

INTERNATIONAL STANDARD



GROUP SAFETY PUBLICATION

**Safety requirements for electrical equipment for measurement, control and laboratory use –
Part 2-010: Particular requirements for laboratory equipment for the heating of materials**

Document Preview

[IEC 61010-2-010:2019](#)

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

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

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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	2
1 Scope and object.....	9
2 Normative references	10
3 Terms and definitions	10
4 Tests	10
5 Marking and documentation.....	10
6 Protection against electric shock	14
7 Protection against mechanical HAZARDS.....	17
8 Resistance to mechanical stresses	17
9 Protection against the spread of fire	18
10 Equipment temperature limits and resistance to heat.....	19
11 Protection against HAZARDS from fluids and solid foreign objects	20
12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure	21
13 Protection against liberated gases and substances, explosion and implosion	21
14 Components and subassemblies	22
15 Protection by interlocks	23
16 HAZARDS resulting from application	23
17 RISK assessment	23
Annexes	24
Annex K (normative) Insulation requirements not covered by 6.7	25
Bibliography.....	26
Figure 101 – Schema of a refrigerating system incorporating a condenser.....	7
Figure 102 – Flow chart illustrating the selection process	8
Table 1 – Symbols	11
Table 101 – Time-temperature conditions	21

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-010: Particular requirements for laboratory equipment for the heating of materials

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 61010-2-010 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 fourth edition cancels and replaces the third edition published in 2014. 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) alignment with IEC 61010-2-011 and IEC 61010-2-012:
 - new matching Introduction clarifying which standard(s) to use;
 - new 5.4.101 instructions for flammable liquid HEAT TRANSFER MEDIUM;
 - subclause 9.5 on flammable liquids replaced with text from IEC 61010-2-012;
- c) subclause 5.2.101 deleted;
- d) requirements in 10.101 b) and c) clarified.

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

CDV	Report on voting
66/657/CDV	66/678/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 2-010 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 2-010 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for laboratory equipment for the heating of materials*.

Where a particular subclause of Part 1 is not mentioned in this Part 2-010, that subclause applies as far as is reasonable. Where this Part 2-010 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: in roman type;
 - NOTES in small roman type;
 - *conformity and test: in italic type;*

– terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS;

2) subclauses, figures, tables and notes which are additional to those in Part 1 are numbered starting from 101. Additional annexes are lettered starting from AA.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
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INTRODUCTION

This Part 2-010, Part 2-011 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 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 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 maximum temperature of low-pressure side (return temperature) to the motor-compressor. A motor-compressor incorporates a refrigerant cooled motor and it must 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 must accommodate the worst-case pressures whilst providing the correct safety margin for a pressure vessel.
- The maximum temperature of high-pressure side to the condenser. The temperatures of the high-pressure side under most unfavourable conditions may present a temperature HAZARD if the OPERATOR is exposed to them or if the electrical insulation is degraded.
- The maximum pressure of high-pressure side at the outlet to the motor-compressor. The refrigerant components downstream of the motor-compressor up to the expansion device are exposed to this pressure and so the design RATING of these components must accommodate the worst-case pressures whilst providing the appropriate safety margin for a pressure vessel.
- The maximum controlled 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 them or if the electrical insulation is degraded. Whether this controlled temperature is derived from an integral heating function of the device or from the heat dissipated from the material being cooled, the impact under worst-case conditions should be evaluated.

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

The worst-case conditions need to 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.

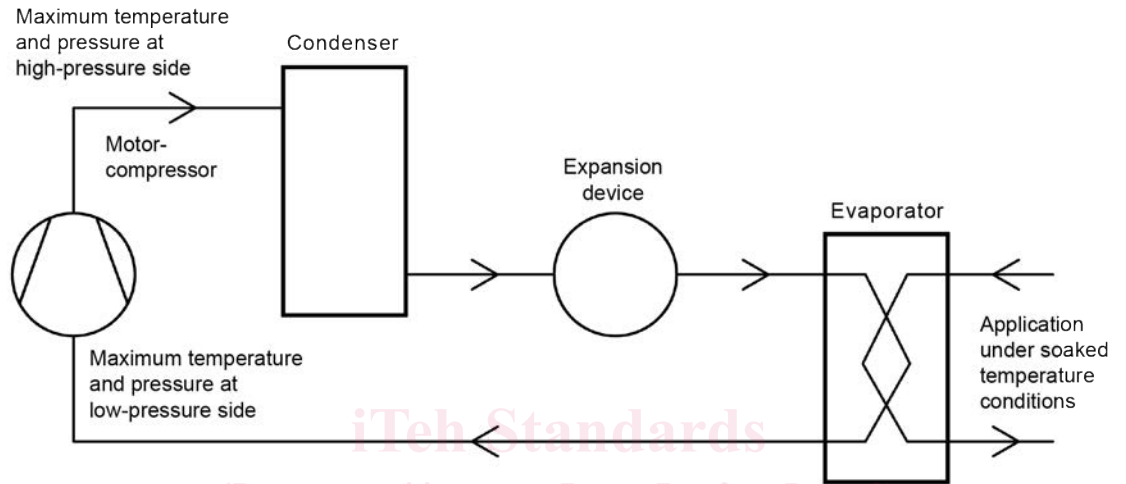
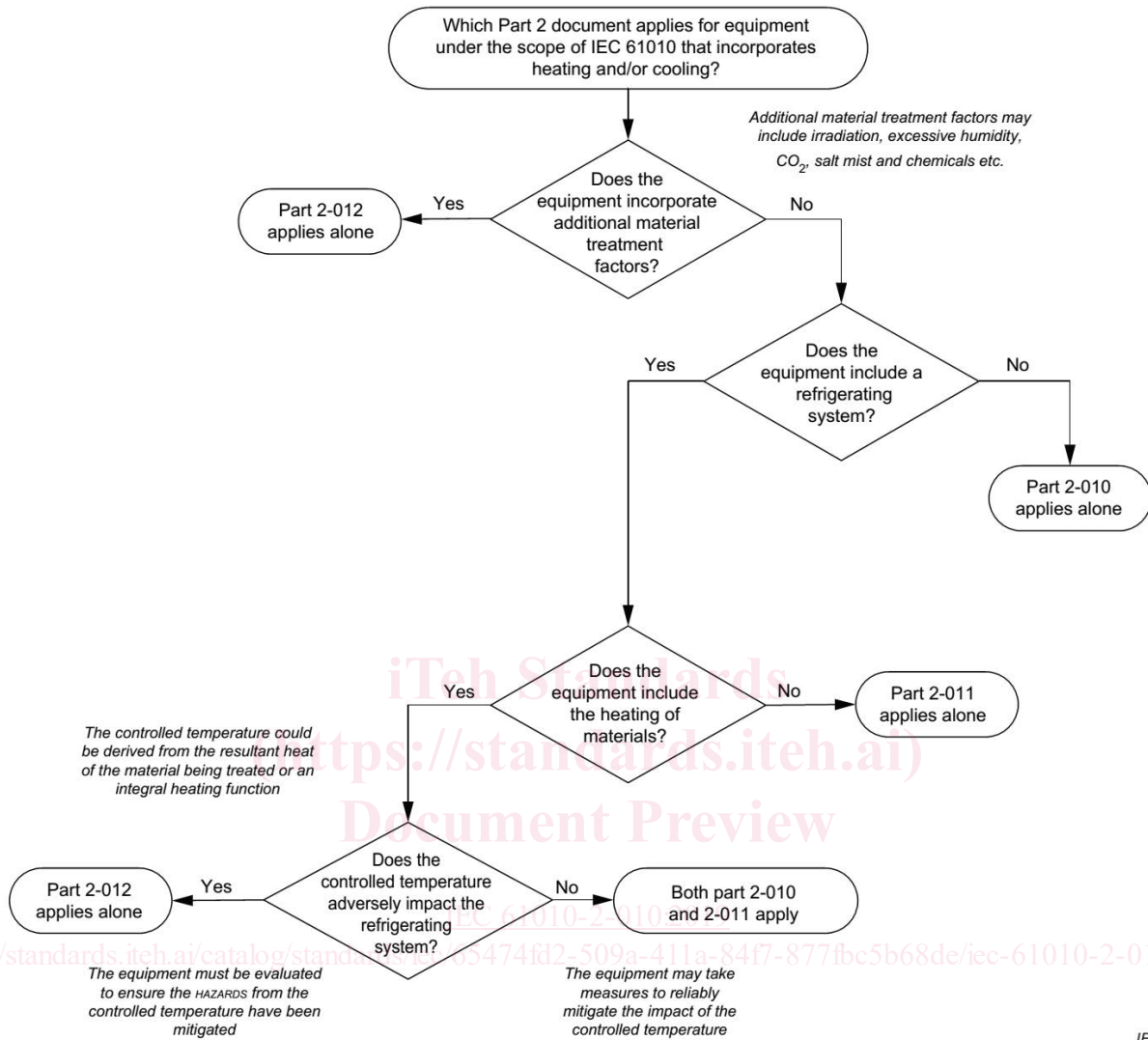


Figure 101 – Schema of a refrigerating system incorporating a condenser

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



IEC

Figure 102 – Flow chart illustrating the selection process

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

Part 2-010: Particular requirements for laboratory equipment for the heating of materials

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

Replace the second paragraph by the following:

This part of IEC 61010 specifies particular safety requirements for ~~electrically powered laboratory equipment for the heating of materials, where~~ whenever the following types a) to c) of electrical equipment and their accessories, wherever they are intended to be used, the heating of materials is one of the functions of the equipment.

~~NOTE 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 will also need to meet the requirements of those other part 2 standards. In particular, if equipment is intended to be used for IVD purposes, it will need to meet the requirements of IEC 61010-2-101.~~

Addition:

Add the following text after item c): [IEC 61010-2-010:2019](https://standards.iec.ch/catalog/standards/iec/65474612-509a-411a-84f7-877fbc5b68de/iec-61010-2-010-2019)

<https://standards.iec.ch/catalog/standards/iec/65474612-509a-411a-84f7-877fbc5b68de/iec-61010-2-010-2019>

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 for in vitro diagnostic (IVD) purposes, the requirements of IEC 61010-2-101 will also 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 2-010.

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

1.1.2 Equipment excluded from scope

Addition:

Add the following items after item j):

- aa) equipment for the heating and ventilation of laboratories;
- bb) sterilizing equipment;
- cc) heating and/or cooling equipment which the OPERATOR is intended to enter, and which is large enough for the OPERATOR to remain inside with the door or doors closed.

2 Normative references

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

Addition:

Add the following reference to the list:

ISO 7010:~~2011~~, *Graphical symbols – Safety colours and safety signs – Registered safety signs (available at <https://www.iso.org/obp>)*

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

3.2 Parts and accessories

Addition:

Add the following new term and definition:

3.2.101

HEAT TRANSFER MEDIUM

medium used to transfer heat to the material being processed

4 Tests

This clause of Part 1 is applicable except as follows:

4.4.2.11 Heating devices

Addition:

Add the following new text after the existing text:

If a HAZARD could be caused by over-filling or under-filling with a liquid HEAT TRANSFER MEDIUM, the equipment shall be tested when it is empty, partially filled, or overfilled, whichever is least favourable. In case of doubt, the test shall be carried out in more than one condition. The HEAT TRANSFER MEDIUM used for the test shall be of a type specified for NORMAL USE.

5 Marking and documentation

This clause of Part 1 is applicable except as follows:

~~5.1~~ Marking

5.1.3 MAINS supply

Addition:


Add the following new text to the end of item c):

If, for periods of 1 min or less after switching on, the actual power or current can be much higher than the marked maximum RATED power or current, the short-term maximum may be marked in brackets after the maximum RATED power or current.

Table 1 – Symbols

Addition:

Add the following new symbol to Table 1:

Number	Symbol	Publication	Description
101	 <p>Background colour – yellow (optional, not green); symbol and outline – black (optional).</p>	ISO 7010-W021:2011-05	Warning; Flammable material

5.1.6 Switches and circuit-breakers

Addition:

Add the following new text after the last paragraph, before the conformity statement:

For ovens and similar equipment, there shall be an indication of the "ON" condition on each side of the equipment which has a door in it or has any other opening intended for loading material.

~~5.2 Warning markings~~

~~Replacement of the first paragraph by the following:~~

~~Warning markings specified in 5.1.5.2 c), 5.2.101, 6.1.2 b), 6.1.2.101 2), 7.3.2 b) 3), 7.4, 10.1, 9.5 c), and 13.2.2 shall meet the following requirements:~~

~~Additional subclause:~~

~~5.2.101 Equipment with high ACCESSIBLE current~~

~~If the ACCESSIBLE current of the equipment exceeds the limit of 6.3.1 b) or 6.3.2 b) for non-permanently connected equipment, but is within the limit for PERMANENTLY CONNECTED EQUIPMENT, there shall be a warning marking requiring permanent connection to the supply source. The marking shall be on or beside the cover of the TERMINALS for connection to the supply source, and the warning shall be repeated in the installation instructions. Symbol 14 of Table 1 is an adequate warning marking, particularly when it may not be known in which country the equipment will be used and, therefore, in which language it would be appropriate to print the warning marking.~~

~~Conformity is checked by inspection.~~

5.4.3 Equipment installation

Replacement:

Replace the text with the following new text:

The documentation shall include installation and specific commissioning instructions (~~examples are listed below~~) and, if necessary for safety, warnings against HAZARDS which

could arise during installation or commissioning or as a result of improper installation or commissioning of the equipment. Such information includes, if applicable:

- a) assembly, location and mounting requirements. If a HAZARD could be caused by hot items falling from the equipment, for example when a door is opened, there shall be a warning that the equipment shall not be mounted on a surface of flammable material;
- b) instructions for protective earthing;
- c) connections to the supply, ~~including the warning and statement which are necessary when permanent connection to the supply source is essential (see 5.2.101)~~, and for equipment in which HAZARDOUS LIVE parts may need to be ACCESSIBLE (see 6.1.2), a statement requiring the fitting of a residual current-operated circuit-breaker;
- d) for PERMANENTLY CONNECTED EQUIPMENT:
 - 1) supply wiring requirements;
 - 2) requirements for any external switch or circuit-breaker (see 6.11.23.1) and external overcurrent protection devices (see 9.6.2), and a recommendation that the switch or circuit-breaker be near the equipment;
- e) ventilation requirements;
- f) requirements and safety characteristics for special external services, for example: maximum and minimum temperatures, pressure, or flow of air or cooling liquid.
- g) the maximum sound level produced by equipment which emits sound, if measurement is required by 12.5.1;
- h) instructions relating to sound level (see 12.5.1);
- i) any requirement for drying-out (see 5.4.3.101);
- j) if the heating of materials could lead to liberation of hazardous substances: installation instructions shall warn of any need for an extraction system, additional temperature-limiting devices relating to safe temperatures for the materials, ~~etc.~~ or other necessary measures (see also Note 2 to 5.4.1).

NOTE An extraction system is a system which removes air from the building, not a recirculating system.

<https://standards.itec.org/standards/iec-61010-2-010-2019>
It is recommended to add a statement in the documentation for the installation that the safety of any system incorporating the equipment is the responsibility of the assembler of the system.

Conformity is checked by inspection.

Addition:

Add the following new subclause:

5.4.3.101 Drying-out

If, after transport or storage in humid conditions, equipment could fail to meet all the safety requirements of this document, the installation instructions shall specify a period of operation to dry out the equipment and restore it to NORMAL CONDITION. The instructions shall include a warning that the equipment cannot be assumed to meet all the safety requirements of this document during the drying-out process.

Conformity is checked by inspection.

5.4.4 Equipment operation

Addition:

Add the following at the end of item g):