

INTERNATIONAL STANDARD

**Nuclear instrumentation – Housed scintillators – Test methods of light output
and intrinsic resolution**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

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

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

INTERNATIONAL STANDARD

**Nuclear instrumentation – Housed scintillators – Test methods of light output
and intrinsic resolution**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.120.01

ISBN 978-2-8322-9322-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 Terms, definitions, symbols and abbreviated terms.....	5
3.1 Terms and definitions.....	5
3.2 Symbols and abbreviated terms	7
4 Test methods of basic parameters of housed scintillators	9
4.1 General.....	9
4.1.1 Test conditions	9
4.1.2 The sources of ionizing radiation	9
4.1.3 The assembly test conditions.....	10
4.2 Test methods of nonlinearity and instability of the assembly	10
4.2.1 Nonlinearity measurement	10
4.2.2 Instability measurement.....	12
4.3 Test methods of the intrinsic resolution, light output of the housed scintillator and PMT spectrometric constant.....	13
4.3.1 Equipment	13
4.3.2 Measurements	13
4.3.3 Processing of results	14
4.4 Test methods of the light output.....	15
4.4.1 General	15
4.4.2 Measurements.....	15
4.4.3 Processing of results	16
4.5 Test methods of the intrinsic resolution	16
4.5.1 Determination of PMT spectrometric constant.....	16
4.5.2 Test method of the intrinsic resolution for housed scintillator	17
Bibliography.....	19
Table 1 – Source of ionizing radiation	9

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**NUCLEAR INSTRUMENTATION – HOUSED SCINTILLATORS –
TEST METHODS OF LIGHT OUTPUT AND INTRINSIC RESOLUTION**

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.

International Standard IEC 62372 has been prepared by IEC technical committee 45: Nuclear instrumentation.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- Title has been modified.
- To review the existing requirements and to update the terminology, definitions and normative references.

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

FDIS	Report on voting
45/913/FDIS	45/915/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.

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.

NUCLEAR INSTRUMENTATION – HOUSED SCINTILLATORS – TEST METHODS OF LIGHT OUTPUT AND INTRINSIC RESOLUTION

1 Scope

This document is applicable to housed scintillators for registration and spectrometry of alpha-, beta-, gamma-, X-ray and neutron radiation.

The main parameters, such as a light output and intrinsic resolution are established. This document specifies the requirements for the testing equipment and test methods of the basic parameters of housed scintillators, such as:

- the direct method is applicable to measure the light output of housed scintillators based on scintillation material. The housed scintillators certified by this method can be used as working standard of housed scintillators (hereinafter: working standard) when performing measurements by a relative method of comparison.
- the relative method of comparison with the working standard is applicable to housed scintillators based on the same scintillation material as the working standard.

This document does not apply to gas or liquid scintillators and scintillators for counting and current modes.

The numerical values of the parameters are set to the specific type of scintillators in the specifications.

2 Normative references

There are no normative references in this document.

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1.1 scintillator

luminescent material, usually liquid or solid, showing radioluminescence with a short afterglow

[SOURCE: IEC 60050-845:1987, 845-04-37]

3.1.2 housed scintillator

scintillator, housed in a container with a reflector and optical window