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2-091: ERINÕUDED KAPPTÜÜPI  
RÖNTGENSEADMETELE

Safety requirements for electrical equipment for  
measurement, control and laboratory use - Part 2-091:  
Particular requirements for cabinet X-ray systems

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

|                                                                                                                         |                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| See Eesti standard EVS-EN IEC 61010-2-091:2021 sisaldab Euroopa standardi EN IEC 61010-2-091:2021 ingliskeelset teksti. | This Estonian standard EVS-EN IEC 61010-2-091:2021 consists of the English text of the European standard EN IEC 61010-2-091:2021.                    |
| Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.                                                      | This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation. |
| Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 30.04.2021.     | Date of Availability of the European standard is 30.04.2021.                                                                                         |
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English Version

Safety requirements for electrical equipment for measurement,  
control and laboratory use - Part 2-091: Particular requirements  
for cabinet X-ray systems  
(IEC 61010-2-091:2019)

Règles de sécurité pour appareils électriques de mesurage,  
de régulation et de laboratoire - Partie 2-091: Exigences  
particulières pour les équipements à rayons X montés en  
armoire  
(IEC 61010-2-091:2019)

Sicherheitsbestimmungen für elektrische Mess-, Steuer-,  
Regel- und Laborgeräte - Teil 2-091: Besondere  
Anforderungen für Röntgengeräteschränke  
(IEC 61010-2-091:2019)

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Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

## European foreword

The text of document 66/684/FDIS, future edition 2 of IEC 61010-2-091, prepared by IEC/TC 66 "Safety of measuring, control and laboratory equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61010-2-091:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2022-04-01 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-04-01 document have to be withdrawn

This document supersedes EN 61010-2-091:2012 and all of its amendments and corrigenda (if any).

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For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of EN IEC 61010-2-091:2021/A11:2021.

## Endorsement notice

The text of the International Standard IEC 61010-2-091:2019 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

|                    |      |                                     |
|--------------------|------|-------------------------------------|
| IEC 60601-1-3      | NOTE | Harmonized as EN 60601-1-3          |
| IEC 60846-1        | NOTE | Harmonized as EN 60846-1            |
| IEC 61508 (series) | NOTE | Harmonized as EN 61508 (series)     |
| IEC 62304          | NOTE | Harmonized as EN 62304              |
| ISO 12100          | NOTE | Harmonized as EN ISO 12100          |
| ISO 13849 (series) | NOTE | Harmonized as EN ISO 13849 (series) |
| ISO 13849-2        | NOTE | Harmonized as EN ISO 13849-2        |

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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

**Part 2-091: Particular requirements for cabinet X-ray systems**

**Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –**

**Partie 2-091: Exigences particulières pour les équipements à rayons X montés en armoire**



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# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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

**Part 2-091: Particular requirements for cabinet X-ray systems**

**Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –**

**Partie 2-091: Exigences particulières pour les équipements à rayons X montés en armoire**

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ELECTROTECHNICAL  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT  
FOR MEASUREMENT, CONTROL, AND LABORATORY USE –****Part 2-091: Particular requirements for cabinet X-ray systems**

## FOREWORD

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International Standard IEC 61010-2-091 has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

This second edition cancels and replaces the first edition published in 2012. It constitutes a technical revision.

This edition includes the following significant changes from the first edition, as well as numerous other changes:

- The scope of the document has been clarified and limited to equipment up to 500 kV.
- Additional marking requirements for X-ray generating assemblies have been added. (5.1)
- Requirements for high-voltage cables used in the X-ray assembly have been added. (6.5)
- Insulation requirements have been added. (6.7)
- Temperature requirements for beam-limiting devices have been added. (10.3)

- Clarification has been provided on PROTECTED EQUIPMENT and PARTIALLY PROTECTED EQUIPMENT, and test methods. (12)
- Requirements for INTERLOCKS have been modified, taking into account functional safety standards. (15)
- Requirements for reasonably foreseeable misuse have been clarified. (16)
- Risk assessment has been made mandatory for specific aspects. (17)

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

|             |                  |
|-------------|------------------|
| FDIS        | Report on voting |
| 66/684/FDIS | 66/686A/RVD      |

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.

This document is intended to be used in conjunction with IEC 61010-1. It was established on the basis of the third edition (2010) of IEC 61010-1, including its Amendment 1 (2016), hereinafter referred to as Part 1.

This Part 2-091 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for cabinet X-ray systems*.

Clauses of Part 1 that are fully applicable are indicated by the statement "This clause of Part 1 is applicable." Where this Part 2-091 identifies a particular subclause and states "addition", "modification", "replacement", or "deletion", the text of that particular subclause Part 1 is adapted accordingly. Where a particular subclause of Part 1 is not mentioned in this Part 2-091, that subclause applies as far as is reasonable.

In this standard:

- a) the following print types are used:
  - requirements: in roman type;
  - NOTES: in small roman type;
  - conformity and tests: *in italic type*;
  - terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS.
- b) subclauses, figures, and tables which are additional to those in Part 1 are numbered starting from 101. Additional annexes are lettered starting from AA and additional list items are lettered from aa).

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website 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.

## INTRODUCTION

IEC 61010-1 specifies the safety requirements that are generally applicable to all equipment within its scope. For certain types of equipment, the requirements of IEC 61010-1 and its amendments will be supplemented or modified by the special requirements of one, or more than one, particular Part 2s of the standard, which are to be read in conjunction with the Part 1 requirements.

This document has been prepared, based on IEC 61010-1:2010 including its Amendment 1:2016, to specify additional safety requirements for cabinet X-ray systems. It provides additional guidance for construction and assessment of extra high voltage circuits, mechanical HAZARDS and ionizing radiation HAZARDS which can be present in this type of equipment.

This document has been written to provide protection against both radiation HAZARDS from the direct X-ray beam and any scattered X-radiation caused by reflections of the X-ray beam on any part of the equipment or on the sample subjected to X-rays.

The minimum safety requirements specified in this document are considered to provide for a practical degree of safety in the operation of cabinet X-ray systems.

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

### Part 2-091: Particular requirements for cabinet X-ray systems

#### 1 Scope and object

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

##### 1.1 Scope

##### 1.1.1 Equipment included in scope

*Deletion:*

*Delete the first paragraph.*

*Replacement:*

*Replace the second paragraph (above items a) to c)) with the following new text:*

This part of IEC 61010 specifies particular safety requirements for cabinet X-ray systems, which fall under any of categories a), b) or c) below.

*Addition:*

*Add the two following new paragraphs at the end of the subclause:*

Equipment covered by this document can be both PROTECTED EQUIPMENT or PARTIALLY PROTECTED EQUIPMENT, with X-ray generator voltage up to 500 kV.

A cabinet X-ray system is a system that contains an X-ray tube installed in a cabinet, which, independently of existing architectural structures except the floor on which it may be placed, is intended to contain at least that portion of a material being irradiated, provide radiation attenuation and prevent operator access to the radiation beam, during generation of X-radiation.

These cabinet X-ray systems are used in industrial, commercial, and public environments, for example, to inspect materials, to analyse materials, and to screen baggage.

##### 1.1.2 Equipment excluded from scope

*Addition:*

*Add the following new items to the list:*

- aa) Equipment intended to apply X-radiation to humans or animals;
- bb) Equipment incorporating an X-ray tube but not incorporating complete shielding against X-radiation HAZARDS, such as:
  - equipment intended to be used within a shielded room which excludes personnel during operation;
  - equipment intended to be used with separate portable or temporary shielding;
  - equipment intended to produce an emerging beam of X-radiation.

## 1.2 Object

### 1.2.1 Aspects included in scope

*Addition:*

*Add the following new text to the end of the first paragraph:*

This part of IEC 61010 specifies requirements for the design and methods of construction of cabinet X-ray systems to provide adequate protection for OPERATORS, bystanders, trained service personnel and the surrounding area against unintentionally-emitted X-radiation and from mechanical HAZARDS related to their conveyors.

## 2 Normative references

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

*Addition:*

*Add the following references to the list:*

IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

ISO 13849-1, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

## 3 Terms and definitions

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

### 3.2 Parts and accessories

*Addition:*

*Add the following new terms and definitions:*

#### 3.2.101

##### ACCESS PANEL

PROTECTIVE BARRIER or panel which is designed to be removed or opened through the use of a TOOL for maintenance or service purposes to permit access to the interior of the cabinet

#### 3.2.102

##### APERTURE

opening in the outside surface of the cabinet, other than a PORT, which remains open during generation of X-radiation

#### 3.2.103

##### DOOR

PROTECTIVE BARRIER which is designed to be movable or opened for routine operation purposes, does not generally require TOOLS to open and permits access to the interior of the cabinet

Note 1 to entry: Inflexible hardware rigidly affixed to the DOOR is considered part of the DOOR.

Note 2 to entry: Access openings intended for the OPERATOR, for removal or re-alignment of samples, are considered as a DOOR.