

REDLINE VERSION



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**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

DISCLAIMER

This Redline version is not an official Standard and is intended to provide the user with an indication of what changes have been made to the previous version. Only the IEC International Standard provided in this package is to be considered the official Standard.

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its 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.

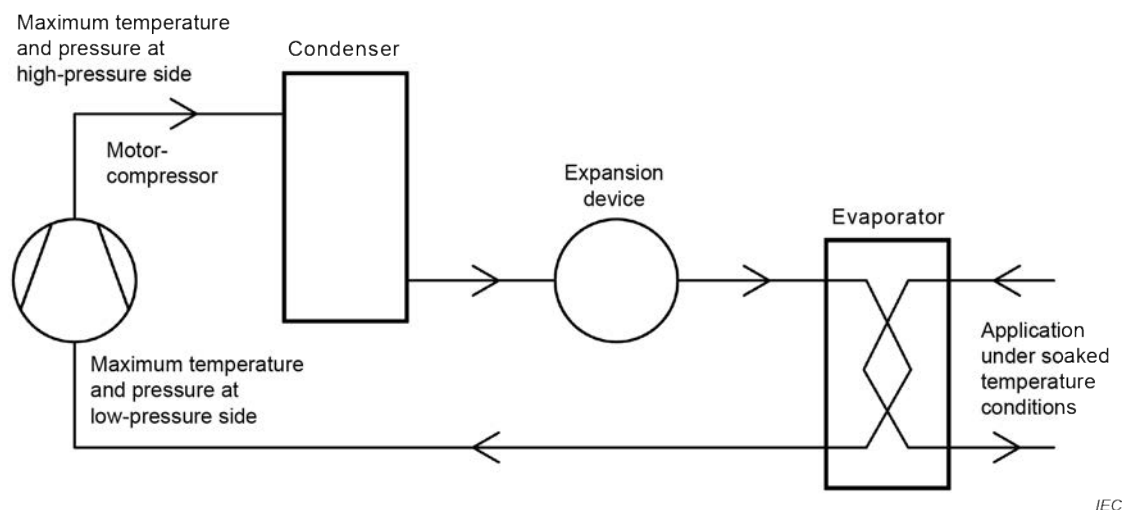
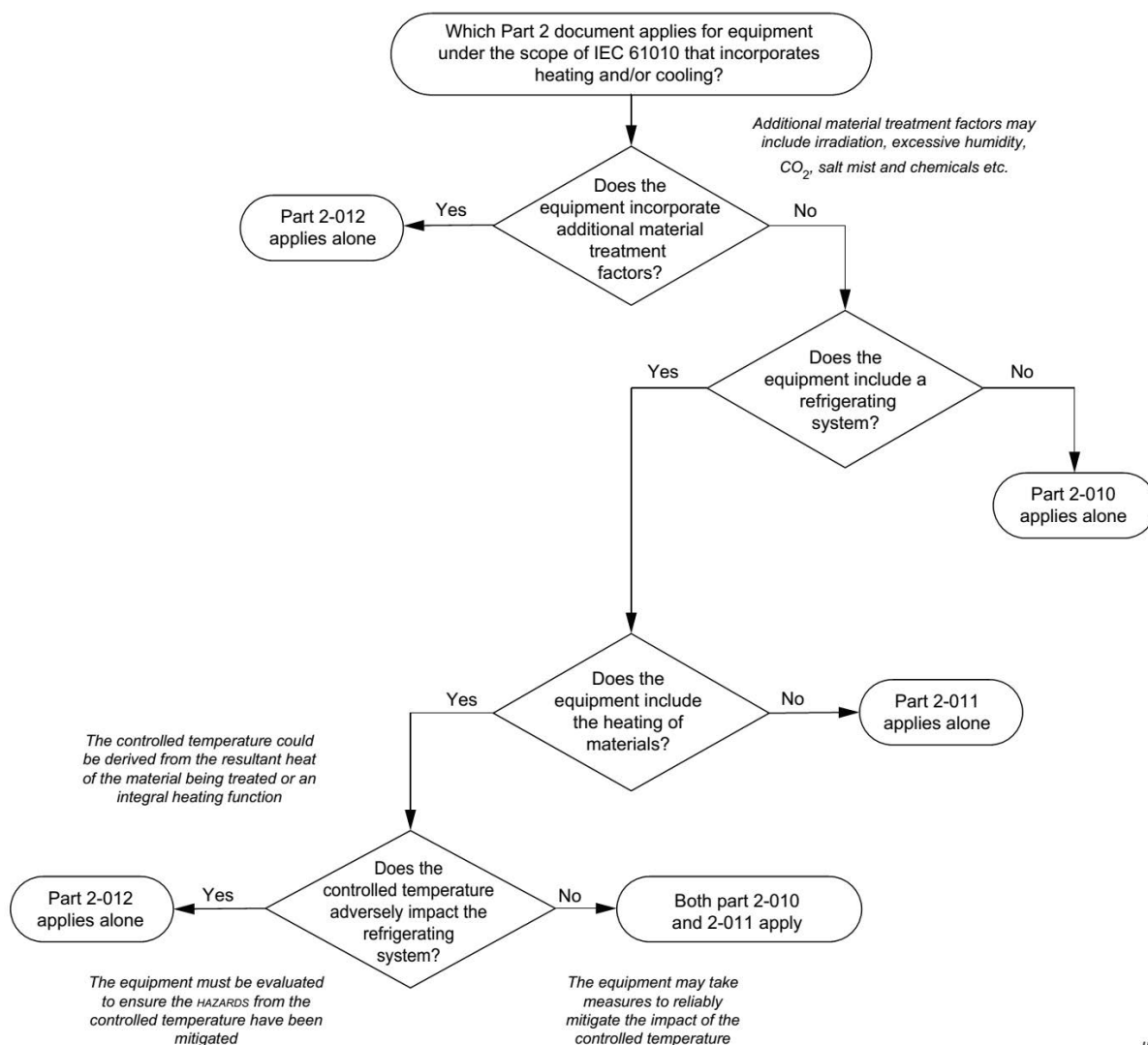


Figure 101 – Schema of a refrigerating system incorporating a condenser

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



IEC

Figure 102 – Flow chart illustrating the selection process

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

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

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

Replace the second paragraph by the following:

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

~~NOTE If all or part of the equipment falls within the scope of one or more other part 2 standards of IEC 61010 as well as within the scope of this standard, it will also need to meet the requirements of those other part 2 standards. In particular, if equipment is intended to be used for IVD purposes, it will need to meet the requirements of IEC 61010-2-101.~~

Addition:

Add the following text after item c):

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>)

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOR MEASUREMENT, CONTROL AND LABORATORY USE –****Part 2-010: Particular requirements for laboratory
equipment for the heating of materials**

FOREWORD

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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.

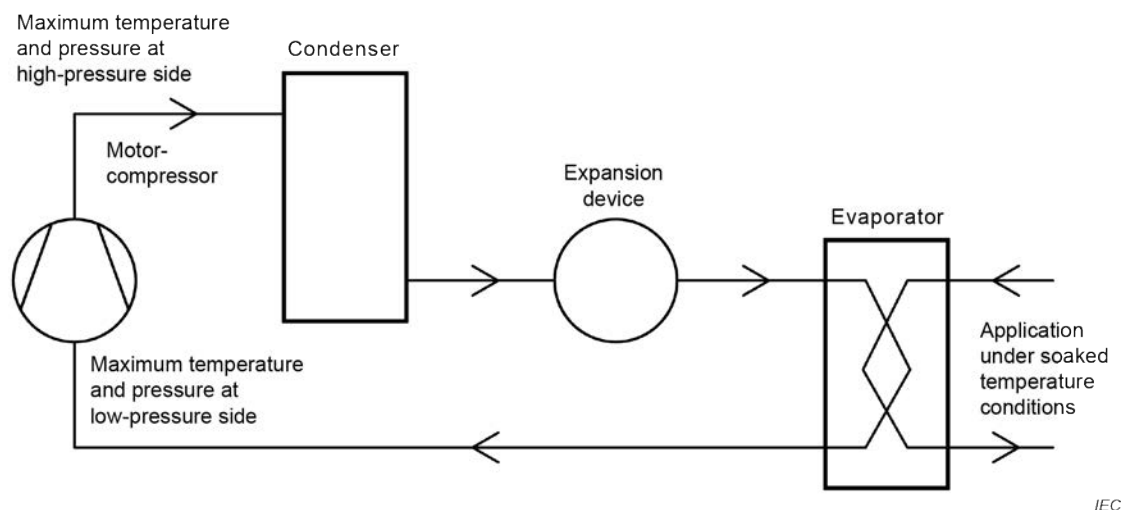
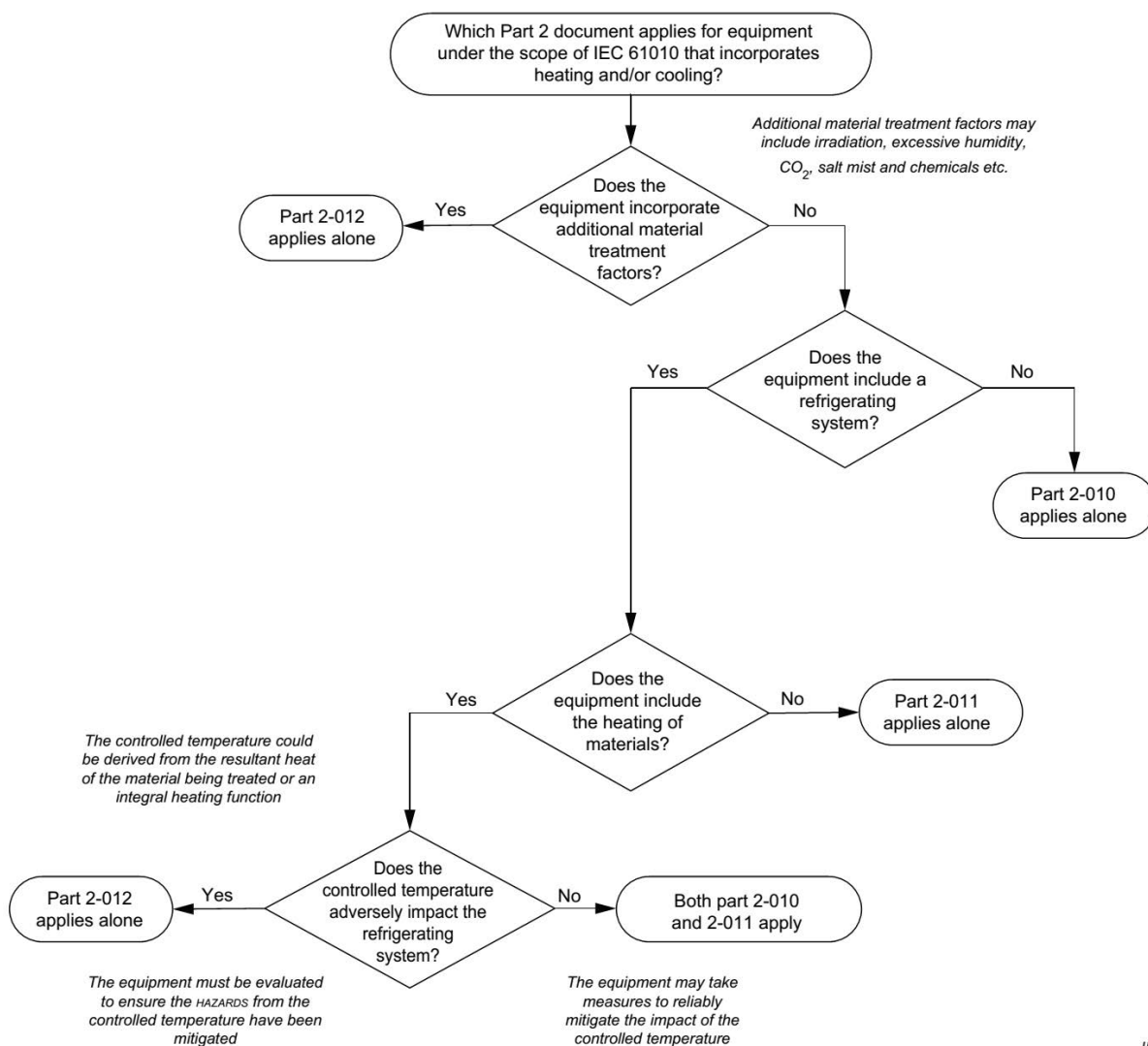


Figure 101 – Schema of a refrigerating system incorporating a condenser

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



IEC

Figure 102 – Flow chart illustrating the selection process

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

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

1 Scope and object

This clause of Part 1 is applicable except as follows:

1.1.1 Equipment included in scope

Replacement:

Replace the second paragraph by the following:

This part of IEC 61010 specifies particular safety requirements for 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>)

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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

AVANT-PROPOS

- 1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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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 mesure, 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 DEF AUT.

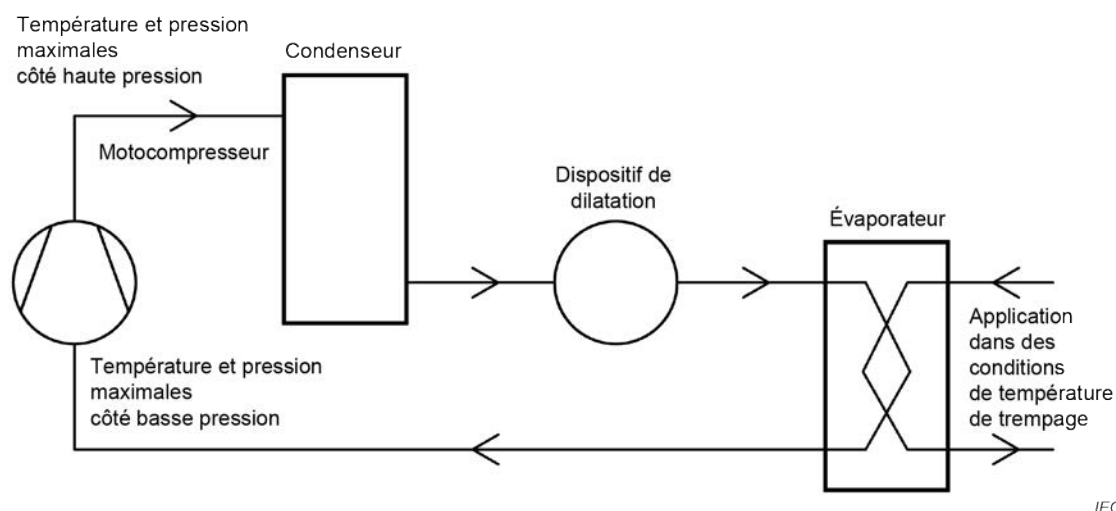
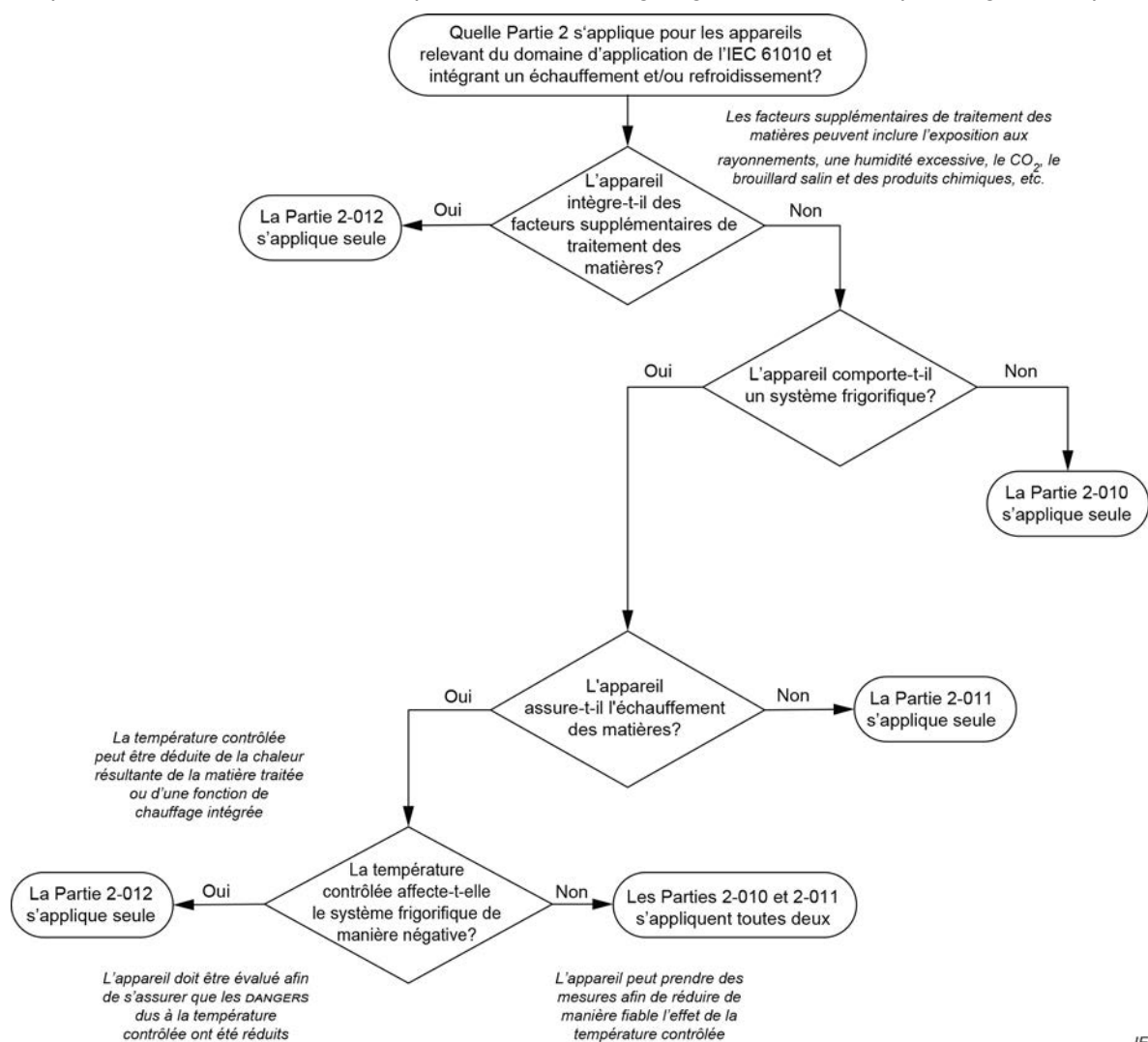


Figure 101 – Schéma d'un système frigorifique comportant un condenseur

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



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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'OPÉRATEUR entre, et qui est assez grand pour que l'OPÉRATEUR 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>)