test, measurement, control or laboratory equipment that incorporates a REFRIGERATING SYSTEM either as an integral part of or separate from the equipment

3.102
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 in brackets "(heat pump)", the words "(heating and cooling)", and the note to entry, have been omitted.]

3.103
FLAMMABLE REFRIGERANT
REFRIGERANT with a flammability classification of group 2 or 3 in accordance with ISO 5149-1 and ISO 817

Note 1 to entry: For REFRIGERANT blends which have more than one flammability classification, either the most unfavourable classification is taken for the purpose of this definition or the blend itself is evaluated for flammability in accordance with ISO 817.

3.104
HPCO
HIGH PRESSURE CUT-OUT
pressure-actuated device that is designed to stop the operation of the pressure generator

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

3.105
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: ISO 5149-1:2014, 3.3.3]

3.106
SOAKED TEMPERATURE CONDITION
environmental temperature condition when all the temperatures in the equipment under test (EUT) equal to ±2 °C of the test ambient temperature

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