

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

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 61010-2-012:2016 sisaldab Euroopa standardi EN 61010-2-012:2016 ingliskeelset teksti.	This Estonian standard EVS-EN 61010-2-012:2016 consists of the English text of the European standard EN 61010-2-012:2016.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 11.11.2016.	Date of Availability of the European standard is 11.11.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:

Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

**Safety requirements for electrical equipment for measurement,
control and laboratory use - Part 2-012: Particular requirements
for climatic and environmental testing and other temperature
conditioning equipment
(IEC 61010-2-012:2016)**

Règles de sécurité pour appareils électriques de mesurage,
de régulation et de laboratoire - Partie 2-012: Exigences
particulières pour les appareils d'essais climatiques et
d'environnement, et autres appareils de conditionnement de
température
(IEC 61010-2-012:2016)

Sicherheitsbestimmungen für elektrische Mess-, Steuer-,
Regel- und Laborgeräte - Teil 2-012: Besondere
Anforderungen an Klima- und Umwelttestgeräte und andere
Temperatur-Konditionierungsgeräte
(IEC 61010-2-012:2016)

This European Standard was approved by CENELEC on 2016-08-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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

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



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 66/590/FDIS, future edition 1 of IEC 61010-2-012, 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 61010-2-012:2016.

The following dates are fixed:

- latest date by which the document has to be (dop) 2017-05-16
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2019-08-19
standards conflicting with the
document have to be withdrawn

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

Endorsement notice

The text of the International Standard IEC 61010-2-012:2016 was approved by CENELEC as a European Standard without any modification.

The Bibliography of EN 61010-1:2010 is applicable except as follows:

In the bibliography of EN 61010-1:2010, the following notes have to be **added** for the standards indicated:

IEC 60068-1:1988+A1:1992	NOTE	Harmonized as EN 60068-1:1994 ¹⁾ (not modified).
IEC 60068-2-1:2007	NOTE	Harmonized as EN 60068-2-1:2007 (not modified).
IEC 60068-2-2:2007	NOTE	Harmonized as EN 60068-2-2:2007 (not modified).
IEC 60068-2-5:2010	NOTE	Harmonized as EN 60068-2-5:2011 (not modified).
IEC 60068-2-10:2005	NOTE	Harmonized as EN 60068-2-10:2005 (not modified).
IEC 60068-2-11:1981	NOTE	Harmonized as EN 60068-2-11:1999 (not modified).
IEC 60068-2-13:1983	NOTE	Harmonized as EN 60068-2-13:1999 (not modified).
IEC 60068-2-14:2009	NOTE	Harmonized as EN 60068-2-14:2009 (not modified).
IEC 60068-2-30:2005	NOTE	Harmonized as EN 60068-2-30:2005 (not modified).
IEC 60068-2-38:2009	NOTE	Harmonized as EN 60068-2-38:2009 (not modified).
IEC 60068-2-39:1976	NOTE	Harmonized as EN 60068-2-39:1999 ²⁾ (not modified).
IEC 60068-2-40:1976+A1:1983	NOTE	Harmonized as EN 60068-2-40:1999 (not modified).
IEC 60068-2-41:1976+A1:1983	NOTE	Harmonized as EN 60068-2-41:1999 (not modified).
IEC 60068-2-53:2010	NOTE	Harmonized as EN 60068-2-53:2010 (not modified).
IEC 60068-2-66:1994	NOTE	Harmonized as EN 60068-2-66:1994 (not modified).
IEC 60068-2-67:1995	NOTE	Harmonized as EN 60068-2-67:1996 (not modified).
IEC 60068-2-78:2001	NOTE	Harmonized as EN 60068-2-78:2001 ³⁾ (not modified).
IEC 60068-3-5	NOTE	Harmonized as EN 60068-3-5.
IEC 60335-2-41	NOTE	Harmonized as EN 60335-2-41.

¹⁾ Superseded by EN 60068-1:2014 (IEC 60068-1:2013).

²⁾ Superseded by EN 60068-2-39:2016 (IEC 60068-2-39:2015).

³⁾ Superseded by EN 60068-2-78:2013 (IEC 60068-2-78:2012).

IEC 60335-2-73:2002	NOTE	Harmonized as EN 60335-2-73:2003 (modified).
IEC 60335-2-73:2002/A1:2006	NOTE	Harmonized as EN 60335-2-73:2003/A1:2006 (not modified).
IEC 60335-2-74:2002	NOTE	Harmonized as EN 60335-2-74:2003 (not modified).
IEC 60335-2-74:2002/A1:2006	NOTE	Harmonized as EN 60335-2-74:2003/A1:2006 (not modified).
IEC 60335-2-89	NOTE	Harmonized as EN 60335-2-89.
IEC 60335-2-98:2002	NOTE	Harmonized as EN 60335-2-98:2003 (not modified).
IEC 60335-2-98:2002/A1:2004	NOTE	Harmonized as EN 60335-2-98:2003/A1:2005 (not modified).
IEC 61010-2-010	NOTE	Harmonized as EN 61010-2-010.
IEC 61770:2008	NOTE	Harmonized as EN 61770:2009 (not modified).
ISO 4126-1	NOTE	Harmonized as EN ISO 4126-1.
ISO 9227	NOTE	Harmonized as EN ISO 9227.

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 When 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 is applicable, except as follows:

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
Additions:				
IEC 60079-15	2010	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"	EN 60079-15	2010
IEC 60079-20-1	-	Explosive atmospheres - Part 20-1: Material characteristics for gas and vapour classification - Test methods and data	EN 60079-20-1	-
IEC 60335-2-24	2010	Household and similar electrical appliances - Safety - Part 2-24: Particular requirements for refrigerating appliances, ice-cream appliances and ice makers	EN 60335-2-24	2010
+A1 (mod)	2012		+A1	2016
IEC 60335-2-34	2012	Household and similar electrical appliances - Safety - Part 2-34: Particular requirements for motor- compressors	EN 60335-2-34	2013
+A1	2015		+A1	2015
IEC 62471	-	Photobiological safety of lamps and lamp systems	EN 62471	-
IEC/TR 62471-2	-	Photobiological safety of lamps and lamp systems - Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety	-	-
ISO 7010	2011	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	2012

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope and object.....	9
2 Normative references.....	10
3 Terms and definitions	10
4 Tests.....	16
5 Marking and documentation	22
6 Protection against electric shock.....	32
7 Protection against mechanical HAZARDS.....	33
8 Resistance to mechanical stresses.....	35
9 Protection against the spread of fire.....	36
10 Equipment temperature limits and resistance to heat.....	37
11 Protection against HAZARDS from fluids.....	41
12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure	56
13 Protection against liberated gases and substances, explosion and implosion	57
14 Components and subassemblies.....	59
15 Protection by interlocks.....	61
16 HAZARDS resulting from application.....	63
17 RISK assessment	64
Annex.....	65
Annex K (normative) Insulation requirements not covered by 6.7	65
Annex L (informative) Index of defined terms.....	66
Annex AA (informative) Useful symbols	68
Annex BB (informative) Protection for people who are inside WALK-IN EQUIPMENT	71
Annex CC (informative) Safety requirements for components and piping	73
Annex DD (informative) Equipment containing FLAMMABLE REFRIGERANTS information and marking requirements.....	79
Annex EE (normative) Non-sparking “n” electrical device	82
Bibliography	83
Figure 101 – Schema of a REFRIGERATING SYSTEM incorporating a CONDENSER.....	7
Figure 102 – Flow chart illustrating the selection process	8
Figure 103 –Scratching TOOL tip details	51
Table 1 – Symbols.....	25
Table 101 – Time-temperature conditions.....	29
Table 102 – Maximum temperatures for MOTOR-COMPRESSORS	39
Table 103 – Minimum temperature for determination of SATURATED-VAPOUR PRESSURE of REFRIGERANT	46
Table 104 – REFRIGERANT flammability parameters	54
Table 105 – Lamp or lamp systems considered photobiologically safe.....	57

Table 106 – Lamp or lamp systems considered photobiologically safe under certain conditions	57
Table AA.1 – Useful symbols	68
Table CC.1 – Parameters of pressure vessels according to EN 14276-1.....	74
Table CC.2 – Parameters of piping according to EN 14276-2	75
Table CC.3 – Components and piping requirements	76
Table CC.4 – Minimum wall thickness for copper and steel tubing.....	78

INTRODUCTION

This standard, in conjunction with Part 2-010 and Part 2-011, addresses the specific HAZARDS associated with the heating and cooling of materials by equipment and are segregated 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 cooling system yield additional or more severe HAZARDS for the two systems than if treated separately. It also addresses the HAZARDS associated with the treatment of materials by other factors like irradiation, excessive humidity, CO ₂ and MECHANICAL MOVEMENT etc.

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

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

What HAZARDS are applicable for a REFRIGERATING SYSTEM?

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

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

OPERATOR is exposed to or electrical insulation is degraded. Whether this application temperature is derived from an integral heating function of the device or from the heat dissipated from the material being cooled the impact under worst case conditions should be evaluated.

- The current draw of the equipment should be established when including the worst case running conditions of the REFRIGERATING SYSTEM including any defrost cycles that may apply.

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

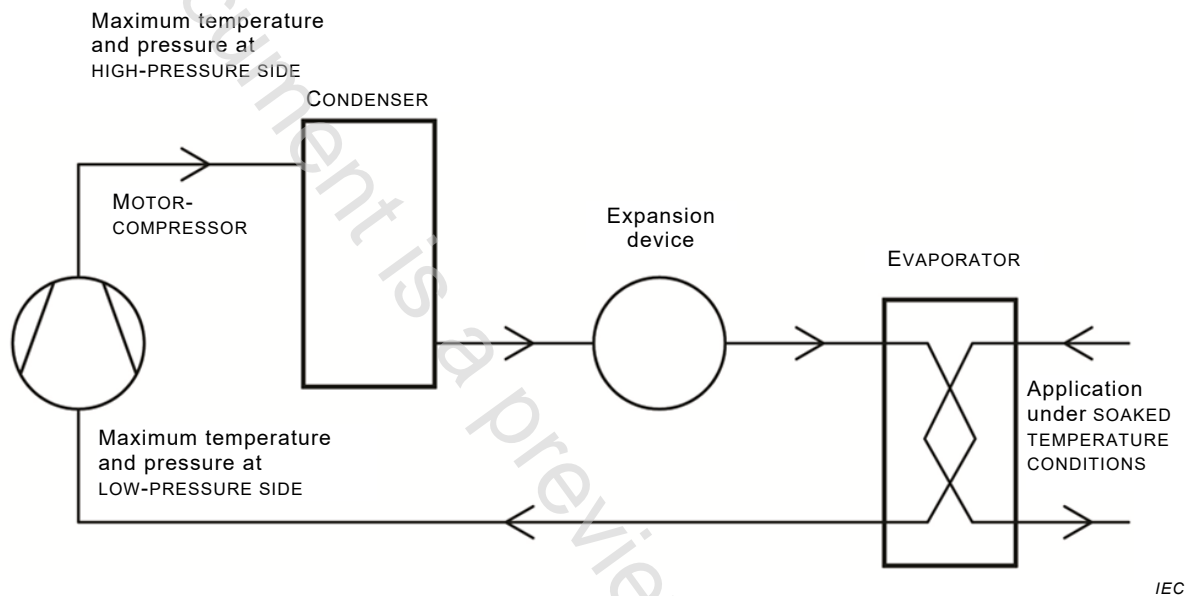
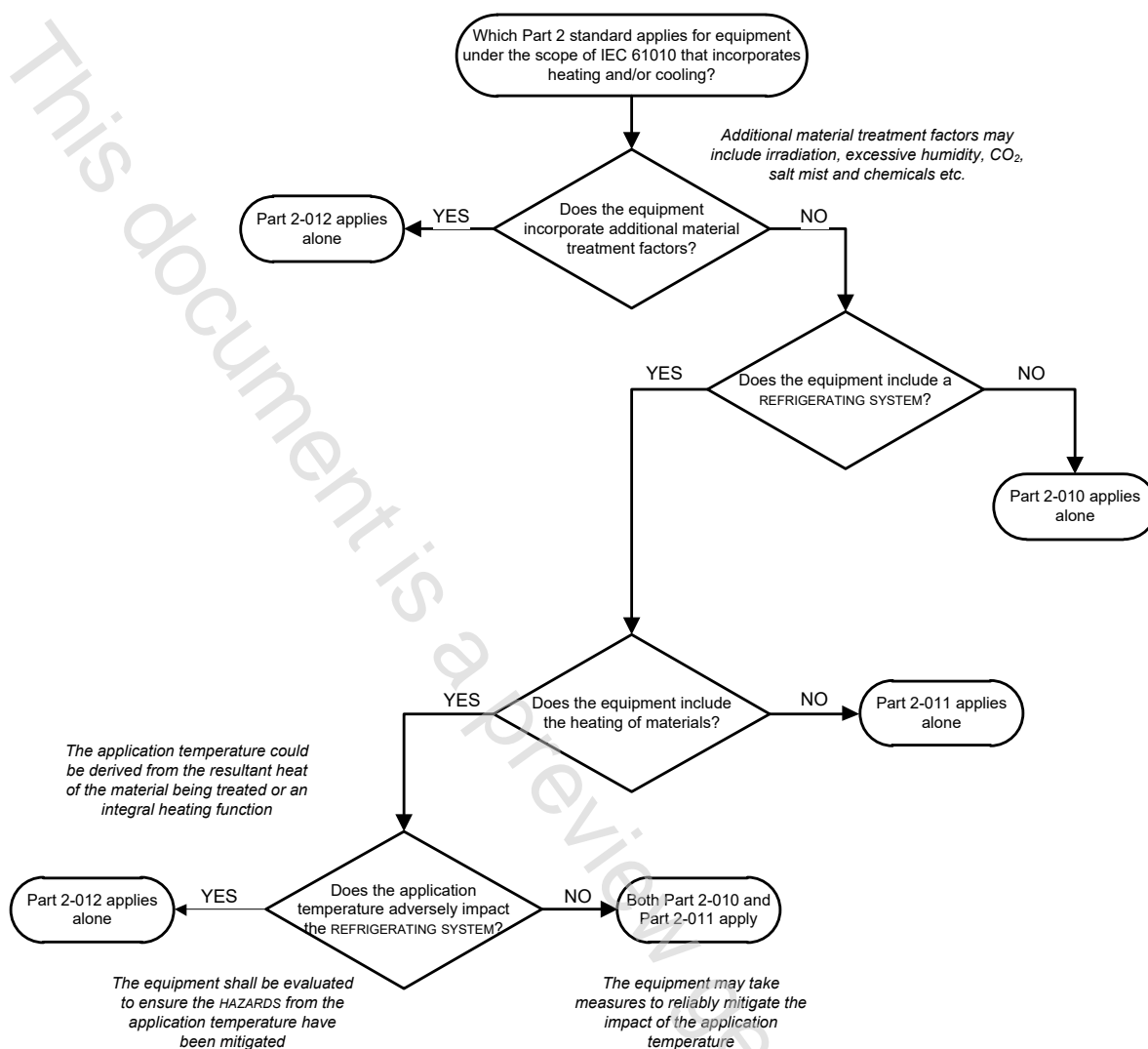


Figure 101 – Schema of a REFRIGERATING SYSTEM incorporating a CONDENSER

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



IEC

Figure 102 – Flow chart illustrating the selection process

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

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

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

Replace the first paragraph by the following:

This group safety publication is primarily intended to be used as a product safety standard for the products mentioned in the scope, but shall also be used by technical committees in the preparation of their publications for products similar to those mentioned in the scope of this standard, in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

This Part 2 of IEC 61010 specifies safety requirements for electrical equipment and their accessories within the categories a) through c), wherever they are intended to be used, whenever that equipment incorporates one or more of the following characteristics:

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

Addition:

Add the following text after the last paragraph:

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

If 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, it should also meet the requirements of those other Part 2 standards. However, when the equipment incorporates only a REFRIGERATING SYSTEM or only a heating function or a combination of the two without introducing additional HAZARDS described in the above dashed paragraphs then the application of IEC 61010-2-011 or IEC 61010-2-010 or both, as applicable, shall be considered instead of this Part 2.