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Interested committees:

Title: BS EN 61010-2-011 Ed.3.0 Draft Safety requirements for electrical equipment for measurement, control, and laboratory use.
Part 2-011: Particular requirements for refrigerating equipment.

Please notify admin.start@bsigroup.com if you are aware of any keywords that might assist in clarifying or identifying the standard or of the content of this standard:

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



66/846/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:
IEC 61010-2-011 ED3

DATE OF CIRCULATION:
2025-03-28

CLOSING DATE FOR COMMENTS:
2025-05-23

SUPERSEDES DOCUMENTS:
66/822/CD, 66/834/CC

IEC TC 66 : SAFETY OF MEASURING, CONTROL AND LABORATORY EQUIPMENT	
SECRETARIAT: United Kingdom	SECRETARY: Ms Stephanie Lavy
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S): TC 66 Horizontal Group Safety
ASPECTS CONCERNED: Safety	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE AC/22/2007 OR NEW GUIDANCE DOC).

TITLE:

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

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT
FOR MEASUREMENT, CONTROL, AND LABORATORY USE –****Part 2-011: Particular requirements for REFRIGERATING EQUIPMENT****FOREWORD**

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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 third edition cancels and replaces the second edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant changes from the second edition, as well as numerous other changes.

- a) adjustment of the scope to include CO₂ refrigeration systems including a TRANSCRITICAL REFRIGERATION SYSTEM and the ancillary components and requirements that such a system requires
- b) addition of the supplemental requirements if the flammable charge exceeds 150g per stage to a maximum of 13 times the LFL of the flammable refrigerant per stage, but still relying on risk mitigation if a leak occurs under single fault conditions, defined as a NORMAL TIGHTNESS system.

- c) addition of an enhanced construction approach that reduces the risk to tolerable levels (in alignment with established pressure system requirements) of a leak occurring under both normal and single fault conditions, defined as an ENHANCED TIGHTNESS system. This construction is not relying on limiting the flammable refrigerant charge amount as one of the methods of risk mitigation.
- d) addresses the use of other equipment inside the refrigerated compartment.
- e) updated marking and documentation requirements.
- f) addition of requirements to prevent back-siphonage into potable water systems for water cooled systems.
- g) updated requirements for piping joints and fittings (clause 8.1.102).
- h) Additional requirements for the protection against cold surfaces (clause 10.1.101).
- i) Update to the requirements for fluidic pressure requirements to incorporate NORMAL TIGHTNESS and ENHANCED TIGHTNESS and introduce requirements for an R744 (CO₂) system (11.7.101 to 11.7.105.4.4)
- j) an update to the protective requirements for pressures caused by transport and storage temperatures.
- k) An update of material requirements for components using for REFRIGERATING SYSTEMS (14.102)
- l) Update of Annex CC for the safety requirements of components and piping
- m) Addition of Annex EE for determining the gas concentration beyond the boundary in a NORMAL TIGHTNESS system using a FLAMMABLE REFRIGERANT charge greater than 150g per stage.
- n) Addition of Annex FF to detail the competence of personnel required for REFRIGERATING SYSTEMS of ENHANCED TIGHTNESS using FLAMMABLE REFRIGERANTS.
- o) Addition of Annex GG to provide an informative reference for the Globally Harmonized System of Classification and Labelling of Chemicals with respect to refrigerants.
- p) Update requirements to address the requirements for Stirling Refrigeration Systems

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) and Amendment 2, 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.

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.

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.
 - Expansion of liquid refrigerant in a closed space without the presence of vapour, caused by a rise in external temperature.
 - 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 escape of refrigerant causing, for example: asphyxiation, risk of fire or explosion or freezing of skin, depending on the refrigerant released.
- 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.

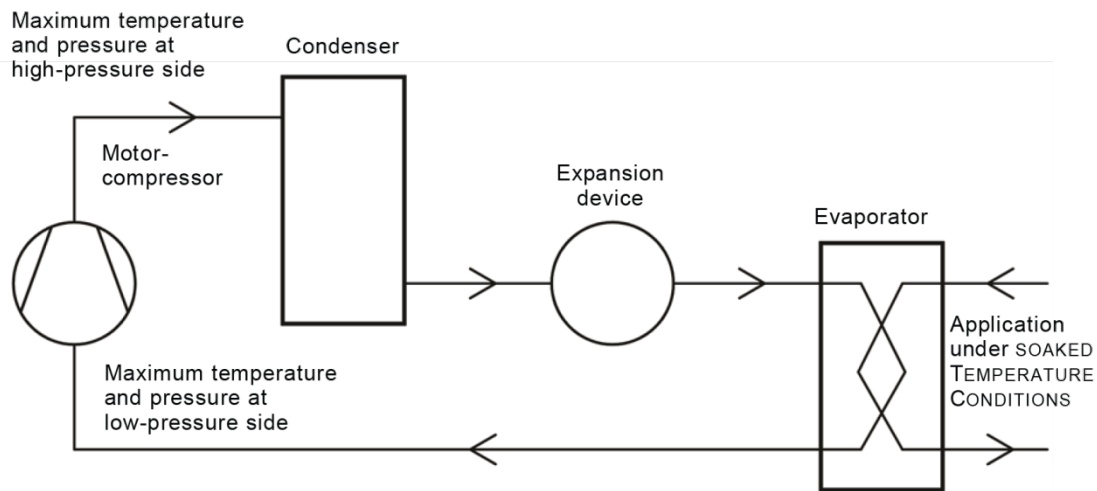
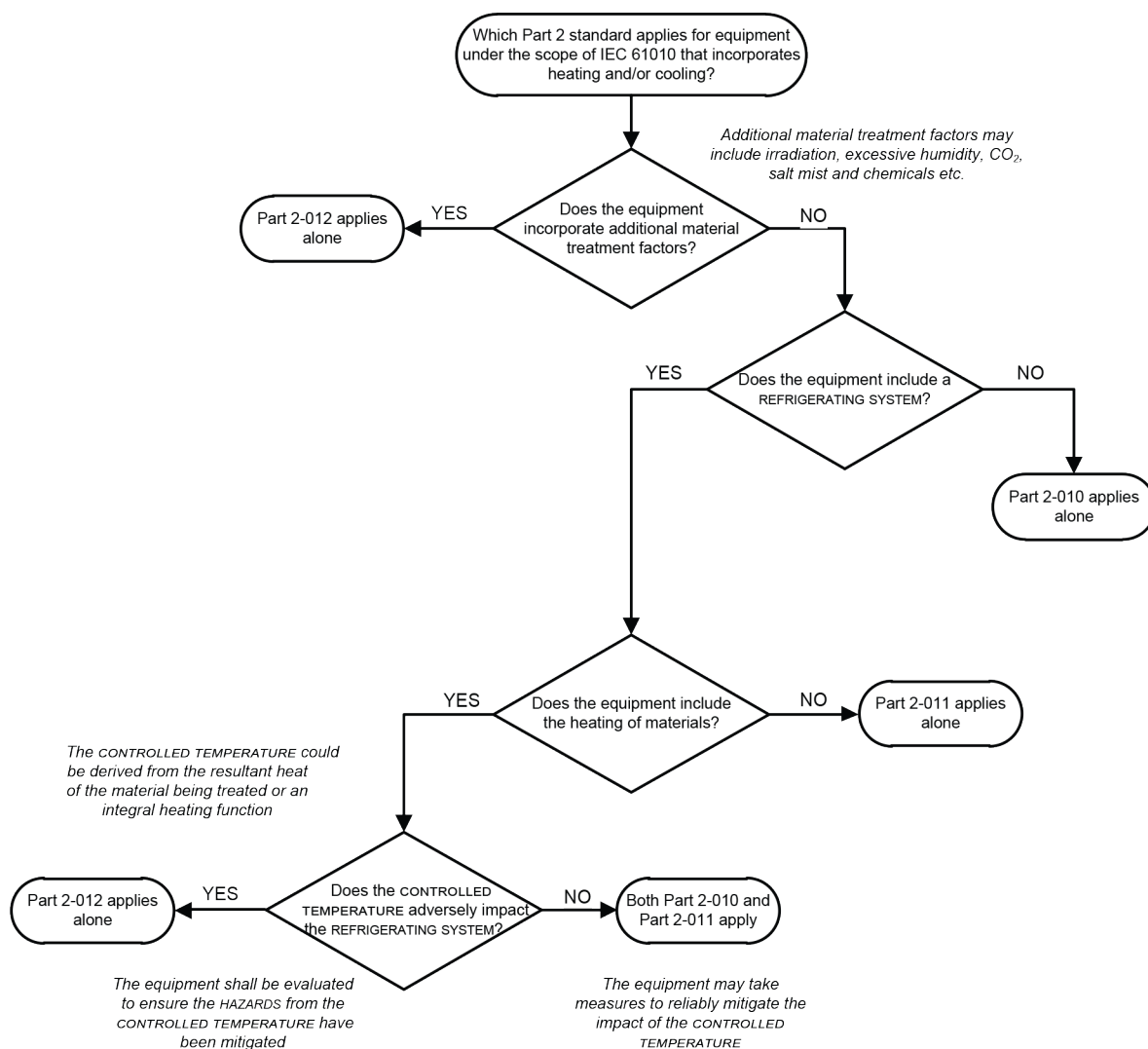


Figure 101 – Schema of a REFRIGERATING SYSTEM incorporating a condenser

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



IEC

228 **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. It also details the requirements for STIRLING REFRIGERATION SYSTEMS.

Addition:

dd) This document addresses all refrigeration systems and their associated components and piping using gaseous or liquid refrigerant or mixtures of refrigerants given in ISO 817.

Pressure equipment, assemblies and their components below or equal to the limits set out in points (A) for vessels and (B) for piping respectively shall be designed and manufactured in accordance with the sound engineering practice in this document.

Fluids with hazard statement H220 and H221 are considered group 1 fluids, where the maximum allowable temperature is above the flashpoint, and substances and mixtures with a maximum allowable temperature TS which exceeds the flashpoint of the fluid.

Fluids contained in group 2 (“non-dangerous fluids”) are fluids with no risk or other risks not quoted above associated with them.

A detailed list of can be found in Annex GG of this document.

A) Limits for vessels

This covers gases, liquefied gases, gases dissolved under pressure, vapours and those liquids whose vapour pressure at the maximum allowable temperature is $> 0,5$ bar above normal atmospheric pressure (1 013 mbar) within the limits detailed in Table CC.1 of Annex CC of this document.

B) Limits for piping

This covers liquids having a vapour pressure at the maximum allowable temperature of $\leq 0,5$ bar above normal atmospheric pressure (1 013 mbar) within the limits detailed in Table CC.2 of Annex CC of this document.

Addition:

268 *Add the following text after the last paragraph:*

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

271 It is possible that all or part of the equipment falls within the scope of one or more other Part 2
272 standards of IEC 61010 as well as within the scope of this standard. In that case, the
273 requirements of those other Part 2 standards will also apply. In particular, if equipment is
274 intended to be used as a centrifuge, the requirements of IEC 61010-2-020 apply. However,
275 when the equipment incorporates a refrigerating system and a heating function where the
276 combination of the two introduces additional or more severe HAZARDS than if treated separately,
277 then it is possible that IEC 61010-2-012 is applicable instead of this Part 2-011.

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

280 **1.1.2 Equipment excluded from scope**

281 *Addition:*

282 *Add the following after d)*

283 This document does not apply to:

- 284 - the evaluation of safety devices or components for pressure
- 285 - equipment or components exceeding the limits in 1.1.1 as additional requirements apply
286 and national or international legislation may set additional requirements.
- 287 - Walk-in chambers

288 **1.2 Object**

289 **1.2.1 Aspects included in scope**

290 *Replacement:*

291 *Replace the first paragraph by the following:*

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

296 *Addition:*

297 *Add the following note after the existing note:*

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

300 NOTE 102 For the EU, the sealed system components may be considered pressure vessels or piping in accordance
301 with the PRESSURE EQUIPMENT DIRECTIVE (PED) 2014/68/EU. This standard address equipment which is PED
302 category ≤ I and so excluded from the scope of the PED according to Article 4 (3). Refer to Annex CC for guidance
303 on the applicable pressure category for vessels (Annex CC.1) or piping (Annex CC.2).

304 For the equipment or the components, which are classified higher than category I and operated at this classification
305 level, will have to follow additional requirements (such as EN 378-2, alternative standards are not excluded). These
306 additional requirements are not covered by this standard. However, the basic method applied in this standard is
307 according to the method for complying with such additional requirements.

308

2 Normative references

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

Addition:

Add the following references to the list:

IEC 60079-7/AMD1:2017, *Explosive atmospheres – Part 7: Equipment protection by increased safety “e”*

IEC 60079-10-1:2020 *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

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

IEC 60079-29-1/AMD1:2020, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*

IEC 60335-2-34:2024, *Household and similar electrical appliances – Safety – Part 2-34: Particular requirements for motor-compressors.*

IEC 60730-1:2022, *Automatic electrical controls – Part 1: General requirements*

IEC 60730-1/Cor 1:2014, *Automatic electrical controls – Part 1: General requirements*

IEC 60730-1/Amd 1:2015, *Automatic electrical controls – Part 1: General requirements*

IEC 60730-1/Amd 2:2020, *Automatic electrical controls – Part 1: General requirements*

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

UL 1998 Ed.3:2013, *UL Standard for Safety Software in Programmable Components*

ISO 817:2024, *Refrigerants – Designation and safety classification*

ISO 4126-2:2018, *Safety devices for protection against excessive pressure – Bursting disc safety devices*

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

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

EN 378-1:2016, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Basic requirements, definitions, classifications and selection criteria*

EN 378-2:2016, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation*

ISO 14903:2017, *Refrigerating systems and heat pumps – Qualification of tightness of components and joints*

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 SYSTEM

combination of interconnected REFRIGERANT-containing parts constituting one closed circuit in which the REFRIGERANT is circulated for the purpose of extracting and delivering heat (i.e., cooling and heating)

[SOURCE: EN 378-1:2020 Terms and definitions, 3.1.1]

3.103

FLAMMABLE REFRIGERANT

REFRIGERANT with a flammability classification of group 2L, 2 or 3 in accordance with ISO 817, or hazard statement codes of H220, H221 in accordance with GHS Classification

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.

Note 2 to entry: GHS, an abbreviation for the Globally Harmonized System of Classification and Labelling of Chemicals. Refer to Annex GG for more information.

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

PS

Maximum allowable pressure for which the refrigerant containing parts of the equipment can be subjected to in NORMAL USE or SINGLE FAULT CONDITION

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

Note 2 to entry: PS is the limit which should not be exceeded whether the system is operating or not.

[SOURCE: EN 378-1:2016 Terms and definitions, 3.3.2]

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.

3.107

ABNORMAL OPERATION

operation of REFRIGERATING EQUIPMENT with a limited RATED ambient temperature range in ambient temperature conditions outside that limitation but within the temperature limits of 1.4.1

3.108**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 5149-1:2014, 3.7.9, modified – The note has been removed.]

3.109**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 heat pump systems, where a four-way valve is used to shift between heating and cooling, the function of the condenser and evaporator is exchanged.

3.110**LOWER EXPLOSIVE LIMIT / LOWER FLAMMABILITY LIMIT****LEL / LFL**

concentration of flammable gas or vapour in air, below which an explosive gas atmosphere will not be formed

3.111**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" and note 2 has been removed.]

3.112**CONDENSING UNIT**

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

[SOURCE: ISO 5149-1:2014, 3.4.5, modified – The definition has been adapted for the specific case of refrigerating equipment.]

3.113**QUALIFIED PERSON**

person having the appropriate technical training and experience necessary to be aware of hazards to which he or she is exposed in performing a task and of measures necessary to minimize the danger to themselves or other persons.

3.114**GAS COOLER**

heat exchanger in which, after compression, the refrigerant is cooled down, by transferring heat to an external cooling medium, without changing state

NOTE 1: A gas cooler is normally used in a TRANSCRITICAL REFRIGERATION SYSTEM.

3.115

TRANSCRITICAL REFRIGERATION SYSTEM

refrigeration system where the pressure in the high-pressure side is above the pressure where the vapour and liquid states of the refrigerant can coexist in thermodynamic equilibrium.

3.116

PRESSURE RELIEF DEVICE

pressure sensing device intended to reduce pressure automatically when pressures within the refrigeration system exceed the setting pressure of the device during abnormal operation.

3.117

FLASH GAS BYPASS VALVE

enables gas from the flash gas tank to be removed for compression typically in a TRANSCRITICAL REFRIGERATION SYSTEM

3.118

FLASH GAS TANK

provided to separate the vapor and supply liquid to evaporators for expansion typically in a TRANSCRITICAL REFRIGERATION SYSTEM. Once cooled in the gas cooler, refrigerant is throttled to the subcritical region and enters this device.

3.119

INTERMEDIATE PRESSURE STAGE

this applies to carbon dioxide (R-744) transcritical systems, lays between the high side and low side pressure stages and is regulated by a FLASH GAS BYPASS VALVE. This stage may include a FLASH GAS TANK and gas cooler.

3.120

PRESSURE REGULATING RELIEF VALVE

similar to a pressure relief valve except specifically intended for use with refrigeration systems utilizing carbon dioxide (R-744) as the refrigerant in a secondary loop or cascade system. The pressure relief setting of this valve is always lower than the relief setting of a PRESSURE RELIEF DEVICE. This valve may open and re-close many times during the life of the system.

3.121

GROUP I EQUIPMENT

equipment containing or intended for using with Group I fluids.

Note 1 to entry: Group I fluids are dangerous fluids with at least one of the HAZARD statements as defined in Annex GG.

Note 2 to entry: Group I fluids also include substances and mixtures contained or intended for use with the equipment whose maximum permissible temperature is above the FLASH POINT of the fluid.

3.122

HERMETICALLY SEALED JOINT

joint that are made tight by welding, brazing or a similar permanent connection.

[SOURCE: ISO 14903:2017, 3.7]

3.123

HERMETICALLY SEALED COMPONENT

component that are made tight by welding, brazing or a similar permanent connection.

[SOURCE: ISO 14903:2017, 3.8]

3.124**TYPE APPROVED COMPONENT**

component for which examination is performed on one or more samples of this component in accordance with a recognized standard for type approval.

3.125**WELDED JOINT**

joint obtained by the joining of metal parts in plastic or molten state.

[SOURCE: EN 378-1:2016, 3.5.3]

3.126**BRAZED JOINT**

joint obtained by the joining of metal parts with alloys which melt at temperatures in general higher than 450°C but less than the melting temperatures of the joined parts.

[SOURCE: EN 378-1:2016, 3.5.4]

3.127**SOLDERED JOINT**

joint obtained by the joining of metal parts with metallic mixtures or alloys which melt at temperatures in general less than 450°C.

[SOURCE: EN 378-1:2016, 3.5.5]

3.128**NORMAL TIGHTNESS**

absence of leakage when any of the tightness tests or tightness monitoring appropriate for the application does not reveal any hazardous leaks during normal operation.

[SOURCE: EN 1127-1:2019, 3.1]

3.129**ENHANCED TIGHTNESS**

absence of leakage when due to the design and measures of maintenance any of the tightness tests or tightness monitoring appropriate for the application does not reveal any hazardous leaks during normal operations and expected malfunctions.

[SOURCE: EN 1127-1:2019, 3.2]

3.130 REFRIGERATION EQUIPMENT TYPE A

a REFRIGERATION SYSTEM that contains non-flammable, non-toxic REFRIGERANT, not including CO₂ in either a sub-critical or transcritical state.

3.131 REFRIGERATION EQUIPMENT TYPE B

a REFRIGERATION SYSTEM that contains flammable REFRIGERANT, at a charge ≤ 150g. A REFRIGERANT leak is considered possible under single fault conditions, but only ignition sources internal to the equipment need to be addressed.

3.132 REFRIGERATION EQUIPMENT TYPE C

a REFRIGERATION SYSTEM that contains flammable REFRIGERANT, with a charge > 150g but ≤ 13 x LFL. A REFRIGERANT leak is considered possible under single fault conditions, but ignition sources both internal to the equipment and the area surrounding the equipment need to be addressed.

3.133 REFRIGERATION EQUIPMENT TYPE D

a REFRIGERATION SYSTEM that contains flammable REFRIGERANT where the construction and routine test are such that a REFRIGERANT leak under single fault conditions is not considered

520 possible during its expected life provided all preventative maintenance is sustained. Therefore,
521 there is no limit to the quantity of refrigerant employed.

522 **3.134 REFRIGERATION EQUIPMENT TYPE E**

523 a REFRIGERATION SYSTEM that employs CO₂ REFRIGERANT (R744) in both a sub-critical and
524 transcritical system.

525 **3.135 HEAT TRANSFER MEDIUM**

526 a fluid used to transfer heat around a system which does not go through a phase change while
527 it is heated or cooled.
528

529 **3.136 STIRLING REFRIGERATION SYSTEMS**

530 a hermetic refrigeration system based on the Stirling gas cycle in which the refrigerant is at all
531 times in the gas or vapor phase. The STIRLING REGERATION SYSTEM may include a
532 thermosiphon containing a different refrigerant in a saturated condition.

533
534
535

536 **4 Tests**

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

538 **4.3.1 Environmental conditions**

539 *Addition:*

540 *Add the following text after item d):*

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

545 aa) an ambient temperature of 40 °C;

546 bb) a relative humidity not exceeding the limits of 1.4.1 d).

547 If the equipment is RATED by the manufacturer to operate in extended environmental conditions
548 as defined by 1.4.2 or a more restricted environment condition for temperature and humidity,
549 then these conditions will define the settings for 4.3.1 aa) or 4.3.1 bb).

550 When the REFRIGERATING SYSTEM is water cooled, the temperature of the water supply shall be
551 the maximum as specified by the manufacturer (see 5.4.3) with the worst case water pressure
552 as specified by the manufacturer.

553 If a restricted environment condition in accordance with 1.4.1, note 2, is employed then the test
554 of 4.4.2.102 applies.

555 **4.3.2 State of equipment**

556 **4.3 Reference test conditions**

557 **4.3.2.1 General**

558 *Addition:*

559 *Add the following text after the first paragraph:*

560 When measuring temperatures, pressures and current draws of equipment incorporating a
561 REFRIGERATING SYSTEM the tests shall be started from a SOAKED TEMPERATURE CONDITION when
562 all pressures have fully equalized. Tests at the extremes of the input voltage ($\pm 10\%$) shall start
563 under these voltage conditions and achieve a stable state but need not start from a SOAKED
564 TEMPERATURE CONDITION. Safety protective devices shall not operate during this test.

565 *Addition:*

566 *Add the following new subclause:*

567
568
569

4.3.2.101 REFRIGERATING EQUIPMENT intended to be used with other equipment inside the refrigerated compartment.

REFRIGERATED EQUIPMENT TYPE B OR REFRIGERATED EQUIPMENT TYPE C that, according to the instructions, may be used with other electrical equipment inside a refrigerated storage compartment are evaluated with such equipment in operation as they would be in normal use.

4.4.2 Application of fault conditions

4.4.2.10 Cooling

Replacement:

Replace the text with the following:

For cooling not associated with the cooling of the REFRIGERATING SYSTEM:

- a) air-holes with filters shall be closed;
- b) forced cooling by motor-driven fans shall be stopped;
- c) cooling by circulation of water or other coolant shall be stopped.

For cooling associated with the cooling of the REFRIGERATING SYSTEM:

d) Condenser fan stall test – for an air cooled REFRIGERATING SYSTEM

Each condenser fan shall be stalled one at a time unless a single fault could disable all condenser fans simultaneously, or with the condenser airflow restricted, whichever is the worst case, until maximum stabilized pressure is attained or until representative maximum temperatures are attained under cycling load. The temperatures and pressures shall be monitored at short intervals throughout the test for the pressures to ensure that peak pressures are captured. This test is conducted at an ambient temperature of $25\text{ °C} \pm 3\text{ °C}$.

For STIRLING REFRIGERATION SYSTEMS, the gas pressure shall be monitored by a pressure gauge on the motor enclosure during the condenser fan stall test to determine maximum pressures. The maximum measured pressure shall not exceed 1/3 of the ultimate strength of the subject component as per the test of 11.7.102.

e) Condenser water failure test – for a water cooled REFRIGERATING SYSTEM

The REFRIGERATING SYSTEM shall be operated with the condensing water shut off, or with the condensing water restricted whichever is the worst case, until maximum stabilized temperatures are attained or until representative maximum temperatures are attained under cycling load. The temperatures and pressures shall be monitored at short intervals throughout the test for the pressures to ensure that peak pressures are captured. This test is conducted at an ambient temperature of $25\text{ °C} \pm 3\text{ °C}$.

If a manual reset HPCO is relied upon to limit the peak pressure during tests d) or e), then it shall be reset manually within 6 s of operation for 10 cycles.

If an automatic reset HPCO is relied upon to limit the peak pressure during tests d) or e), then it shall be permitted to cycle automatically until it can be demonstrated that peak temperatures and pressures have been achieved.

If it can be demonstrated that an HPCO will operate during tests d) or e), the manufacturer can elect to waive this test, but will set the PS for the high and low side of the MOTOR-COMPRESSOR to the RATING of the HPCO.

For equipment with both air-cooled and water-cooled condensers, only one can be faulted at a time unless the customer is permitted to run either the air-cooled or water-cooled condenser (the design incorporates a redundant cooling option for the condenser).

For a cascade REFRIGERATING SYSTEM, if a heat exchanger from the first stage system acts as a condenser to the second stage system, then the manufacturer can elect to run each condenser

stage individually under the tests of d) or e) accordingly. In this case, disabling the first stage system is considered to simulate the second stage running under a test condition of d) or e).

Addition:

Add the following new subclauses:

4.4.2.101 Uncontrolled cooling

Temperature controllers shall be overridden to produce uncontrolled cooling. This applies regardless of whether the controller controls the temperature of the equipment, HEAT TRANSFER MEDIUM or material being processed.

4.4.2.102 ABNORMAL OPERATION to simulate the failure of the controlled environment

For REFRIGERATING EQUIPMENT intended to operate in a restricted environment and tested in accordance with 4.3.1 this additional test of ABNORMAL OPERATION shall apply to simulate the failure of the controlled environment in the installation.

Having determined the worst case test condition for the temperature and pressure tests under 10.4.1 the equipment is run under these conditions until a steady state has been achieved. The test environment is then increased to the limits from 1.4.1 for normal environmental conditions (40 °C, up to 50 % RH) and the equipment is allowed to stabilize, and the maximum temperatures and pressures are recorded. The operation of protective devices is permitted during this test. If steady state conditions are not possible due to the operation of protective devices, then the maximum values recorded for this test shall be either:

- the maximum temperatures and pressures at the point of operation of non-resettable or manually resettable devices. The manually resettable device does not need to be reset during this test; or
- the maximum temperatures and pressures achieved after the cycling of auto-resetting protective devices. Cycling shall continue until it is clear that successive cycles will not develop higher maximum values.

4.4.3.1 General

Addition:

Add the following paragraph after the first paragraph:

Owing to the time it can take to achieve stable conditions for a REFRIGERATING SYSTEM, the duration of single fault tests can be longer than 4 h unless it is clear that stable conditions have been maintained for at least 1 h.

5 Marking and documentation

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

5.1.2 Identification

Addition:

653 *Add the following new items after the note following item b):*

654 aa) the total mass of REFRIGERANT for each separate REFRIGERANT circuit;

655 bb) for a single component REFRIGERANT, at least one of the following:

656 – the chemical name,

657 – the chemical formula,

658 – the REFRIGERANT number,

659 cc) for a blended REFRIGERANT, at least one of the following:

660 – the chemical name and nominal proportion of each of its components,

661 – the chemical formula and nominal proportion of each of its components,

662 – the REFRIGERANT number and nominal proportion of each of its components,

663 – the REFRIGERANT number of the REFRIGERANT blend,

664 NOTE 101 REFRIGERANT numbers are quoted in accordance with ISO 817 or other REFRIGERANT classification
665 standard, for example ANSI/ASHRAE 34.

666 dd) PS under NORMAL OR SINGLE FAULT CONDITION, for the high- and low-pressure sides for
667 each REFRIGERANT stage.

668 NOTE 102 The collation of the test results that define PS is detailed in 11.7.101.

669 ee) For REFRIGERATION EQUIPMENT TYPE C shall be marked with symbol 105 (table 1)

670 ff) REFRIGERATION EQUIPMENT TYPE E shall be marked with the substance of the following:

671 WARNING: The system contains refrigerant under high pressure. Do not tamper with the
672 system. It must be serviced by suitably QUALIFIED PERSONS only.

673 gg) REFRIGERATION EQUIPMENT TYPE E shall be marked with symbol 104 (table 1)

674 hh) Global Warming Potential (GWP) given as CO₂ Equivalent in tonnes.

675 **5.1.3 MAINS supply**

676 *Replacement:*

677 *Replace the conformity statement as follows:*

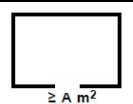
678 *Conformity is checked by inspection and by measurement of the power or input current to check*
679 *that the requirements of 5.1.3 c) have been met. The measurement is made with the equipment*
680 *in the condition of maximum power consumption, but to exclude any initial inrush current, it is*
681 *not made until the current has stabilized (usually after 1 min). Transients are ignored. For*
682 *REFRIGERATING EQUIPMENT, the impact of extreme ambient temperatures and the interaction of*
683 *any defrost mode need to be evaluated in determining the condition of maximum power*
684 *consumption.*

685 *Addition:*

686 *Add the following new symbols to Table 1:*

687

Table 1 – Symbols

Number	Symbol	Reference	Description
101		ISO 7010-W010 (2011-05)	Warning; low temperature/freezing conditions, frostbite HAZARD (MOD)
102		ISO 7010-W021 (2011-05)	Warning; flammable material
103		ISO 7010-W024 (2011-05)	Warning; crushing of hands
104		ISO 7000-1701 (2004-01)	High pressure system
105		IEC 60417-6415 (2019-03)	Minimum room floor area

688

5.2 Warning markings*Replacement:**Replace item a) by the following:*

- a) the perpendicular height of the triangle for all warning symbols shall be at least 15 mm. The height of text shall be at least 1,8 mm, depending on the size of the equipment, the legibility during NORMAL USE and the space available for the symbol. Symbols and text shall have clear contrast in colour with the background.

*Addition:**Add the following new paragraph before the conformity statement:*

Warning markings or symbols for particular HAZARDS, which exist or develop only when performing installation or maintenance of the equipment, shall be marked and visible only when executing this particular maintenance. For example, the marking of the type of FLAMMABLE REFRIGERANT and of the flammable insulation blowing gas, shall be visible when gaining access to the MOTOR-COMPRESSORS, and, in the case of equipment with a remote REFRIGERANT CONDENSING UNIT, the pipe connections. Symbol 102 of Table 1 shall be placed on the nameplate of the equipment near the declaration of the REFRIGERANT type and charge information. It shall be visible after installation of the REFRIGERATING EQUIPMENT.

For REFRIGERATION EQUIPMENT TYPE E, the equipment shall be marked with the substance of the following:

WARNING: The system is high pressure. Do not tamper with the system. It must be serviced by suitably qualified persons only.

Type E refrigeration equipment shall be marked with symbol 104 of Table 1

Type E refrigeration equipment with a remote refrigerant unit shall be marked with the design pressure, unless the appliance incorporates a pressure relief device pre-fitted to the high-pressure side of the motor-compressor.