Measurement of internal electric field in insulating materials - Pressure wave propagation method

EESTI STANDARDIMIS- JA AKREDITEERIMISKESKUS
ESTONIAN CENTRE FOR STANDARDISATION AND ACCREDITATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 62836:2024 sisaldab Euroopa standardi EN IEC 62836:2024 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 62836:2024 consists of the English text of the European standard EN IEC 62836:2024.
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 05.04.2024.	Date of Availability of the European standard is 05.04.2024.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 17.220.99, 29.035.01

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 62836

April 2024

ICS 17.220.99; 29.035.01

English Version

Measurement of internal electric field in insulating materials - Pressure wave propagation method (IEC 62836:2024)

Mesurage du champ électrique interne dans les matériaux isolants - Méthode de l'onde de pression (IEC 62836:2024)

Messung des inneren elektrischen Feldes in Isoliermaterialien - Methode der Druckwellenausbreitung (IEC 62836:2024)

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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

Ref. No. EN IEC 62836:2024 E

European foreword

The text of document 112/627/FDIS, future edition 1 of IEC 62836, prepared by IEC/TC 112 "Evaluation and qualification of electrical insulating materials and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62836:2024.

The following dates are fixed:

•	latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop) 2025-01-03
•	latest date by which the national standards conflicting with the document have to be withdrawn	(dow) 2027-04-03

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62836:2024 was approved by CENELEC as a European Standard without any modification.

IEC 62836

Edition 1.0 2024-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Measurement of internal electric field in insulating materials – Pressure wave propagation method

Mesurage du champ électrique interne dans les matériaux isolants – Méthode de l'onde de pression

IEC 62836:2024-02(en-fr)

IEC Secretariat
3, rue de Varembé
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 Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. 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 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

IEC 62836

Edition 1.0 2024-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Measurement of internal electric field in insulating materials – Pressure wave propagation method

Mesurage du champ électrique interne dans les matériaux isolants – Méthode de l'onde de pression

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 17.220.99, 29.035.01

ISBN 978-2-8322-8338-7

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

MEASUREMENT OF INTERNAL ELECTRIC FIELD IN INSULATING MATERIALS – PRESSURE WAVE PROPAGATION METHOD

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62836 has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems. It is an International Standard.

This first edition cancels and replaces IEC TS 62836 published in 2020.

This edition includes the following significant technical changes with respect to IEC TS 62836:

a) addition of Clause 12 for the measurement of space charge distribution in a planar sample;
b) addition of Clause 13 for coaxial geometry samples;
c) addition of Annex D with measurement examples for coaxial geometry samples;
d) addition of a Bibliography;
e) measurement examples for a planar sample have been moved from Clause 12 in IEC TS 62836 to Annex C.

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

Draft	Report on voting
112/627/FDIS	112/632/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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

High-voltage insulating structures, especially high-voltage DC cables and capacitors etc., are subjected to charge accumulation and this can lead to electrical breakdown if the electric field produced by the charges exceeds the electrical breakdown threshold. With the trend to multiply power plants, especially green power plants such as wind or solar generators, more cables will be used for connecting these power plants to the grid and share the electric energy between countries. Therefore, a standardized procedure for testing how the internal electric field can be characterized has become essential for the materials used for the cables, and even the structure of these cables when considering electrodes or the junction between cables. The measurement of the internal electric field provides a tool for comparing materials and helps to establish thresholds on the internal electric field for high-voltage applications in order to avoid risks of breakdown as much as possible. The pressure wave propagation (PWP) method has been used by many researchers to measure the space charge distribution and the internal electric field distribution in insulators. However, since experimental equipment, with slight differences, is developed independently by researchers throughout the world, it is difficult to compare the measurement results between the different equipment.

The procedure outlined in this document provides a reliable point of comparison between different test results carried out by different laboratories in order to avoid interpretation errors. The method is suitable for a planar plaque sample as well as for a coaxial sample, with homogeneous insulating materials of thickness from 0,5 mm to 5 mm.

MEASUREMENT OF INTERNAL ELECTRIC FIELD IN INSULATING MATERIALS – PRESSURE WAVE PROPAGATION METHOD

1 Scope

This document provides an efficient and reliable procedure to test the internal electric field in the insulating materials used for high-voltage applications, by using the pressure wave propagation (PWP) method. It is suitable for a planar and coaxial geometry sample with homogeneous insulating materials of thickness larger or equal to 0,5 mm and an electric field higher than 1 kV/mm, but it is also dependent on the thickness of the sample and the pressure wave generator.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

3.1.1
pressure wave propagation
procedure where a pressure wave is propagated in a material containing electric charges and the induced electric signal from electrodes is measured.

3.1.2
interface charge
net layer of charges between two different materials, either two different insulators or a conductor and an insulator

3.1.3
space charge
net charge inside an insulating dielectric material

3.2 Abbreviated terms

CB	carbon black
EVA	ethylene vinyl acetate
LDPE	low density polyethylene
LIPP	laser induced pressure pulse
PE	polyethylene
PIPP	piezoelectric induced pressure pulse
PMMA	poly methyl methacrylate
PWP	pressure wave propagation
S/N	signal to noise ratio