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**Measurement of radioactivity —  
Gamma ray and beta emitting  
radionuclides — Test method to assess  
the ease of decontamination of surface  
materials**

*Mesurage de la radioactivité — Radionucléides émetteurs gamma et  
bêta — Méthode d'essai pour évaluer l'aptitude à la décontamination  
des matériaux de surface*



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# Contents

Page

<b>Foreword</b>	<b>iv</b>
<b>Introduction</b>	<b>v</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normatives references</b>	<b>1</b>
<b>3 Terms, definitions and symbols</b>	<b>2</b>
3.1 Terms and definitions	2
3.2 Symbols	3
<b>4 Principle</b>	<b>4</b>
<b>5 Apparatus</b>	<b>4</b>
<b>6 Contamination and decontamination agents</b>	<b>6</b>
6.1 Contaminant solutions	6
6.1.1 Composition of contaminant solutions	6
6.1.2 Preparation of the contaminant solutions	6
6.1.3 Preparation of contaminant solution using neutron activation	7
6.1.4 Storage of the contaminant solution	8
6.2 Decontaminant solution	8
<b>7 Test specimens</b>	<b>8</b>
7.1 Preparation and preliminary testing	8
7.1.1 Resistance to cleaning solution	8
7.1.2 Test specimens of non-metallic materials	8
7.1.3 Test specimens of metallic materials	9
7.2 Number and dimensions	9
7.3 Conditioning and cleaning	9
<b>8 Procedure</b>	<b>10</b>
8.1 Determining the specific pulse rate of each contaminant solution	10
8.2 Contamination	10
8.3 Decontamination	12
8.4 Determining the residual pulse rate	13
<b>9 Calculation of results and assessment of ease of decontamination</b>	<b>14</b>
<b>10 Test report</b>	<b>15</b>
<b>Annex A (informative) Holder for contamination of test specimen</b>	<b>16</b>
<b>Annex B (normative) Cage-stirrer apparatus for decontamination</b>	<b>18</b>
<b>Annex C (informative) Formulae for preparation of the <math>^{137}\text{Cs}</math> and <math>^{60}\text{Co}</math> contaminant solutions</b>	<b>27</b>
<b>Annex D (informative) Calculations for the production of the contaminant solution using neutron activation</b>	<b>30</b>
<b>Annex E (informative) Example of a test report</b>	<b>32</b>
<b>Bibliography</b>	<b>34</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 2, *Radiological protection*.

This second edition cancels and replaces the first edition (ISO 8690:1988), which has been technically revised. The main changes compared to the previous edition are as follows:

- title was changed and adapted to measurement of radioactivity (or gamma ray and beta emitting radionuclides);
- opening to further applications;
- adding of symbols of the used measurands;
- improvement in readability;
- adaption to current standards;
- insert preparation of contaminant solution using neutron activation;
- adding a new annex with calculations using neutron activation.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

Wherever radioactivity is used, there is a risk that surfaces can become contaminated through contact with radioactivity in solution or airborne radioactivity. It is normally necessary to remove this surface contamination to reduce the risk to staff from accidental ingestion of the radioactivity on the surface. The ease of decontaminating surface materials is therefore an important parameter to consider when selecting materials to use, e.g. for facilities in the nuclear industry, in radionuclide laboratories or nuclear medicine facilities.

This document defines a quantitative method under objective conditions for testing the ease of decontamination of surface materials. The method enables the comparison of different surface materials to support decisions on materials to use for different applications.

For the test, radioactive solutions are deposited onto a sample of the material being studied. The solutions contain radionuclides commonly found in the nuclear industry ( $^{60}\text{Co}$ ,  $^{137}\text{Cs}$  or  $^{134}\text{Cs}$ ) and are in aqueous form. The surface is then cleaned and the residual activity on the surface is measured to give a quantitative measure of the ease of decontamination.

The results of the tests on different materials therefore help the user select the best surface material for the application being considered.



# Measurement of radioactivity — Gamma ray and beta emitting radionuclides — Test method to assess the ease of decontamination of surface materials

## 1 Scope

This document applies to the testing of surfaces that may become contaminated by radioactive materials.

The ease of decontamination is a property of a surface and an important criterion for selecting surface materials used in the nuclear industry, interim storage or disposal facilities from which contamination can be removed easily and rapidly without damaging the surface. The test described in this document is a rapid laboratory-based method to compare the ease of decontamination of different surface materials.

The results from the test can be one parameter to take into account when selecting surface coatings such as varnish or impervious layers such as ceramics and other surfaces. The radionuclides used in this test are those commonly found in the nuclear industry ( $^{137}\text{Cs}$ ,  $^{134}\text{Cs}$  and  $^{60}\text{Co}$ ) in aqueous form. The test can also be adopted for use with other radionuclides and other chemical forms, depending on the customer requirements, if the solutions are chemically stable and do not corrode the test specimen.

The test does not measure the ease of decontamination of the surface materials in practical use, as this depends on the radionuclide(s) present, their chemical form, the duration of exposure to the contaminant and the environmental conditions amongst other factors.

The test method is not intended to describe general decontamination procedures or to assess the efficiency of decontamination procedures (see ISO 7503 series).

The test method is not suitable for use of radiochemicals if the radionuclide emit low energy gamma rays or beta particles that are readily attenuated in the surface.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15, *Rolling bearings — Radial bearings — Boundary dimensions, general plan*

ISO 273, *Fasteners — Clearance holes for bolts and screws*

ISO 2009, *Slotted countersunk flat head screws — Product grade A*

ISO 2010, *Slotted raised countersunk head screws — Product grade A*

ISO 3819, *Laboratory glassware — Beakers*

ISO 4762, *Hexagon socket head cap screws*

ISO 11074, *Soil quality — Vocabulary*

ISO 80000-10, *Quantities and units — Part 10: Atomic and nuclear physics*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

### 3 Terms, definitions and symbols

#### 3.1 Terms and definitions

For the purposes of this document, the definitions, symbols and abbreviations defined in ISO 11074, ISO 80000-10, ISO/IEC Guide 98-3 and ISO/IEC Guide 99, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

##### 3.1.1

##### **surface contamination**

radioactive substances deposited on defined surfaces

[SOURCE: ISO 7503-1:2016, 3.1.2]

##### 3.1.2

##### **decontamination**

complete or partial removal of radioactive contamination by a deliberate physical, chemical, or biological process

[SOURCE: ISO 12749-3:2015, 3.7.11.2]

Note 1 to entry: It is preferred that decontamination does not significantly change the characteristics of the surface.

##### 3.1.3

##### **specific pulse rate**

$I_s$

pulse rate caused in the measuring apparatus under given geometrical conditions by 1 ml of a contaminant solution

Note 1 to entry: It is expressed in pulses per minute standardized on 1 ml of the contaminant solution. Pulse rates are derived from count rates applying dead time and background corrections.

##### 3.1.4

##### **residual pulse rate**

$I_r$

pulse rate caused in the measuring apparatus under given geometrical conditions by the residual radionuclide on the tested side of the specimen after *decontamination* (3.1.2)

Note 1 to entry: It is expressed in pulses per minute.

##### 3.1.5

##### **mean residual pulse rate**

$\bar{I}_r$

arithmetic mean of the residual pulse rate values obtained for the five test specimens contaminated by the same radionuclide

Note 1 to entry: It is expressed in pulses per minute.