# IEC 61010-2-010

Edition 4.0 2019-02
REDLINE VERSION

# INTERNATIONAL STANDARD

colour inside

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**



IEC 61010-2-010:2019-02 RLV(en)

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INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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

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**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

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,
- 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 2-010, 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.

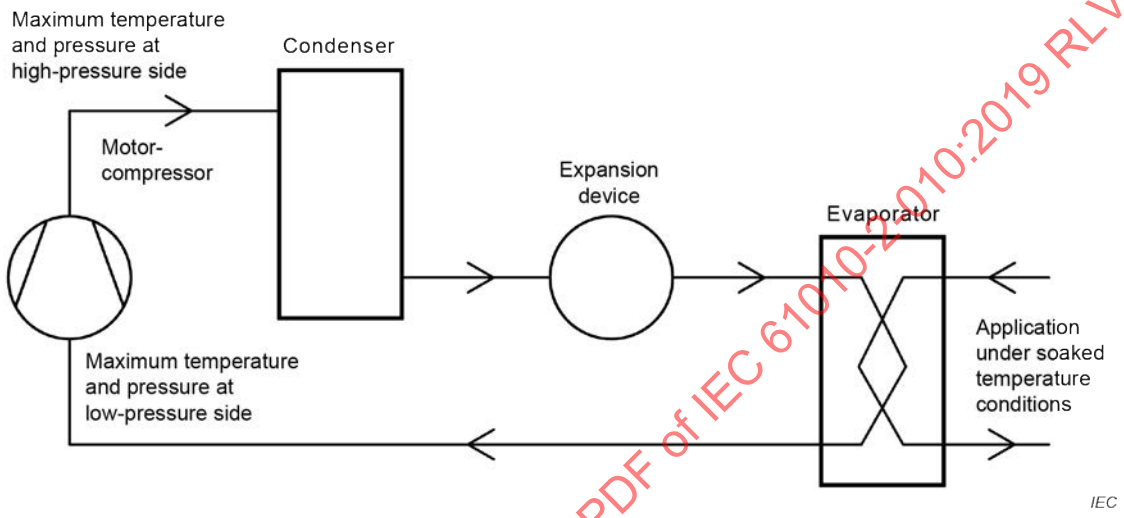


**Figure 101 – Schema of a refrigerating system incorporating a condenser**

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

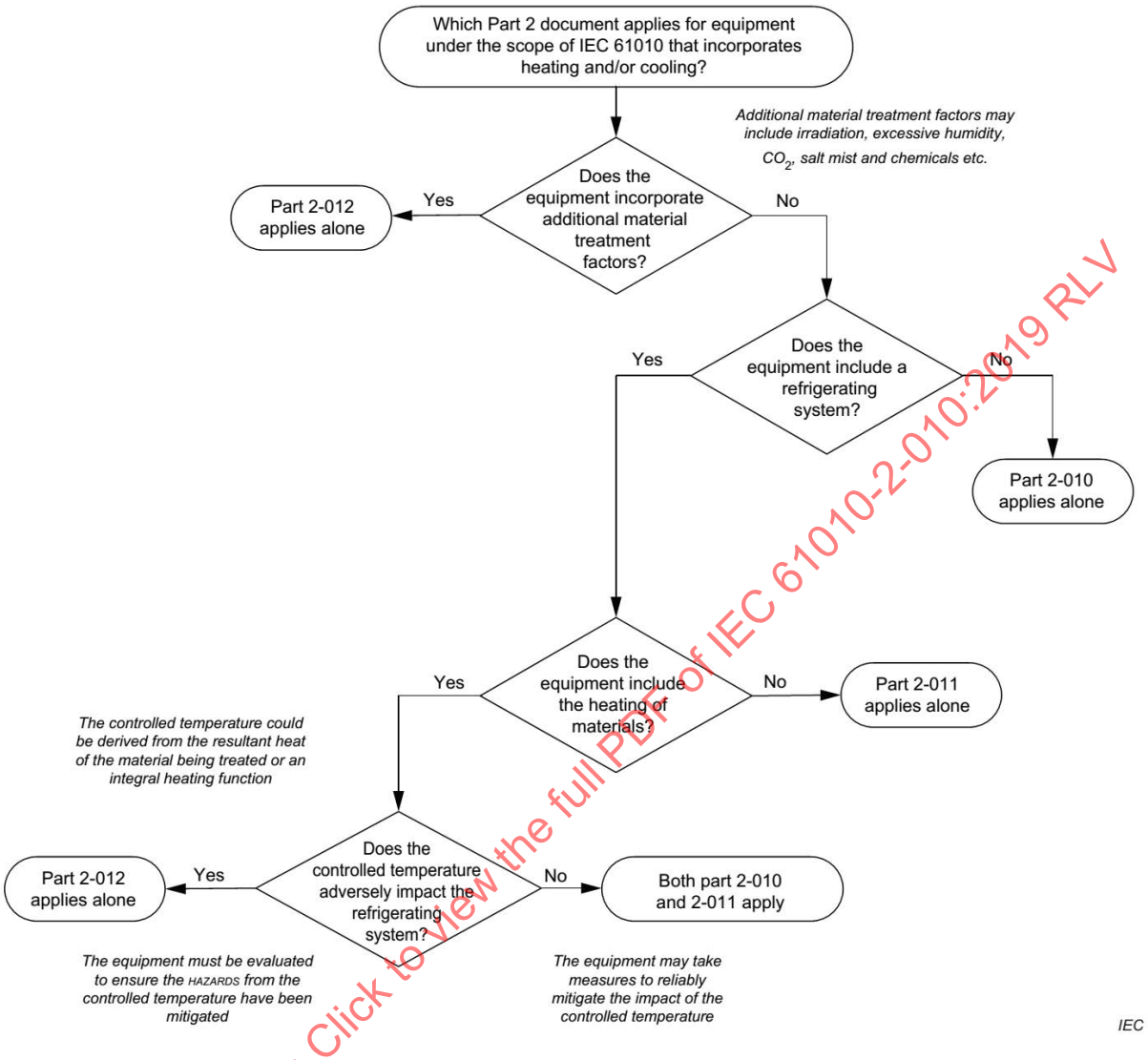


**Figure 102 – Flow chart illustrating the selection process**

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

## Part 2-010: 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 equipmen 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):*

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 |  | Background colour<br>– yellow (optional, not green); symbol and outline<br>– black (optional). | ISO 7010-W021:2011-05 | Warning;<br>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.~~2~~3.1) 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.

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):*

(see 5.4.4.101);

*Add the following after item j):*

aa) specification of additional protection needed by the OPERATOR when HAZARDOUS LIVE parts are permitted to be ACCESSIBLE (see 6.1.2.101);

bb) a warning about any possible HAZARDS of explosion, implosion, or the release of toxic or flammable gases arising from the materials being heated see also 5.4.4 h));

cc) specification of HEAT TRANSFER MEDIA which are suitable for use, for example liquids for use in a heating bath;

dd) specific requirements for ventilation.

*Addition:*

*Add the following new subclause:*

#### 5.4.4.101 Cleaning and decontamination

The instructions shall include recommendations for cleaning and, where necessary, decontamination, together with the recognized generic names of recommended materials for cleaning and decontamination, and an indication of any materials which could be likely to be used but which are incompatible with parts of the equipment or with material contained in it.

The instructions shall also state that the RESPONSIBLE BODY shall ensure that:

a) appropriate decontamination is carried out if hazardous material is spilled onto or into the equipment;

b) no decontamination or cleaning agents are used which could cause a HAZARD as a result of a reaction with parts of the equipment or with material contained in it;

c) the manufacturer or its agent is consulted if there is any doubt about the compatibility of decontamination or cleaning agents with parts of the equipment or with material contained in it.

Manufacturers should be aware of the internationally recognized "Laboratory Biosafety Manual", published by the World Health Organization in Geneva, which gives information on decontaminants, their use, dilutions, properties and potential applications. There are also national guidelines which cover these areas.

Cleaning and decontamination may be necessary as a safeguard when laboratory heating equipment and any accessories are maintained, repaired, or transferred. Manufacturers should provide a ~~format~~ document for the RESPONSIBLE BODY to certify that such treatment has been carried out.

*Conformity is checked by inspection.*

#### 5.4.5 Equipment maintenance and service

*Addition:*

*Add the following new text:*

If a high-temperature cable or other special cable is used for the MAINS supply cord, the instructions shall state that it is to be replaced by an equivalent cable only.

If practicable, instructions shall specify methods for the RESPONSIBLE BODY to check the effective operation of devices or systems for overtemperature protection or liquid-level

protection which are necessary for safety, and shall state how often the checks need to be made.

*Addition:*

*Add the following new subclause:*

#### 5.4.101 Additional instructions for equipment intended for use with flammable liquid HEAT TRANSFER MEDIUM

For baths, circulators and shaking baths intended for use with flammable liquid HEAT TRANSFER MEDIUM, the instructions shall include sufficient information to ensure the safe handling, servicing and disposal of the equipment.

The instructions shall include the substance of the following warnings as necessary:

– WARNING: Ensure all ventilation openings are not obstructed;

– WARNING: No smoking! No flame! Do not use electrical parts which can produce spark when operating around the equipment and the application system;

– WARNING: Drain and recover the liquid when the equipment idles, if the liquid heat transfer medium is used with an open bath tank and if it is highly volatile at ambient temperature.

A label carrying symbol 101 shall be provided with equipment which can be used with a flammable liquid HEAT TRANSFER MEDIUM along with instructions for the RESPONSIBLE BODY to affix the label visibly on the equipment if it is to be used with a flammable liquid HEAT TRANSFER MEDIUM.

The instructions shall be provided with detailed information for procedures to reduce the RISK with regard to the use of a flammable liquid HEAT TRANSFER MEDIUM, including how the adjustable temperature-limiting device is adequately set so that the surface temperature in contact with the liquid is below the limit of 9.5 a).

*Conformity is checked by inspection.*

## 6 Protection against electric shock

This clause of Part 1 is applicable except as follows:

### 6.1 General

#### 6.1.1 Requirements

*Addition:*

*Add the following new text after the conformity statement:*

*If a drying-out process is specified (see 6.7.2.2.101), this is carried out in accordance with the ~~operator manual~~ installation instructions (see 5.4.3.101) before making the measurements of 6.3. Drying-out is followed by a rest period of 2 h, with the equipment de-energized, before the measurements are taken.*

*Measurements are made with the equipment at ambient temperature. If there is doubt whether the permissible limits could be exceeded at the maximum ~~operating~~ controlled temperature, the relevant measurements are repeated at the maximum ~~operating~~ controlled temperature and the higher values are used.*

*Addition:*

*Add the following new subclause:*

### 6.1.2.101 Exceptions for ovens and furnaces

HAZARDOUS LIVE parts are permitted to be ACCESSIBLE if efficient operation of an oven or furnace would otherwise be impossible for one or more of the following reasons:

a) continuous access is needed (for example, conveyor ovens and tube furnaces);

b) ports are needed for observation or for the insertion of probes or sensors;

c) it is necessary to maintain a steady ~~operating~~ controlled temperature to prevent thermal shock to materials being treated, and therefore ACCESSIBLE heaters, etc., have to remain energized even when a door is opened.

In the above cases, ACCESSIBLE internal parts are permitted to be HAZARDOUS LIVE only if all ~~those of~~ the following conditions ~~that are~~ as applicable are met:

1) the HAZARDOUS LIVE parts are supplied from a circuit protected by a residual current operated circuit-breaker which interrupts the supply at a differential current of 30 mA or less, or the installation instructions specify that the equipment shall be connected to a supply source which incorporates such a circuit-breaker;

2) warning markings give notice of the potential HAZARD and a lamp indicates the presence of the HAZARD (symbol 12 of Table 1);

3) conveyor belts, muffles, etc., which are conductive are connected to the PROTECTIVE CONDUCTOR TERMINAL;

4) the instructions for use state that it is necessary for the OPERATOR to be protected against electric shock, including electric shock resulting from the possibility of simultaneous contact with HAZARDOUS LIVE parts and parts connected to the PROTECTIVE CONDUCTOR TERMINAL, and indicate the means of protection. These protective means may include one or more of the following:

   i) insulated TOOLS;

   ii) insulating clothing;

   iii) OPERATOR standing on an insulating surface;

   iv) shrouding of parts connected to the PROTECTIVE CONDUCTOR TERMINAL with which the OPERATOR might come into contact in NORMAL USE.

*Conformity is checked by inspection.*

### 6.3.1 ~~b) 1) Current~~ Levels in NORMAL CONDITION

*Addition:*

*Add the following new text to the end of item b) 1):*

Levels for PERMANENTLY CONNECTED EQUIPMENT are 1,5 times ~~the above~~ these values.

### 6.3.2 ~~b) 1) Current~~ Levels in SINGLE FAULT CONDITION

*Addition:*

*Add the following new text to the end of item b) 1):*

Levels for PERMANENTLY CONNECTED EQUIPMENT are 1,5 times ~~the above~~ these values.

#### 6.7.2.2 Solid insulation

*Addition:*

*Add the following new subclause:*

#### 6.7.2.2.101 Drying-out time

If the performance requirements of the equipment cannot be achieved without the use of hygroscopic heater insulation it is permissible for equipment to require a period of operation to dry out the insulation before meeting the requirements of 6.7.2.2, 6.3.1 and 6.8.2 ~~providing~~ provided the ~~operator~~ RESPONSIBLE BODY is made aware of this (see 5.4.3.101).

*Conformity is checked by performing the drying-out process specified in the user manual (see 5.4.3.101) before conducting the tests of 6.3.1 and 6.8.2.*

#### 6.8.2 Humidity preconditioning

*Addition:*

*Add the following new text at the end of the existing text:*

*If a drying-out process is specified (see 6.7.2.2.101), this is carried out in accordance with the operator manual (see 5.4.3.101) before the tests of 6.8.3. Drying-out is followed by a rest period of 2 h with the equipment de-energized. The tests are then performed and completed within 1 h of the end of the rest period.*

*If there is doubt as to whether the equipment would pass a particular test at maximum ~~operating~~ controlled temperature, then that test is repeated at maximum ~~operating~~ controlled temperature.*

*Equipment for which a drying-out period is specified (see 5.4.3.101) shall not be subjected to humidity preconditioning.*

#### 6.8.3.1 The a.c. voltage test

*Replacement:*

*Replace the first sentence by the following new sentence:*

The voltage tester shall be capable of maintaining the test voltage throughout the test within ±5 % of the specified value.

#### 6.9.2 Insulating materials

*Addition:*

*Add the following note before the conformity statement:*

NOTE Although ceramics can provide satisfactory electrical insulation at ambient temperature, their insulating properties are reduced at high temperatures. This is not only because they are susceptible to progressive mechanical deterioration, but also because they can become electrically conductive at high temperatures and in NORMAL USE can be contaminated by conductive material.

#### 6.10.1 MAINS supply cords

*Addition:*

*Add the following new text to the third paragraph:*

Alternatively, additional protection shall be provided to prevent the cord from ~~contacting~~ coming into contact with the hot surface.

*Add the following new text to the fourth paragraph:*

The appliance coupler shall have a temperature RATING above the temperatures measured under NORMAL CONDITION on any part of the appliance coupler itself.

## 7 Protection against mechanical HAZARDS

This clause of Part 1 is applicable.

## 8 Resistance to mechanical stresses

This clause of Part 1 is applicable except as follows:

### 8.1 General

~~*Replacement of item 3):*~~

~~*3) except for FIXED EQUIPMENT, equipment with a mass over 100 kg, and equipment which is not moved in NORMAL USE whose size and weight make unintentional movement unlikely, the appropriate test of 8.3. The equipment is not operated during the tests.*~~

*Addition:*

*Add the following new item to the numbered list:*

*4) for heating equipment with a horizontal surface of glass or ceramic, the test of 8.2.101.*

### 8.2.2 Impact test

*Addition:*

*Add the following new text before the first paragraph:*

*For heating equipment with a horizontal surface of glass, ceramic, or similar material, this surface shall be tested as specified in 8.2.101. The rest of the equipment is tested as specified below.*

*Addition:*

*Add the following new subclause:*

### 8.2.101 Dynamic test of horizontal heating surfaces of glass or ceramic material

*Conformity to the requirements for horizontal heating surfaces made of glass or ceramic material is checked after performing the treatment of a) to c).*

*a) The heater is operated at the maximum setting until the surface temperature of the heating zone does not rise by more than 1 °C in 15 min. The heater is then switched off, and a loaded vessel is dropped flat 10 times from a height of 150 mm onto the heating zone. The loaded vessel has a copper or aluminium base which is flat over a diameter of 120 mm ± 10 mm, with a rounded edge ~~of~~ having a radius of at least 10 mm. It is filled to a uniform height with sand or shot to give a total mass of 1,8 kg ± 0,01 kg.*

*b) After the above treatment to each heating zone in turn, the heater is again operated at the maximum setting until the surface temperature does not rise by more than 1 °C in 15 min.*

*(1 l ± 0,1 l) of a saline solution of 1 % NaCl in water, at a temperature of 15 °C ± 5 °C, is poured steadily onto the heating surface. The heater is then switched off and after 15 min all excess solution is cleaned off the surface.*

c) *The heater is allowed to cool to approximately ~~room~~ ambient temperature, then the same quantity of the saline solution is poured steadily onto the heating surface and again all excess solution is cleaned off the surface.*

*A voltage test according to 6.8 applicable to the type of insulation (see 6.7) shall be performed. The test voltage shall be for* BASIC INSULATION. *No breakdown shall occur.*

*No breakage of glass parts shall have occurred which could cause a cutting* HAZARD.

NOTE Subclause 8.2.101 corresponds to 21.102 of IEC 60335-2-6:~~2002~~ 2014.

## 9 Protection against the spread of fire

This clause of Part 1 is applicable except as follows:

### 9.5 Requirements for equipment containing or using flammable liquids

*Replacement:*

*Replace item a) and Note 1 by the following:*

a) The equipment shall be so constructed that it complies with items 1), 2) and 3) as follows:

1) In NORMAL CONDITION and SINGLE FAULT CONDITION, the surface temperature of the flammable liquid shall not exceed the flash point of the liquid being exposed to the air. ~~In NORMAL CONDITION and SINGLE FAULT CONDITION the surface temperature of any heating element at the surface of the liquid and in contact with air shall not exceed ($t$ - 25) °C , where $t$ is the fire point of the liquid.~~

~~NOTE 1 Fire point is the temperature to which a HEAT TRANSFER MEDIUM must be heated (under specified conditions) so that the vapour/air mixture at the surface will support a flame for at least 5 s when an external flame is applied and withdrawn. Flash point is lowest liquid temperature at which, under certain standardized conditions, the HEAT TRANSFER MEDIUM gives off vapours in quantity such as to be capable of forming an ignitable vapour/air mixture.~~

2) In NORMAL CONDITION and SINGLE FAULT CONDITION, the surface temperature of any heating device at the surface of the flammable liquid and in contact with air shall not exceed ($t$ − 25) °C, where $t$ is the fire point of the liquid.

3) For equipment where an OPERATOR setting could expose a flammable liquid to a condition where 1) or 2) could be exceeded in the case of a SINGLE FAULT CONDITION during REASONABLY FORESEEABLE MISUSE, additional measures shall be provided to protect the OPERATOR from this HAZARD.

– For example, a liquid level cut out that disables the heating device before the temperature requirements of a) 1) or 2) are exceeded is considered to comply with this requirement.

– Consideration should be given to any scenario that can expose any permitted flammable liquid to a temperature that could exceed $t_a$ – 100 °C, where $t_a$ is the auto-ignition temperature.

– The use of a flammable liquid not approved by the manufacturer for use in the equipment is not considered as an OPERATOR setting and is therefore beyond the evaluation of Clause 16.

NOTE 101 Guidance on what is considered REASONABLY FORESEEABLE MISUSE is provided in 16.1.

It is not sufficient to limit the surface temperature of ~~the surface of~~ the flammable liquid and parts in contact with the surface ~~limited~~ solely by the temperature control system.

Overtemperature protection meeting the requirements of 10.101 achieved by an independent, adjustable ~~over-~~temperature-limiting device shall be used.

NOTE 102 The surface temperature of the heating device used to heat a liquid can be considerably higher than the temperature of the liquid.

NOTE 103 Additional instructions for equipment intended for use with flammable liquid HEAT TRANSFER MEDIUM are detailed in 5.4.101.

*Addition:*

*Add the following note after item c):*

NOTE ~~101~~ 104 Where flammable ~~material~~ liquid is present in the equipment, symbol 101 can be used as a warning marking.

*Replacement:*

*Replace the first paragraph of the conformity statement by the following:*

*Conformity is checked by inspection, including nameplate, documentation and function of the equipment and, if necessary, by the tests and measurements of temperature as specified in 10.4 and 10.101.*

## 10 Equipment temperature limits and resistance to heat

This clause of Part 1 is applicable except as follows:

### 10.1 Surface temperature limits for protection against burns

*Replacement:*

*Replace the first sentence of the third paragraph with the following text:*

If easily touched heated surfaces are necessary for functional reasons, whether because they are intended to deliver heat or are hot because of proximity to heating parts, they are permitted to exceed the values of Table 19 in NORMAL CONDITION and to exceed 105 °C in SINGLE FAULT CONDITION, provided that they are recognizable as such by appearance or function or are marked with symbol 13 of Table 1 (see 5.2).

*Addition:*

*Add the following new subclause:*

### 10.101 Overtemperature protection

If a single fault in a temperature control system, heater, cooling means, circulating pump or fan, agitator, or other part could cause a HAZARD through overheating of any part of equipment, a non-self-resetting overtemperature device or system meeting the requirements of 14.3 shall de-energize the heating means and any other parts which could cause a HAZARD.

If a HAZARD could be caused by an inadequate quantity of HEAT TRANSFER MEDIUM, a self-resetting or non-self-resetting liquid-level device shall de-energize the heating means and any other parts which could cause a HAZARD.

The equipment as a whole, or the relevant parts, shall be de-energized by one of the following methods:

a) For single-phase equipment, the proposed circuit and physical construction shall be examined to identify possible single faults. The overtemperature device shall be placed in the pole of the supply that provides the better protection from single faults that could defeat the overtemperature protection in the event of a subsequent failure of the temperature control system. A device which isolates both phase and neutral conductors at the same time may provide double fault protection (depending on application) and should be considered if the residual RISK is unacceptable.

*Conformity is checked by inspection of the circuit diagram, the data sheet for the overtemperature protection device, and the method in which it is installed in the equipment, and, if necessary, by the tests specified in 14.3.*

b) For polyphase equipment, ~~either~~ one single device or system disconnecting all phases~~, or an individual device or system for each phase~~.

~~c) a device or system providing disconnection from all poles of the supply. Note the following:~~

Consideration shall be given to the following:

– In equipment designed for the heating of materials, HAZARDS ~~may~~ can arise from overheating of materials being treated or overheating of HEAT TRANSFER MEDIA (mainly in heating baths) as well as from overheating of parts of the equipment itself. For this reason, a higher level of safety may be needed to ~~provide in the case of~~ allow for a single faULT CONDITION in the equipment.

– In some cases a fall in the temperature of a heated medium (for example, liquid in a bath or air in an oven or heating cabinet) could cause a HAZARD. If this could occur as a result of the operation of an overtemperature protection device ~~after failure of the temperature control system, a second temperature control system may be fitted to maintain a safe temperature without the over-temperature device operating~~, an additional independent system may be used to prevent the temperature from falling to a hazardous level.

For equipment designed to contain flammable materials, either for treatment or for heat-transfer, overtemperature protection devices or systems shall ensure, when set as directed in the manufacturer's instructions, that the liquid cannot exceed the temperature specified in 9.5 a) in NORMAL USE or SINGLE FAULT CONDITION.

NOTE ~~1~~ NORMAL USE (which is use in accordance with the manufacturer's instructions) includes the correct setting of any adjustable overtemperature device. Incorrect setting of a device by the use of a TOOL is itself a SINGLE FAULT CONDITION, so tests in any other SINGLE FAULT CONDITION are made with overtemperature protection devices or systems set in accordance with the manufacturer's instructions.

Overtemperature protection devices necessary for safety shall be separate from any temperature control system. This applies not only to the temperature sensing means but also to all disconnecting devices in the circuits to be de-energized. Whether operated by temperature, pressure, liquid-level, airflow or other means, they shall meet the requirements of 14.3.

Adjustable overtemperature and liquid-level devices and systems shall be adjustable only with the aid of a TOOL or similar means that prevents unintended adjustment.

*Conformity is checked by inspection and during the fault tests specified in 4.4.2.9 and 4.4.2.10.*

## 11 Protection against HAZARDS from fluids and solid foreign objects

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

### 11.2 Cleaning

*Addition:*

*Add the following after the first paragraph:*

If a manufacturer claims that a part of the equipment or an accessory can be decontaminated by steam sterilization, ~~it~~ that part of equipment or accessory shall be capable of withstanding steam sterilization under at least one of the time-temperature conditions given in Table 101.

**Table 101 – Time-temperature conditions**

| Absolute pressure kPa | Corresponding steam temperature | | Minimum hold time min |
|---|---|---|---|
| | Nominal °C | Range °C | |
| 325 | 136,0 | 134 to 138 | 3 |
| 250 | 127,5 | 126 to 129 | 10 |
| 215 | 122,5 | 121 to 124 | 15 |
| 175 | 116,5 | 115 to 118 | 30 |
| NOTE "Minimum hold time" means the time during which the containment is at steam temperature. | | | |

## 12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure

This clause of Part 1 is applicable.

## 13 Protection against liberated gases and substances, explosion and implosion

This clause of Part 1 is applicable except as follows:

### 13.2.1 Components

*Replacement:*

*Replace the title by the following:*

### 13.2.1 Components and materials being heated

*Replace the text of the subclause with the following new text:*

If components liable to explode if overheated or overcharged are not provided with a pressure relief device, or if the equipment is designed to treat materials which could explode or implode, protection for the OPERATOR shall be incorporated in the ~~apparatus~~ equipment (see also 7.7).

Pressure release devices shall be located so that a discharge will not cause danger to the OPERATOR. The construction shall be such that any pressure release device shall not be obstructed.

*Conformity is checked by inspection.*

*Addition:*

*Add the following new subclause:*

### 13.2.101 Implosion of vacuum ovens

Vacuum ovens shall incorporate protection for the OPERATOR and surroundings against the effects of implosion.

*Conformity is checked by inspection of the equipment and of the design information and, in case of doubt, by provoking an implosion.*

## 14 Components and subassemblies

This clause of Part 1 is applicable except as follows:

### 14.3 Overtemperature protection devices

*Replacement:*

*Replace the text of the subclause with the following new text:*

Overtemperature protection devices and systems designed to operate in SINGLE FAULT CONDITION shall be:

a) constructed and tested to ensure reliable function;

b) RATED to interrupt the maximum voltage and current of the circuit in which they are employed;

c) RATED so that components or materials whose temperatures are intended to be limited by the device do not exceed the relevant temperature limits of 9.5 a) and Table 19.

If necessary, means shall be provided for the OPERATOR to check that a device or system will function in the case of SINGLE FAULT CONDITION. ~~The instructions for use shall specify the method and how often the check is required.~~

For adjustable devices or systems, the check can normally be made by setting the overtemperature device to a lower temperature than that of the temperature control system. For non-adjustable devices or systems which do not also act as liquid-level protection devices, it may be necessary to provide a self-resetting means to override the temperature control system temporarily.

Liquid-level devices used to protect against overtemperature shall meet the same requirements as overtemperature protection devices and systems.

*Conformity is checked by studying the operating principle of the device or system and by performing adequate reliability tests with the equipment operated in SINGLE FAULT CONDITION.*

*The number of operations is as follows:*

*1) non-resetting devices are caused to operate once;*

*2) non-self-resetting devices and systems, except thermal fuses, are reset after each operation and thus caused to operate 10 times;*

*3) self-resetting ~~liquid level~~ devices and systems are caused to operate 200 times.*

NOTE Forced cooling and resting periods can be introduced to prevent damage to the equipment.

*During the test, resetting devices shall operate each time if the SINGLE FAULT CONDITION is applied, and non-resetting devices shall operate once. After the test, resetting devices shall show no sign of damage which could prevent their operation in a further SINGLE FAULT CONDITION.*

## 15 Protection by interlocks

This clause of Part 1 is applicable.

## 16 HAZARDS resulting from application

This clause of Part 1 is applicable.

## 17 RISK assessment

This clause of Part 1 is applicable.

## Annexes

The annexes of Part 1 are applicable except as follows:

# Annex K
(normative)

## Insulation requirements not covered by 6.7

### K.1.3 Solid insulation for MAINS CIRCUITS

#### K.1.3.1 General

*Addition:*

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

If the performance requirements of the equipment cannot be achieved without the use of hygroscopic heater insulation, it is permissible for equipment to require a period of operation to dry out the insulation before meeting the requirements of 6.3.1 and 6.8.3 ~~providing~~ provided the ~~operator~~ RESPONSIBLE BODY is made aware of this (see 5.4.3.101).

*Replacement:*

*Replace the conformity statement with the following new text:*

*Conformity is checked by both of the following tests:*

*a) the a.c. test of 6.8.3.1 with a duration of at least 5 s or the peak impulse test of 6.8.3.3 using the applicable voltages from Tables K.5, K.6 or K.7;*

*b) the a.c. test of 6.8.3.1 with a duration of at least 1 min, or for MAINS CIRCUITS stressed only by d.c. the 1 min d.c. test of 6.8.3.2 using the applicable voltages from Table K.8.*

*If the test from Tables K.5 to K.7 is performed for at least 1 min, there is no need to repeat the test of b) above.*

*If a drying-out process is specified, conformity is checked by performing the drying-out process specified in the ~~user manual~~ installation instructions (see 5.4.3.101) before conducting the tests of a) and b) above.*

NOTE 2 These two different voltage tests are required for these circuits for the following reasons. Test a) checks the effects of TRANSIENT OVERVOLTAGES, while test b) checks the effects of long-term stress of solid insulation.

~~NOTE 3 If the test from Tables K.5 to K.7 is performed for at least 1 min, there is no need to repeat the test of b) above.~~

# Bibliography

The Bibliography of Part 1 is applicable, except as follows:

*Addition:*

*Add the following entries to the list:*

IEC 60335-2-6:2014, *Household and similar electrical appliances – Safety – Part 2-6: Particular requirements for stationary cooking ranges, hobs, ovens and similar appliances*

World Health Organization, *Laboratory Biosafety Manual*

DIN 12876-1, *Electrical laboratory devices – Laboratory circulators and baths – Part 1: Terms and classification*

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# IEC 61010-2-010

Edition 4.0 2019-02

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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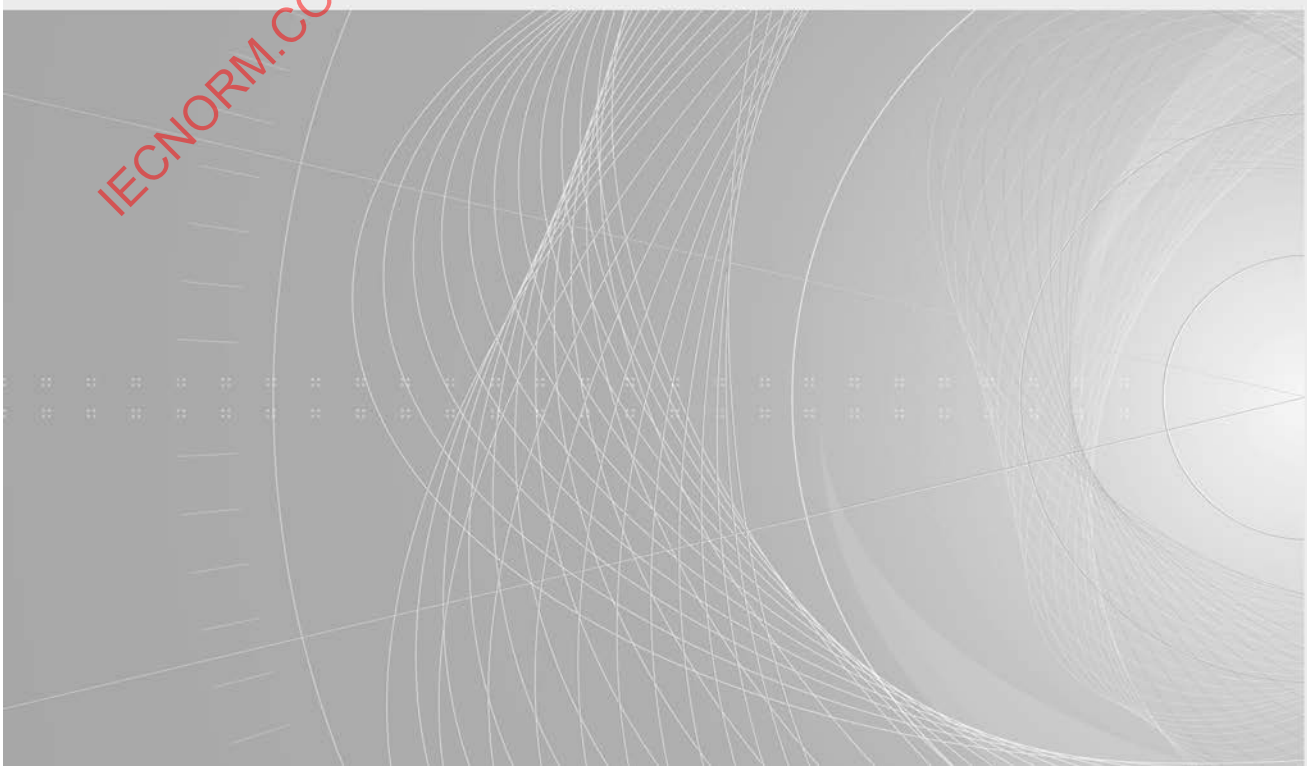
GROUP SAFETY PUBLICATION
PUBLICATION GROUPÉE DE SÉCURITÉ

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

## Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
## Partie 2-010: Exigences particulières pour appareils de laboratoire utilisés pour l'échauffement des matières





IEC 61010-2-010:2019-02(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# 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,
- 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 2-010, 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.

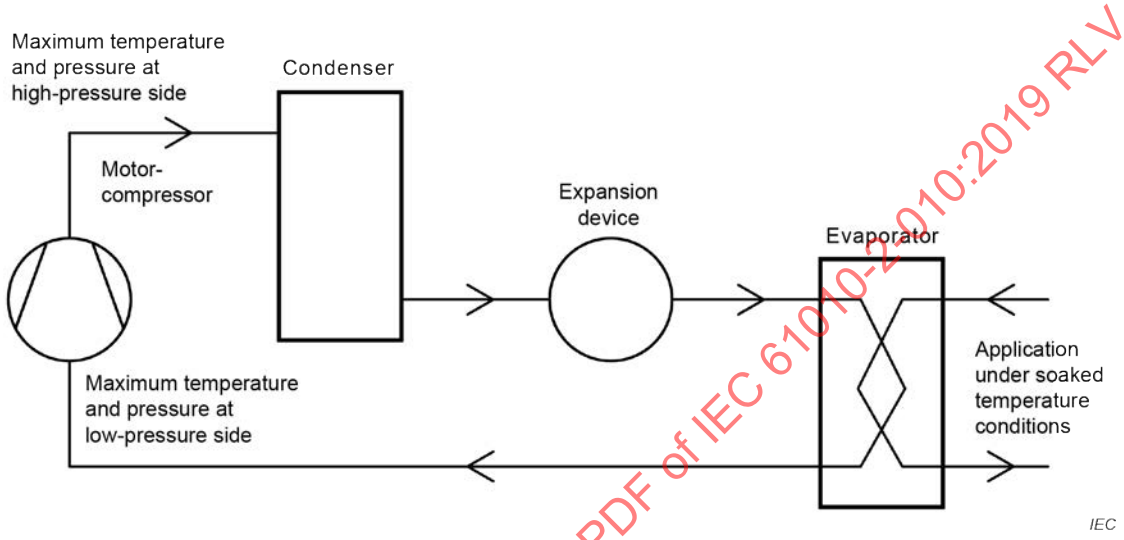


**Figure 101 – Schema of a refrigerating system incorporating a condenser**

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

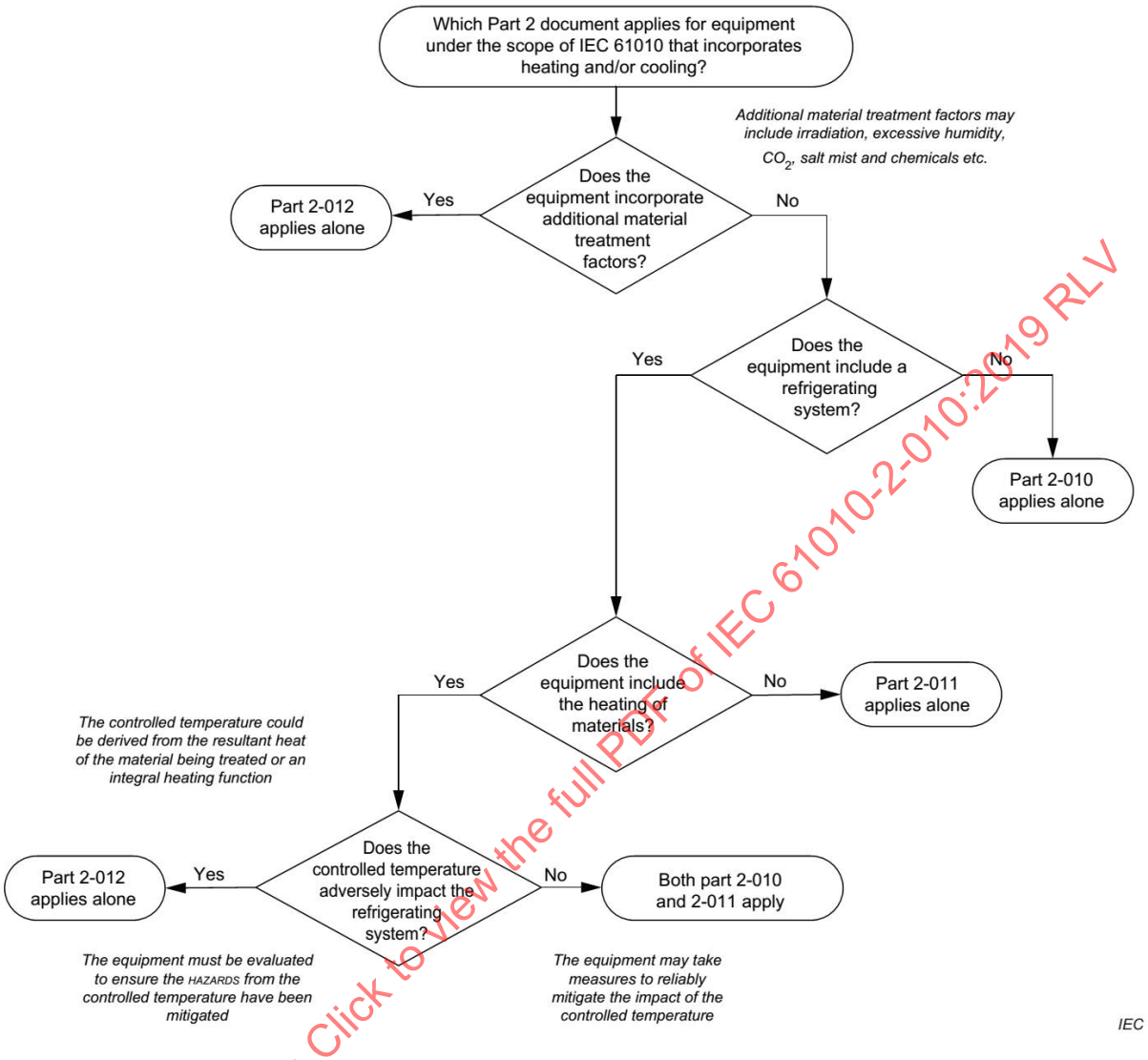


**Figure 102 – Flow chart illustrating the selection process**

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

# Part 2-010: 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 the following types a) to c) of electrical equipment and their accessories, wherever they are intended to be used, whenever the heating of materials is one of the functions of the equipment.

*Addition:*

*Add the following text after item c):*

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, *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:

### 5.1.3 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 |  | Background colour<br>– yellow (optional, not green); symbol and outline<br>– black (optional). | ISO 7010-W021:2011-05 | Warning;<br>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.

### 5.4.3 Equipment installation

*Replacement:*

*Replace the text with the following new text:*

The documentation shall include installation and specific commissioning instructions 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, 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 6.11.3.1) 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, 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.

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):*

(see 5.4.4.101);

*Add the following after item j):*

aa) specification of additional protection needed by the OPERATOR when HAZARDOUS LIVE parts are permitted to be ACCESSIBLE (see 6.1.2.101);

bb) a warning about any possible HAZARDS of explosion, implosion, or the release of toxic or flammable gases arising from the materials being heated see also 5.4.4 h));

cc) specification of HEAT TRANSFER MEDIA which are suitable for use, for example liquids for use in a heating bath;

dd) specific requirements for ventilation.

*Addition:*

*Add the following new subclause:*

#### 5.4.4.101 Cleaning and decontamination

The instructions shall include recommendations for cleaning and, where necessary, decontamination, together with the recognized generic names of recommended materials for cleaning and decontamination, and an indication of any materials which could be likely to be used but which are incompatible with parts of the equipment or with material contained in it.

The instructions shall also state that the RESPONSIBLE BODY shall ensure that:

a) appropriate decontamination is carried out if hazardous material is spilled onto or into the equipment;

b) no decontamination or cleaning agents are used which could cause a HAZARD as a result of a reaction with parts of the equipment or with material contained in it;

c) the manufacturer or its agent is consulted if there is any doubt about the compatibility of decontamination or cleaning agents with parts of the equipment or with material contained in it.

Manufacturers should be aware of the internationally recognized "Laboratory Biosafety Manual", published by the World Health Organization in Geneva, which gives information on decontaminants, their use, dilutions, properties and potential applications. There are also national guidelines which cover these areas.

Cleaning and decontamination may be necessary as a safeguard when laboratory heating equipment and any accessories are maintained, repaired, or transferred. Manufacturers should provide a document for the RESPONSIBLE BODY to certify that such treatment has been carried out.

*Conformity is checked by inspection.*

### 5.4.5 Equipment maintenance and service

*Addition:*

*Add the following new text:*

If a high-temperature cable or other special cable is used for the MAINS supply cord, the instructions shall state that it is to be replaced by an equivalent cable only.

If practicable, instructions shall specify methods for the RESPONSIBLE BODY to check the effective operation of devices or systems for overtemperature protection or liquid-level protection which are necessary for safety, and shall state how often the checks need to be made.

*Addition:*

*Add the following new subclause:*

### 5.4.101 Additional instructions for equipment intended for use with flammable liquid HEAT TRANSFER MEDIUM

For baths, circulators and shaking baths intended for use with flammable liquid HEAT TRANSFER MEDIUM, the instructions shall include sufficient information to ensure the safe handling, servicing and disposal of the equipment.

The instructions shall include the substance of the following warnings as necessary:

– WARNING: Ensure all ventilation openings are not obstructed;
– WARNING: No smoking! No flame! Do not use electrical parts which can produce spark when operating around the equipment and the application system;
– WARNING: Drain and recover the liquid when the equipment idles, if the liquid heat transfer medium is used with an open bath tank and if it is highly volatile at ambient temperature.

A label carrying symbol 101 shall be provided with equipment which can be used with a flammable liquid HEAT TRANSFER MEDIUM along with instructions for the RESPONSIBLE BODY to affix the label visibly on the equipment if it is to be used with a flammable liquid HEAT TRANSFER MEDIUM.

The instructions shall be provided with detailed information for procedures to reduce the RISK with regard to the use of a flammable liquid HEAT TRANSFER MEDIUM, including how the adjustable temperature-limiting device is adequately set so that the surface temperature in contact with the liquid is below the limit of 9.5 a).

*Conformity is checked by inspection.*

# 6 Protection against electric shock

This clause of Part 1 is applicable except as follows:

## 6.1 General

### 6.1.1 Requirements

*Addition:*

*Add the following new text after the conformity statement:*

*If a drying-out process is specified (see 6.7.2.2.101), this is carried out in accordance with the installation instructions (see 5.4.3.101) before making the measurements of 6.3. Drying-out is followed by a rest period of 2 h, with the equipment de-energized, before the measurements are taken.*

*Measurements are made with the equipment at ambient temperature. If there is doubt whether the permissible limits could be exceeded at the maximum controlled temperature, the relevant measurements are repeated at the maximum controlled temperature and the higher values are used.*

*Addition:*

*Add the following new subclause:*

#### 6.1.2.101 Exceptions for ovens and furnaces

HAZARDOUS LIVE parts are permitted to be ACCESSIBLE if efficient operation of an oven or furnace would otherwise be impossible for one or more of the following reasons:

a) continuous access is needed (for example, conveyor ovens and tube furnaces);

b) ports are needed for observation or for the insertion of probes or sensors;

c) it is necessary to maintain a steady controlled temperature to prevent thermal shock to materials being treated, and therefore ACCESSIBLE heaters, etc., have to remain energized even when a door is opened.

In the above cases, ACCESSIBLE internal parts are permitted to be HAZARDOUS LIVE only if all the following conditions as applicable are met:

1) the HAZARDOUS LIVE parts are supplied from a circuit protected by a residual current operated circuit-breaker which interrupts the supply at a differential current of 30 mA or less, or the installation instructions specify that the equipment shall be connected to a supply source which incorporates such a circuit-breaker;

2) warning markings give notice of the potential HAZARD and a lamp indicates the presence of the HAZARD (symbol 12 of Table 1);

3) conveyor belts, muffles, etc., which are conductive are connected to the PROTECTIVE CONDUCTOR TERMINAL;

4) the instructions for use state that it is necessary for the OPERATOR to be protected against electric shock, including electric shock resulting from the possibility of simultaneous contact with HAZARDOUS LIVE parts and parts connected to the PROTECTIVE CONDUCTOR TERMINAL, and indicate the means of protection. These protective means may include one or more of the following:

   i) insulated TOOLS;

   ii) insulating clothing;

   iii) OPERATOR standing on an insulating surface;

iv) shrouding of parts connected to the PROTECTIVE CONDUCTOR TERMINAL with which the OPERATOR might come into contact in NORMAL USE.

*Conformity is checked by inspection.*

### 6.3.1 Levels in NORMAL CONDITION

*Addition:*

*Add the following new text to the end of item b) 1):*

Levels for PERMANENTLY CONNECTED EQUIPMENT are 1,5 times these values.

### 6.3.2 Levels in SINGLE FAULT CONDITION

*Addition:*

*Add the following new text to the end of item b) 1):*

Levels for PERMANENTLY CONNECTED EQUIPMENT are 1,5 times these values.

### 6.7.2.2 Solid insulation

*Addition:*

*Add the following new subclause:*

#### 6.7.2.2.101 Drying-out time

If the performance requirements of the equipment cannot be achieved without the use of hygroscopic heater insulation it is permissible for equipment to require a period of operation to dry out the insulation before meeting the requirements of 6.7.2.2, 6.3.1 and 6.8.2 provided the RESPONSIBLE BODY is made aware of this (see 5.4.3.101).

*Conformity is checked by performing the drying-out process specified in the user manual (see 5.4.3.101) before conducting the tests of 6.3.1 and 6.8.2.*

### 6.8.2 Humidity preconditioning

*Addition:*

*Add the following new text at the end of the existing text:*

*If a drying-out process is specified (see 6.7.2.2.101), this is carried out in accordance with the operator manual (see 5.4.3.101) before the tests of 6.8.3. Drying-out is followed by a rest period of 2 h with the equipment de-energized. The tests are then performed and completed within 1 h of the end of the rest period.*

*If there is doubt as to whether the equipment would pass a particular test at maximum controlled temperature, then that test is repeated at maximum controlled temperature.*

*Equipment for which a drying-out period is specified (see 5.4.3.101) shall not be subjected to humidity preconditioning.*

### 6.8.3.1 The a.c. voltage test

*Replacement:*

*Replace the first sentence by the following new sentence:*

The voltage tester shall be capable of maintaining the test voltage throughout the test within ±5 % of the specified value.

### 6.9.2 Insulating materials

*Addition:*

*Add the following note before the conformity statement:*

NOTE Although ceramics can provide satisfactory electrical insulation at ambient temperature, their insulating properties are reduced at high temperatures. This is not only because they are susceptible to progressive mechanical deterioration, but also because they can become electrically conductive at high temperatures and in NORMAL USE can be contaminated by conductive material.

### 6.10.1 MAINS supply cords

*Addition:*

*Add the following new text to the third paragraph:*

Alternatively, additional protection shall be provided to prevent the cord from coming into contact with the hot surface.

*Add the following new text to the fourth paragraph:*

The appliance coupler shall have a temperature RATING above the temperatures measured under NORMAL CONDITION on any part of the appliance coupler itself.

## 7 Protection against mechanical HAZARDS

This clause of Part 1 is applicable.

## 8 Resistance to mechanical stresses

This clause of Part 1 is applicable except as follows:

### 8.1 General

*Addition:*

*Add the following new item to the numbered list:*

*4) for heating equipment with a horizontal surface of glass or ceramic, the test of 8.2.101.*

### 8.2.2 Impact test

*Addition:*

*Add the following new text before the first paragraph:*

*For heating equipment with a horizontal surface of glass, ceramic, or similar material, this surface shall be tested as specified in 8.2.101. The rest of the equipment is tested as specified below.*

*Addition:*

*Add the following new subclause:*

### 8.2.101 Dynamic test of horizontal heating surfaces of glass or ceramic material

*Conformity to the requirements for horizontal heating surfaces made of glass or ceramic material is checked after performing the treatment of a) to c).*

*a) The heater is operated at the maximum setting until the surface temperature of the heating zone does not rise by more than 1 °C in 15 min. The heater is then switched off, and a loaded vessel is dropped flat 10 times from a height of 150 mm onto the heating zone. The loaded vessel has a copper or aluminium base which is flat over a diameter of 120 mm ± 10 mm, with a rounded edge having a radius of at least 10 mm. It is filled to a uniform height with sand or shot to give a total mass of 1,8 kg ± 0,01 kg.*

*b) After the above treatment to each heating zone in turn, the heater is again operated at the maximum setting until the surface temperature does not rise by more than 1 °C in 15 min. (1 l ± 0,1 l) of a saline solution of 1 % NaCl in water, at a temperature of 15 °C ± 5 °C, is poured steadily onto the heating surface. The heater is then switched off and after 15 min all excess solution is cleaned off the surface.*

*c) The heater is allowed to cool to approximately ambient temperature, then the same quantity of the saline solution is poured steadily onto the heating surface and again all excess solution is cleaned off the surface.*

*A voltage test according to 6.8 applicable to the type of insulation (see 6.7) shall be performed. The test voltage shall be for* BASIC INSULATION*. No breakdown shall occur.*

*No breakage of glass parts shall have occurred which could cause a cutting* HAZARD*.*

NOTE Subclause 8.2.101 corresponds to 21.102 of IEC 60335-2-6:2014.

## 9 Protection against the spread of fire

This clause of Part 1 is applicable except as follows:

### 9.5 Requirements for equipment containing or using flammable liquids

*Replacement:*

*Replace item a) and Note 1 by the following:*

a) The equipment shall be so constructed that it complies with items 1), 2) and 3) as follows:

1) In NORMAL CONDITION and SINGLE FAULT CONDITION, the surface temperature of the flammable liquid shall not exceed the flash point of the liquid being exposed to the air.

2) In NORMAL CONDITION and SINGLE FAULT CONDITION, the surface temperature of any heating device at the surface of the flammable liquid and in contact with air shall not exceed ($t$ − 25) °C, where $t$ is the fire point of the liquid.

3) For equipment where an OPERATOR setting could expose a flammable liquid to a condition where 1) or 2) could be exceeded in the case of a SINGLE FAULT CONDITION during REASONABLY FORESEEABLE MISUSE, additional measures shall be provided to protect the OPERATOR from this HAZARD.

– For example, a liquid level cut out that disables the heating device before the temperature requirements of a) 1) or 2) are exceeded is considered to comply with this requirement.

– Consideration should be given to any scenario that can expose any permitted flammable liquid to a temperature that could exceed $t_a$ – 100 °C, where $t_a$ is the auto-ignition temperature.

– The use of a flammable liquid not approved by the manufacturer for use in the equipment is not considered as an OPERATOR setting and is therefore beyond the evaluation of Clause 16.

NOTE 101 Guidance on what is considered REASONABLY FORESEEABLE MISUSE is provided in 16.1.

It is not sufficient to limit the surface temperature of the flammable liquid and parts in contact with the surface solely by the temperature control system. Overtemperature protection meeting the requirements of 10.101 achieved by an independent, adjustable temperature-limiting device shall be used.

NOTE 102 The surface temperature of the heating device used to heat a liquid can be considerably higher than the temperature of the liquid.

NOTE 103 Additional instructions for equipment intended for use with flammable liquid HEAT TRANSFER MEDIUM are detailed in 5.4.101.

*Addition:*

*Add the following note after item c):*

NOTE 104 Where flammable liquid is present in the equipment, symbol 101 can be used as a warning marking.

*Replacement:*

*Replace the first paragraph of the conformity statement by the following:*

*Conformity is checked by inspection, including nameplate, documentation and function of the equipment and, if necessary, by the tests and measurements of temperature as specified in 10.4 and 10.101.*

## 10 Equipment temperature limits and resistance to heat

This clause of Part 1 is applicable except as follows:

### 10.1 Surface temperature limits for protection against burns

*Replacement:*

*Replace the first sentence of the third paragraph with the following text:*

If easily touched heated surfaces are necessary for functional reasons, whether because they are intended to deliver heat or are hot because of proximity to heating parts, they are permitted to exceed the values of Table 19 in NORMAL CONDITION and to exceed 105 °C in SINGLE FAULT CONDITION, provided that they are recognizable as such by appearance or function or are marked with symbol 13 of Table 1 (see 5.2).

*Addition:*

*Add the following new subclause:*

### 10.101 Overtemperature protection

If a single fault in a temperature control system, heater, cooling means, circulating pump or fan, agitator, or other part could cause a HAZARD through overheating of any part of equipment, a non-self-resetting overtemperature device or system meeting the requirements of 14.3 shall de-energize the heating means and any other parts which could cause a HAZARD.

If a HAZARD could be caused by an inadequate quantity of HEAT TRANSFER MEDIUM, a self-resetting or non-self-resetting liquid-level device shall de-energize the heating means and any other parts which could cause a HAZARD.

The equipment as a whole, or the relevant parts, shall be de-energized by one of the following methods:

a) For single-phase equipment, the proposed circuit and physical construction shall be examined to identify possible single faults. The overtemperature device shall be placed in the pole of the supply that provides the better protection from single faults that could defeat the overtemperature protection in the event of a subsequent failure of the temperature control system. A device which isolates both phase and neutral conductors at the same time may provide double fault protection (depending on application) and should be considered if the residual RISK is unacceptable.

*Conformity is checked by inspection of the circuit diagram, the data sheet for the overtemperature protection device, and the method in which it is installed in the equipment, and, if necessary, by the tests specified in 14.3.*

b) For polyphase equipment, one single device or system disconnecting all phases.

Consideration shall be given to the following:

– In equipment designed for the heating of materials, HAZARDS can arise from overheating of materials being treated or overheating of HEAT TRANSFER MEDIA (mainly in heating baths) as well as from overheating of parts of the equipment itself. For this reason, a higher level of safety may be needed to allow for a single faULT CONDITION in the equipment.

– In some cases a fall in the temperature of a heated medium (for example, liquid in a bath or air in an oven or heating cabinet) could cause a HAZARD. If this could occur as a result of the operation of an overtemperature protection device, an additional independent system may be used to prevent the temperature from falling to a hazardous level.

For equipment designed to contain flammable materials, either for treatment or for heat-transfer, overtemperature protection devices or systems shall ensure, when set as directed in the manufacturer's instructions, that the liquid cannot exceed the temperature specified in 9.5 a) in NORMAL USE or SINGLE FAULT CONDITION.

NOTE NORMAL USE (which is use in accordance with the manufacturer's instructions) includes the correct setting of any adjustable overtemperature device. Incorrect setting of a device by the use of a TOOL is itself a SINGLE FAULT CONDITION, so tests in any other SINGLE FAULT CONDITION are made with overtemperature protection devices or systems set in accordance with the manufacturer's instructions.

Overtemperature protection devices necessary for safety shall be separate from any temperature control system. This applies not only to the temperature sensing means but also to all disconnecting devices in the circuits to be de-energized. Whether operated by temperature, pressure, liquid-level, airflow or other means, they shall meet the requirements of 14.3.

Adjustable overtemperature and liquid-level devices and systems shall be adjustable only with the aid of a TOOL or similar means that prevents unintended adjustment.

*Conformity is checked by inspection and during the fault tests specified in 4.4.2.9 and 4.4.2.10.*

## 11 Protection against HAZARDS from fluids and solid foreign objects

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

### 11.2 Cleaning

*Addition:*

*Add the following after the first paragraph:*

If a manufacturer claims that a part of the equipment or an accessory can be decontaminated by steam sterilization, that part of equipment or accessory shall be capable of withstanding steam sterilization under at least one of the time-temperature conditions given in Table 101.

**Table 101 – Time-temperature conditions**

| Absolute pressure kPa | Corresponding steam temperature | | Minimum hold time min |
|---|---|---|---|
| | Nominal °C | Range °C | |
| 325 | 136,0 | 134 to 138 | 3 |
| 250 | 127,5 | 126 to 129 | 10 |
| 215 | 122,5 | 121 to 124 | 15 |
| 175 | 116,5 | 115 to 118 | 30 |
| NOTE "Minimum hold time" means the time during which the containment is at steam temperature. | | | |

## 12 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure

This clause of Part 1 is applicable.

## 13 Protection against liberated gases and substances, explosion and implosion

This clause of Part 1 is applicable except as follows:

### 13.2.1 Components

*Replacement:*

*Replace the title by the following:*

### 13.2.1 Components and materials being heated

*Replace the text of the subclause with the following new text:*

If components liable to explode if overheated or overcharged are not provided with a pressure relief device, or if the equipment is designed to treat materials which could explode or implode, protection for the OPERATOR shall be incorporated in the equipment (see also 7.7).

Pressure release devices shall be located so that a discharge will not cause danger to the OPERATOR. The construction shall be such that any pressure release device shall not be obstructed.

*Conformity is checked by inspection.*

*Addition:*

*Add the following new subclause:*

### 13.2.101 Implosion of vacuum ovens

Vacuum ovens shall incorporate protection for the OPERATOR and surroundings against the effects of implosion.

*Conformity is checked by inspection of the equipment and of the design information and, in case of doubt, by provoking an implosion.*

## 14 Components and subassemblies

This clause of Part 1 is applicable except as follows:

### 14.3 Overtemperature protection devices

*Replacement:*

*Replace the text of the subclause with the following new text:*

Overtemperature protection devices and systems designed to operate in SINGLE FAULT CONDITION shall be:

a) constructed and tested to ensure reliable function;

b) RATED to interrupt the maximum voltage and current of the circuit in which they are employed;

c) RATED so that components or materials whose temperatures are intended to be limited by the device do not exceed the relevant temperature limits of 9.5 a) and Table 19.

If necessary, means shall be provided for the OPERATOR to check that a device or system will function in the case of SINGLE FAULT CONDITION.

For adjustable devices or systems, the check can normally be made by setting the overtemperature device to a lower temperature than that of the temperature control system. For non-adjustable devices or systems which do not also act as liquid-level protection devices, it may be necessary to provide a self-resetting means to override the temperature control system temporarily.

Liquid-level devices used to protect against overtemperature shall meet the same requirements as overtemperature protection devices and systems.

*Conformity is checked by studying the operating principle of the device or system and by performing adequate reliability tests with the equipment operated in SINGLE FAULT CONDITION.*

*The number of operations is as follows:*

*1) non-resetting devices are caused to operate once;*

*2) non-self-resetting devices and systems, except thermal fuses, are reset after each operation and thus caused to operate 10 times;*

*3) self-resetting devices and systems are caused to operate 200 times.*

NOTE Forced cooling and resting periods can be introduced to prevent damage to the equipment.

*During the test, resetting devices shall operate each time if the SINGLE FAULT CONDITION is applied, and non-resetting devices shall operate once. After the test, resetting devices shall show no sign of damage which could prevent their operation in a further SINGLE FAULT CONDITION.*

## 15 Protection by interlocks

This clause of Part 1 is applicable.

## 16 HAZARDS resulting from application

This clause of Part 1 is applicable.

## 17 RISK assessment

This clause of Part 1 is applicable.

## Annexes

The annexes of Part 1 are applicable except as follows:

# Annex K
(normative)

# Insulation requirements not covered by 6.7

### K.1.3 Solid insulation for MAINS CIRCUITS

#### K.1.3.1 General

*Addition:*

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

If the performance requirements of the equipment cannot be achieved without the use of hygroscopic heater insulation, it is permissible for equipment to require a period of operation to dry out the insulation before meeting the requirements of 6.3.1 and 6.8.3 provided the RESPONSIBLE BODY is made aware of this (see 5.4.3.101).

*Replacement:*

*Replace the conformity statement with the following new text:*

*Conformity is checked by both of the following tests:*

*a) the a.c. test of 6.8.3.1 with a duration of at least 5 s or the peak impulse test of 6.8.3.3 using the applicable voltages from Tables K.5, K.6 or K.7;*

*b) the a.c. test of 6.8.3.1 with a duration of at least 1 min, or for MAINS CIRCUITS stressed only by d.c. the 1 min d.c. test of 6.8.3.2 using the applicable voltages from Table K.8.*

*If the test from Tables K.5 to K.7 is performed for at least 1 min, there is no need to repeat the test of b) above.*

*If a drying-out process is specified, conformity is checked by performing the drying-out process specified in the installation instructions (see 5.4.3.101) before conducting the tests of a) and b) above.*

NOTE 2 These two different voltage tests are required for these circuits for the following reasons. Test a) checks the effects of TRANSIENT OVERVOLTAGES, while test b) checks the effects of long-term stress of solid insulation.

# Bibliography

The Bibliography of Part 1 is applicable, except as follows:

*Addition:*

*Add the following entries to the list:*

IEC 60335-2-6:2014, *Household and similar electrical appliances – Safety – Part 2-6: Particular requirements for stationary cooking ranges, hobs, ovens and similar appliances*

World Health Organization, *Laboratory Biosafety Manual*

DIN 12876-1, *Electrical laboratory devices – Laboratory circulators and baths – Part 1: Terms and classification*

# SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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# EXIGENCES DE SÉCURITÉ POUR APPAREILS ÉLECTRIQUES DE MESURAGE, DE RÉGULATION ET DE LABORATOIRE –

## Partie 2-010: Exigences particulières pour appareils de laboratoire utilisés pour l'échauffement des matières

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9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 61010-2-010 a été établie par le comité d'études 66 de l'IEC: Sécurité des appareils de mesure, de commande et de laboratoire.

Elle a le statut d'une publication groupée de sécurité conformément au Guide IEC 104.

Cette quatrième édition annule et remplace la troisième édition parue en 2014. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) alignement sur les modifications introduites par l'Amendement 1 de l'IEC 61010-1:2010;

b) alignement sur l'IEC 61010-2-011 et l'IEC 61010-2-012:
   – nouvelle Introduction précisant la ou les normes à utiliser;
   – nouvelles instructions en 5.4.101 relatives aux MOYENS DE TRANSFERT DE CHALEUR liquides inflammables;
   – le paragraphe 9.5 relatif aux liquides inflammables a été remplacé par le texte de l'IEC 61010-2-012;
c) le paragraphe 5.2.101 a été supprimé:
d) les exigences de 10.101 b) et c) ont été précisées;

Le texte de cette norme est issu des documents suivants:

| CDV | Rapport de vote |
|---|---|
| 66/657/CDV | 66/678/RVC |

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61010, publiées sous le titre général: *Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire*, peut être consultée sur le site web de l'IEC.

La présente Partie 2-010 doit être utilisée conjointement avec la dernière édition de l'IEC 61010-1. Elle a été établie sur la base de la troisième édition (2010) et de son Amendement 1 (2016), ci-après dénommée la Partie 1.

La présente Partie 2-010 complète ou modifie les articles correspondants de l'IEC 61010-1 de façon à la transformer en norme IEC: *Exigences particulières pour appareils de laboratoire utilisés pour l'échauffement des matières.*

Lorsqu'un paragraphe particulier de la Partie 1 n'est pas mentionné dans la présente Partie 2-010, ce paragraphe s'applique pour autant qu'il est raisonnable. Lorsque la présente Partie 2-010 spécifie "addition", "modification", "remplacement", ou "suppression", il convient que l'exigence, la modalité d'essai ou la note correspondante de la Partie 1 soit adaptée en conséquence.

Dans la présente norme:

1) les caractères d'imprimerie suivants sont utilisés:
   – exigences: caractères romains;
   – NOTES petits caractères romains;
   – *conformité et essais: caractères italiques;*
   – termes définis à l'Article 3 et utilisés dans toute la présente norme: PETITES MAJUSCULES ROMAINES;
2) les paragraphes, figures, tableaux et notes qui viennent en supplément de ceux de la Partie 1 sont numérotés à partir de 101. Les annexes supplémentaires sont identifiées par des lettres à partir de AA.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

**IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.**

# INTRODUCTION

Le présent Partie 2-010, la Partie 2-011 et la Partie 2-012 pris ensemble, couvrent les DANGERS spécifiques associés à l'échauffement et au refroidissement des matières par des appareils, et sont organisés comme suit:

| | |
|---|---|
| IEC 61010-2-010 | Couvre spécifiquement les DANGERS associés aux appareils comportant des systèmes d'échauffement. |
| IEC 61010-2-011 | Couvre spécifiquement les DANGERS associés aux appareils comportant des systèmes frigorifiques. |
| IEC 61010-2-012 | Couvre spécifiquement les DANGERS associés aux appareils comportant à la fois des systèmes d'échauffement et des systèmes frigorifiques qui interagissent entre eux de sorte que les systèmes d'échauffement et de refroidissement combinés génèrent des DANGERS supplémentaires ou plus graves pour les deux systèmes que s'ils sont traités séparément. Elle couvre également les DANGERS associés au traitement des matières par d'autres facteurs tels que l'exposition aux rayonnements, une humidité excessive, la présence de $CO_2$, un mouvement mécanique, etc. |

**Recommandations pour l'application de la ou des Parties 2 appropriées**

Lorsque l'appareil comprend uniquement un système d'échauffement des matières, et aucun système frigorifique, ou lorsque d'autres facteurs d'environnement s'appliquent, la Partie 2-010 s'applique sans que la Partie 2-011 ou la Partie 2-012 s'avère nécessaire. De même, lorsque l'appareil comprend uniquement un système frigorifique, et aucun système d'échauffement des matières, ou lorsque d'autres facteurs d'environnement s'appliquent, la Partie 2-011 s'applique sans que la Partie 2-010 ou la Partie 2-012 s'avère nécessaire. Toutefois, lorsque l'appareil comporte à la fois un système d'échauffement des matières et un système frigorifique ou lorsque les matières traitées dans l'application prévue génèrent une chaleur importante dans le système frigorifique, il convient de déterminer si l'interaction entre les deux systèmes engendre des DANGERS supplémentaires ou plus graves que si les systèmes étaient évalués séparément (température régulée, voir l'organigramme de la Figure 102 pour le processus de sélection). Lorsque l'interaction des fonctions de chauffage et de refroidissement n'engendre aucun DANGER supplémentaire ou plus grave, les deux Parties 2-010 et 2-011 s'appliquent pour leurs fonctions respectives. Inversement, si des DANGERS supplémentaires ou plus graves proviennent de la combinaison des fonctions de chauffage et de refroidissement, ou lorsque l'appareil inclut des facteurs de traitement des matières supplémentaires, la Partie 2-012 s'applique alors, et non les Parties 2-010 et 2-011.

**Quels DANGERS sont applicables dans le cas d'un système frigorifique?**

Les DANGERS propres à un système frigorifique (voir Figure 101) comprenant un motocompresseur, un condenseur, un dispositif de dilatation et un évaporateur incluent entre autres:

– La température maximale côté basse pression (température de retour) en direction du motocompresseur. Un motocompresseur comporte un moteur refroidi par fluide frigorigène, et il doit être établi que les températures maximales du côté basse pression dans les conditions les moins favorables ne dépassent pas les CARACTERISTIQUES ASSIGNEES d'isolation du moteur.

– La pression maximale côté basse pression au niveau de l'admission du motocompresseur. L'enveloppe du motocompresseur est exposée à cette pression et les CARACTERISTIQUES ASSIGNEES de conception du motocompresseur doivent être adaptées aux pressions les plus défavorables tout en fournissant la marge de sécurité correcte pour un récipient sous pression.

– La température maximale côté haute pression en direction du condenseur. Les températures côté haute pression dans les conditions les plus défavorables peuvent présenter un DANGER lié à la température en cas d'exposition de l'OPERATEUR ou de détérioration de l'isolation électrique.

– La pression maximale côté haute pression au niveau de la sortie du motocompresseur. Les composants frigorigènes en aval du motocompresseur jusqu'au niveau du dispositif de dilatation sont exposés à cette pression et leurs CARACTERISTIQUES ASSIGNEES de conception doivent être adaptées aux pressions les plus défavorables tout en fournissant la marge de sécurité appropriée pour un récipient sous pression.

– Les températures régulées maximales, à savoir les conditions de température de trempage auxquelles la chaleur est extraite, peuvent affecter la température maximale côté basse pression en direction du motocompresseur, ainsi que présenter un DANGER lié à la température en cas d'exposition de l'OPERATEUR ou de détérioration de l'isolation électrique. Que cette régulation de température soit issue d'une fonction de chauffage intégrée du dispositif ou de la chaleur dissipée de la matière refroidie, il convient d'évaluer l'effet dans les conditions les plus défavorables.

– Il convient d'établir l'appel de courant de l'appareil lorsque les conditions de fonctionnement les plus défavorables du système frigorifique sont prises en compte, y compris les cycles de dégivrage éventuels qui peuvent s'appliquer.

Les conditions les plus défavorables doivent être déterminées pour les appareils qui comprennent à la fois les conditions d'UTILISATION NORMALE les moins favorables, et les résultats d'essai les plus défavorables dans des CONDITIONS DE PREMIER DEFAUT.

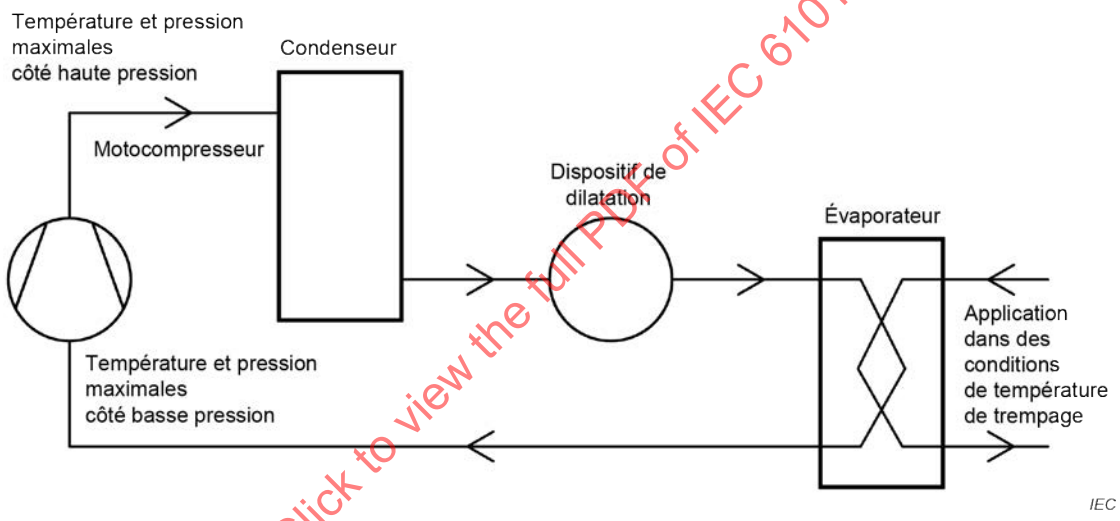


**Figure 101 – Schéma d'un système frigorifique comportant un condenseur**

Le processus de sélection est représenté dans l'organigramme suivant (voir Figure 102).

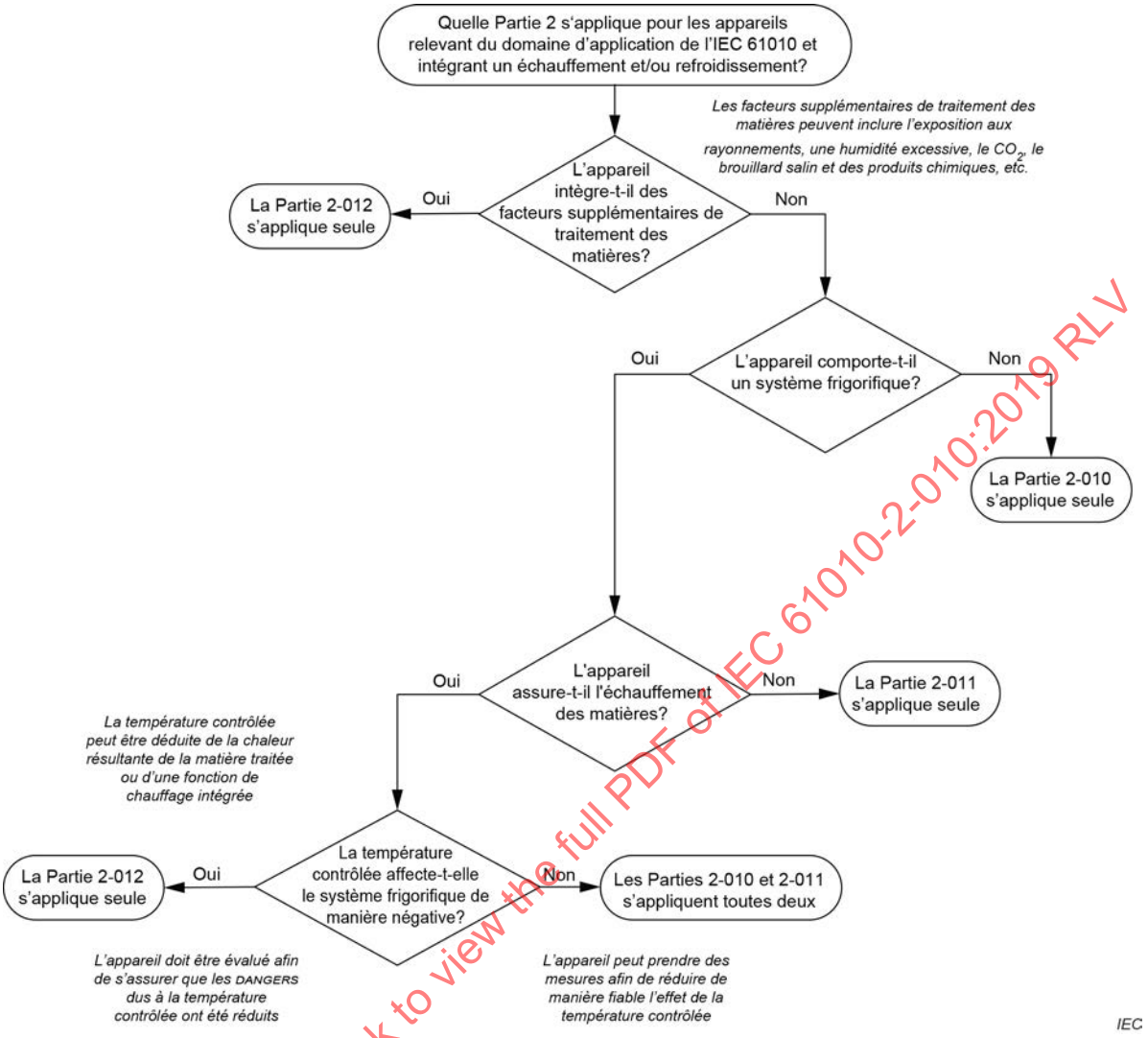


**Figure 102 – Organigramme représentant le processus de sélection**

# EXIGENCES DE SÉCURITÉ POUR APPAREILS ÉLECTRIQUES DE MESURAGE, DE RÉGULATION ET DE LABORATOIRE –

# Partie 2-010: Exigences particulières pour appareils de laboratoire utilisés pour l'échauffement des matières

## 1 Domaine d'application et objet

L'article de la Partie 1 est applicable à l'exception de ce qui suit:

### 1.1.1 Appareils inclus dans le domaine d'application

*Remplacement:*

*Remplacer le deuxième alinéa par ce qui suit:*

La présente partie de l'IEC 61010 spécifie les exigences de sécurité particulières pour les appareils électriques et leurs accessoires des types a) à c) suivants, quelle que soit l'utilisation à laquelle ils sont destinés, lorsque l'échauffement des matières est l'une des fonctions de l'appareil.

*Addition:*

*Ajouter le texte suivant après le point c):*

Il est possible qu'une ou toutes les parties de l'appareil relèvent du domaine d'application d'une ou plusieurs autres Parties 2 de l'IEC 61010, ainsi que du domaine d'application de la présente norme. En particulier, si l'appareil est prévu pour être utilisé pour l'IVD, les exigences de l'IEC 61010-2-101 s'appliquent également. Toutefois, lorsque l'appareil comprend un système frigorifique et une fonction de chauffage dont la combinaison des deux introduit des dangers supplémentaires ou plus graves que lorsque le traitement est réalisé séparément, alors il est possible que l'IEC 61010-2-012 soit applicable à la place de la présente Partie 2-010.

De plus amples informations sur le processus de sélection sont données dans l'organigramme (Figure 102) et des recommandations sont données dans l'Introduction.

### 1.1.2 Appareils exclus du domaine d'application

*Addition:*

*Ajouter les points suivants après le point j):*

aa) appareils pour l'échauffement et la ventilation des laboratoires;

bb) appareils de stérilisation;

cc) appareil de chauffage et/ou de refroidissement à l'intérieur duquel il est prévu que l'OPERATEUR entre, et qui est assez grand pour que l'OPERATEUR puisse s'y tenir avec la ou les portes fermées.

## 2 Références normatives

L'article de la Partie 1 est applicable à l'exception de ce qui suit:

*Addition:*

*Ajouter la référence suivante à la liste:*

ISO 7010, *Symboles graphiques – Couleurs de sécurité et signaux de sécurité – Signaux de sécurité enregistrés* (disponible à l'adresse http://www.iso.org/obp)

## 3 Termes et définitions

L'article de la Partie 1 est applicable à l'exception de ce qui suit:

### 3.2 Parties et accessoires

*Addition:*

*Ajouter le nouveau terme et la nouvelle définition ci-dessous:*

**3.2.101**
**MOYEN DE TRANSFERT DE CHALEUR**
moyen utilisé pour transférer de la chaleur à la matière traitée

## 4 Essais

L'article de la Partie 1 est applicable à l'exception de ce qui suit:

### 4.4.2.11 Dispositifs de chauffage

*Addition:*

*Ajouter le nouveau texte suivant après le texte existant:*

Si un DANGER peut être provoqué par un excès ou un manque de remplissage avec un MOYEN DE TRANSFERT DE CHALEUR à l'état liquide, l'appareil doit être soumis à l'essai à vide, partiellement rempli ou trop rempli, selon le cas le moins favorable. En cas de doute, l'essai doit être réalisé dans différentes conditions. Le MOYEN DE TRANSFERT DE CHALEUR utilisé pour l'essai doit être d'un type spécifié pour une UTILISATION NORMALE.

## 5 Marquage et documentation

L'article de la Partie 1 est applicable à l'exception de ce qui suit:

### 5.1.3 Alimentation RÉSEAU

*Addition:*

*Ajouter le nouveau texte suivant à la fin du point c):*

Si, pour des durées inférieures ou égales à 1 min après l'ouverture de l'interrupteur, la puissance réelle ou le courant réel est susceptible d'être beaucoup plus élevé que la puissance ou le courant ASSIGNE maximal indiqué, le maximum à court terme peut être indiqué entre parenthèses après la puissance ou le courant ASSIGNE maximal.

**Tableau 1 – Symboles**

*Addition:*

*Ajouter le nouveau symbole suivant au Tableau 1:*

| Numéro | Symbole | | Publication | Description |
|---|---|---|---|---|
| 101 |  | Couleur de fond<br>– jaune (facultatif, sauf vert);<br>symbole et contour<br>– noir (facultatif). | ISO 7010-W021:2011<br>-05 | Avertissement;<br>Matière inflammable |

### 5.1.6 Interrupteurs et disjoncteurs

*Addition:*

*Ajouter le nouveau texte suivant après le dernier alinéa qui précède l'alinéa relatif à la conformité:*

Pour les étuves et appareils similaires, il doit y avoir une indication de la position "MARCHE" de chaque côté de l'appareil comportant une porte ou comportant toute ouverture destinée à charger du matériel.

### 5.4.3 Installation des appareils

*Remplacement:*

*Remplacer le texte par le nouveau texte suivant:*

La documentation doit inclure les instructions d'installation et de mise en service spécifique et, si cela est nécessaire pour la sécurité, des avertissements contre les DANGERS susceptibles de survenir durant l'installation ou la mise en service, ou en raison d'une installation ou d'une mise en service inappropriée de l'appareil. De telles informations comprennent, le cas échéant:

a) les exigences relatives à l'assemblage, au placement et au montage. Si un DANGER peut être causé par la chute d'éléments chauds de l'appareil, par exemple lorsqu'une porte est ouverte, il doit y avoir un avertissement indiquant que l'appareil ne doit pas être monté sur une surface en matière inflammable;

b) les instructions pour la mise à la terre de protection;

c) les branchements à l'alimentation, et pour les appareils dont les parties ACTIVES DANGEREUSES peuvent nécessiter d'être ACCESSIBLES (voir 6.1.2), une spécification exigeant l'installation d'un disjoncteur à courant différentiel résiduel;

d) pour les APPAREILS BRANCHES EN PERMANENCE:

   1) les exigences relatives à l'installation de l'alimentation;

   2) les exigences relatives à tout interrupteur ou disjoncteur extérieur (voir 6.11.3.1) et à tout dispositif de protection contre les surintensités extérieurs (voir 9.6.2), ainsi qu'une recommandation pour que l'interrupteur ou le disjoncteur soit placé près de l'appareil;

e) les exigences relatives à la ventilation;

f) les exigences et caractéristiques de sécurité concernant les services externes spéciaux, par exemple: températures maximale et minimale, pression, ou flux d'air ou liquide de refroidissement.

g) le niveau acoustique maximal produit par l'appareil qui émet le son, si le mesurage est exigé par 12.5.1;

h) les instructions concernant le niveau acoustique (voir 12.5.1);

i) toute exigence relative au séchage (voir 5.4.3.101);

j) si l'échauffement des matières peut entraîner l'échappement de substances dangereuses: les instructions d'installation doivent avertir de tout besoin d'un système d'extraction, de dispositifs de limitation de température additionnels relatifs à des températures sûres pour les matières, ou toutes autres mesures nécessaires (voir aussi Note 2 de 5.4.1).

NOTE Un système d'extraction est un système qui évacue l'air du bâtiment, ce n'est pas un système de recyclage.

Il est recommandé d'ajouter à la documentation d'installation une déclaration indiquant que la sécurité de tout système comprenant l'appareil est de la responsabilité du monteur du système.

*La conformité est vérifiée par examen.*

*Addition:*

*Ajouter le nouveau paragraphe suivant:*

#### 5.4.3.101 Séchage

Si, après le transport ou le stockage dans des conditions humides, les appareils sont susceptibles de ne plus réussir à satisfaire à toutes les exigences relatives à la sécurité du présent document, les instructions d'installation doivent spécifier une période de fonctionnement pour sécher les appareils et les remettre en CONDITION NORMALE. Les instructions doivent inclure un avertissement précisant que les appareils sont susceptibles de ne pas satisfaire à toutes les exigences relatives à la sécurité du présent document pendant le séchage.

*La conformité est vérifiée par examen.*

### 5.4.4 Fonctionnement de l'appareil

*Addition:*

*Ajouter ce qui suit à la fin du point g):*

(voir 5.4.4.101);

*Ajouter ce qui suit après le point j):*

aa) une spécification de protection complémentaire nécessaire à l'OPERATEUR lorsqu'il est autorisé que les parties ACTIVES DANGEREUSES soient ACCESSIBLES (voir 6.1.2.101);

bb) un avertissement contre tous les DANGERS possibles d'explosion, d'implosion ou de libération de gaz toxiques ou inflammables émanant des matières en cours d'échauffement (voir aussi 5.4.4 h));

cc) une spécification des MOYENS DE TRANSFERT DE CHALEUR qui sont appropriés pour l'utilisation, par exemple les liquides pour une utilisation dans un bain chauffant;

dd) les exigences spécifiques relatives à la ventilation.

*Addition:*

*Ajouter le nouveau paragraphe suivant:*

#### 5.4.4.101 Nettoyage et décontamination

Les instructions doivent inclure les recommandations relatives au nettoyage et, si nécessaire, à la décontamination, ainsi que les noms génériques reconnus des matières recommandées pour le nettoyage et la décontamination, et une indication des matières susceptibles d'être