

BSI Standards Publication

Safety requirements for electrical equipment for measurement, control, and laboratory use

Part 2-011: Particular requirements for refrigerating equipment

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Full document details: BS EN IEC 61010-2-011:2021+A11:2021

National foreword

This British Standard is the UK implementation of EN IEC 61010-2-011:2021+A11:2021. It is derived from IEC 61010-2-011:2019. It supersedes BS EN 61010-2-011:2017, which will be withdrawn on 19 November 2024.

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

The UK participation in its preparation was entrusted to Technical Committee EPL/66, Safety of measuring, control and laboratory equipment.

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

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

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

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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)

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

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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).

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

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

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European foreword to amendment A11

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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For relationship with EU Directive(s) / Regulation(s), see informative Annex ZZ, which is an integral part of this document.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Annex ZA of EN 61010-1:2010/A1:2019 is applicable with the following additions:

Publication	Year	Title	EN/HD	Year
IEC 60079-15	2010	Explosive atmospheres - Part 15: Equipment protection by type of protection “n”	EN 60079-15	2010
IEC 60335-2-34 + AMD1 + AMD2	2012 2015 2017	Household and similar electrical appliances - Safety - Part 2-34: Particular requirements for motor-compressors	EN 60335-2-34 + AMD1 + AMD2	2013 2015 2016
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	2020
		Pumps and pump units for liquids - Common safety requirements	EN 809 +A1	1998 2009
		Pressure gauges - Part 1: Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing	EN 837-1	1996
		Pressure gauges - Part 2: Selection and installation recommendations for pressure gauges	EN 837-2	1997
		Pressure gauges - Part 3: Diaphragm and capsule pressure gauges - Dimensions, metrology, requirements and testing	EN 837-3	1996
		Refrigerating systems and heat pumps - Flexible pipe elements, vibration isolators, expansion joints and non-metallic tubes - Requirements, design and installation	EN 1736	2008
		Non-destructive testing - Leak testing - Criteria for method and technique selection	EN 1779 +A1	1999 2003
		Refrigerating systems and heat pumps - Liquid level indicating devices - Requirements, testing and marking	EN 12178	2016
		Refrigerating systems and heat pumps - Safety switching devices for limiting the pressure - Requirements and tests	EN 12263	1998

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Publication	Year	Title	EN/HD	Year
IEC 60079-15	2010	Explosive atmospheres - Part 15: Equipment protection by type of protection “n”	EN 60079-15	2010
IEC 60335-2-34	2012	Household and similar electrical appliances - Safety - Part 2-34: Particular requirements for motor-compressors	EN 60335-2-34	2013
+ AMD1	2015		+ AMD1	2015
+ AMD2	2017		+ AMD2	2016
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	2020
		Refrigerating systems and heat pumps - Valves - Requirements, testing and marking	EN 12284	2003
		Refrigerating systems and heat pumps - Safety and environmental requirements - Positive displacement refrigerant compressors	EN 12693	2008
		Refrigerating systems and heat pumps - Pressure relief devices and their associated piping - Methods for calculation	EN 13136	2013
			+A1	2018
		Unfired pressure vessels - Part 1: General	EN 13445-1	2014
			+A1	2014
			+A2	2018
		Unfired pressure vessels - Part 2: Materials	EN 13445-2	2014
			+A1	2016
			+A2	2018
			+A3	2018
		Unfired pressure vessels - Part 3: Design	EN 13445-3	2014
			+A1	2015
			+A2	2016
			+A3	2017
			+A4	2018
			+A4	2018
			+A6	2019
			+A7	2019
			+A8	2019
		Unfired pressure vessels - Part 4: Fabrication	EN 13445-4	2014
			+A1	2016
		Unfired pressure vessels - Part 5: Inspection and testing	EN 13445-5	2014
			+A1	2018
		Unfired pressure vessels - Part 6: Requirements for the design and fabrication of pressure vessels and pressure parts constructed from spheroidal graphite cast iron	EN 13445-6	2014
			+A1	2015
			+A2	2018
		Unfired pressure vessels - Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys	EN 13445-8	2014
			+A1	2014
		Unfired pressure vessels - Part 10: Additional requirements for pressure vessels of nickel and nickel alloys	EN 13445-10	2015

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Publication	Year	Title	EN/HD	Year
IEC 60079-15	2010	Explosive atmospheres - Part 15: Equipment protection by type of protection “n”	EN 60079-15	2010
IEC 60335-2-34	2012	Household and similar electrical appliances - Safety - Part 2-34: Particular requirements for motor-compressors	EN 60335-2-34	2013
+ AMD1	2015		+ AMD1	2015
+ AMD2	2017		+ AMD2	2016
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	2020
		Metallic industrial piping - Part 1: General	EN 13480-1	2017
			+A1	2019
		Metallic industrial piping - Part 2: Materials	EN 13480-2	2017
			+A1	2018
			+A2	2018
			+A3	2018
			+A7	2018
		Metallic industrial piping - Part 3: Design and calculation	EN 13480-3	2017
			+A1	2021
			+A2	2020
			+A3	2020
		Metallic industrial piping - Part 4: Fabrication and installation	EN 13480-4	2017
		Metallic industrial piping - Part 5: Inspection and testing	EN 13480-5	2017
			+A1	2019
		Metallic industrial piping - Part 6: Additional requirements for buried piping	EN 13480-6	2017
			+A1	2018
		Metallic industrial piping - Part 8: Additional requirements for aluminium and aluminium alloy piping	EN 13480-8	2017
		Pressure equipment for refrigerating systems and heat pumps - Part 1: Vessels - General requirements	EN 14276-1	2006
			+A1	2011
		Pressure equipment for refrigerating systems and heat pumps - Part 2: Piping - General requirements	EN 14276-2	2007
			+A1	2011
		Electric appliances connected to the water mains — Avoidance of back-siphonage and failure of hose-sets	EN 61770	2009
			+A11	2018
IEC 60204-1		Safety of machinery - Electrical equipment of machines - Part 1: General requirements	EN 60204-1	2018
ISO 4126-1		Safety devices for protection against excessive pressure - Part 1: Safety valves	EN ISO 4126-1	2013
			+A1	2016
ISO 4126-2		Safety devices for protection against excessive pressure - Part 2: Bursting disc safety devices	EN ISO 4126-2	2019

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Annex ZZ
(informative)

Relationship between this European standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European Standard has been prepared under a Commission's standardization request relating to harmonized standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

Table ZZ.1 — Correspondence between this European standard and Annex I of Directive 2014/35/EU [2014 OJ L96]

Safety objectives of Directive 2014/35/EU (Annex I)	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1. General conditions		
1 (a) the essential characteristics, the recognition and observance of which will ensure that electrical equipment will be used safely and in applications for which it was made, shall be marked on the electrical equipment, or, if this is not possible, on an accompanying document	5.1, 5.2 5,3, 5.4 7.3.101, 9.5.101, 10.101	
1 (b) the electrical equipment, together with its component parts, shall be made in such a way as to ensure that it can be safely and properly assembled and connected	5.4, 6.6 6.10, 6.11 11.101 Annex F	
1 (c) the electrical equipment shall be so designed and manufactured as to ensure that protection against the hazards set out in points 2 and 3 is assured, providing that the equipment is used in applications for which it was made and is adequately maintained	5.4 Annex F, 17 (for hazards not covered by Clauses 6–16) See also the details in points 2 and 3	
2. Protection against hazards arising from the electrical equipment Measures of a technical nature shall be laid down in accordance with point 1, in order to ensure that:		
2 (a) persons and domestic animals are adequately protected against the danger of physical injury or other harm which might be caused by direct or indirect contact	4, 6.1 – 6.11, 9.6, 11.6, 14.4 Annex D, Annex F, Annex K	

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Safety objectives of Directive 2014/35/EU (Annex I)	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
2 (b) temperatures, arcs or radiation which would cause a danger, are not produced	4, 4.4.4.2, 6.3.1.b) 2), 6.3.2 b) 2), 9.5, 9.6, 10.1 −10.5, 10.101 11.7.104.7, 11.7.104.8, 12	
2 (c) persons, domestic animals and property are adequately protected against non-electrical dangers caused by the electrical equipment which are revealed by experience	4, 4.4, 7.2- 7.7, 9, 11 (with references to Annex AA and CC), 12.3, 12.5, 12.6, 13.1, 13.2, 16.2, 16.101	
2 (d) the insulation is suitable for foreseeable conditions	4, 6.7, Annex K	
3. Protection against hazards which may be caused by external influences on the electrical equipment Technical measures shall be laid down in accordance with point 1, in order to ensure that the electrical equipment:		
3 (a) meets the expected mechanical requirements in such a way that persons, domestic animals and property are not endangered	4, 7, 8	
3 (b) is resistant to non-mechanical influences in expected environmental conditions, in such a way that persons, domestic animals and property are not endangered	1.4, 4, 6.7.2.2.1, 10.5, 11.6, 14.3, 14.8, 14.101, 15, Annex CC	
3 (c) does not endanger persons, domestic animals and property in foreseeable conditions of overload	4, 9, 14, 16.1	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard."

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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;

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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).

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- 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

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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.

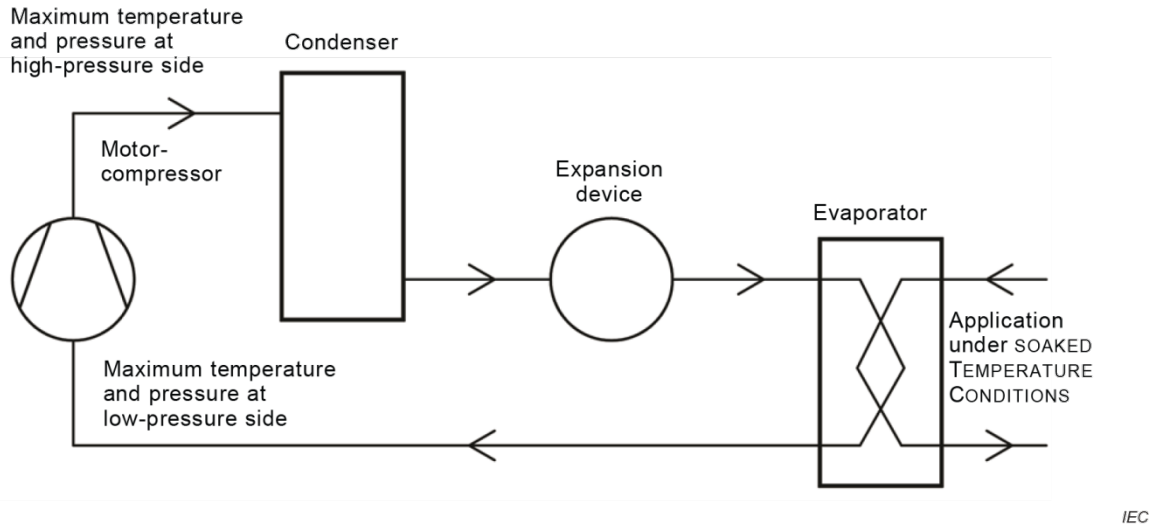


Figure 101 – Schema of a REFRIGERATING SYSTEM incorporating a condenser

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

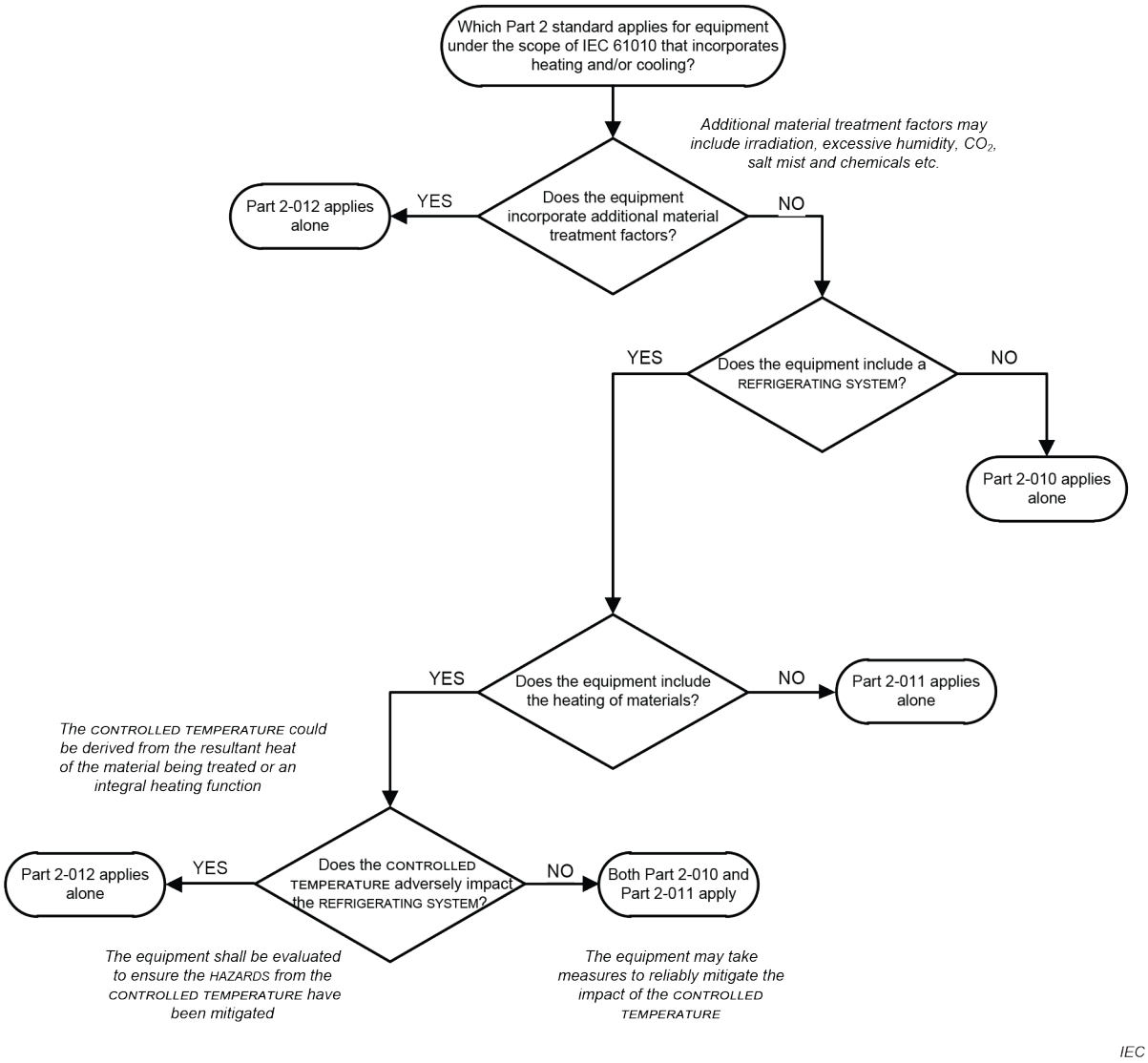


Figure 102 – Flow chart illustrating the selection process

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