

STN	Akumulátorové články a batérie na akumuláciu energie z obnoviteľných zdrojov. Všeobecné požiadavky a skúšobné metódy. Časť 2: Aplikácie on-grid.	STN EN 61427-2 36 4365
------------	---	--

Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 2: On-grid applications

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 04/16

Obsahuje: EN 61427-2:2015, IEC 61427-2:2015

122706

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2016
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

EUROPEAN STANDARD

EN 61427-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2015

ICS 29.220.20

English Version

Secondary cells and batteries for renewable energy storage -
General requirements and methods of test - Part 2: On-grid
applications
(IEC 61427-2:2015)

Accumulateurs pour le stockage de l'énergie renouvelable -
Exigences générales et méthodes d'essais - Partie 2:
Applications en réseaux
(IEC 61427-2:2015)

Wiederaufladbare Zellen und Batterien für die Speicherung
erneuerbarer Energien - Allgemeine Anforderungen und
Prüfverfahren - Teil 2: Netzgekoppelte Anwendungen
(IEC 61427-2:2015)

This European Standard was approved by CENELEC on 2015-10-02. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 21/862/FDIS, future edition 1 of IEC 61427-2, prepared by IEC/TC 21 "Secondary cells and batteries" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61427-2:2015.

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) 2016-07-02
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-10-02

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

Endorsement notice

The text of the International Standard IEC 61427-2:2015 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 60623	NOTE	Harmonized as EN 60623.
IEC 60730-1	NOTE	Harmonized as EN 60730-1.
IEC 60812	NOTE	Harmonized as EN 60812.
IEC 60896-11	NOTE	Harmonized as EN 60896-11.
IEC 60896-21	NOTE	Harmonized as EN 60896-21.
IEC 60896-22	NOTE	Harmonized as EN 60896-22.
IEC 61025	NOTE	Harmonized as EN 61025.
IEC 61427-1	NOTE	Harmonized as EN 61427-1.
IEC 61508	NOTE	Harmonized in EN 61508 series.
IEC 61508-7	NOTE	Harmonized as EN 61508-7.
IEC 62133	NOTE	Harmonized as EN 62133.
IEC 62259	NOTE	Harmonized as EN 62259.

IEC 62485-3	NOTE	Harmonized as EN 62485-3.
IEC 62619 ¹⁾	NOTE	Harmonized as EN 62619 ¹⁾ .
IEC 62620	NOTE	Harmonized as EN 62620.
IEC 62675	NOTE	Harmonized as EN 62675.

1) At draft stage..



INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Secondary cells and batteries for renewable energy storage – General requirements and methods of test –
Part 2: On-grid applications**

**Accumulateurs pour le stockage de l'énergie renouvelable – Exigences générales et méthodes d'essais –
Partie 2: Applications en réseau**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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: csc@iec.ch.

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.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

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 aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

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



INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Secondary cells and batteries for renewable energy storage – General requirements and methods of test –
Part 2: On-grid applications**

**Accumulateurs pour le stockage de l'énergie renouvelable – Exigences générales et méthodes d'essais –
Partie 2: Applications en réseau**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.220.20

ISBN 978-2-8322-2881-4

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 General considerations	13
5 General test conditions	14
5.1 Accuracy of measuring equipment	14
5.1.1 Voltage measurements	14
5.1.2 Current measurements	14
5.1.3 Temperature measurements	14
5.1.4 Time measurements	14
5.2 Test object considerations	14
5.3 Test object battery selection and size considerations	15
5.4 Test plan	16
6 Battery endurance	20
6.1 General	20
6.2 Test for endurance in frequency-regulation service	20
6.3 Test for endurance in load-following service	25
6.4 Test for endurance in peak-power shaving service	28
6.5 Test for endurance in photovoltaic energy storage, time-shift service	30
7 Battery properties and electrical performance	33
7.1 Declaration of the system properties	33
7.2 Determination of energy content at +25 °C ambient temperature	36
7.3 Determination of the energy efficiency during endurance tests at +25 °C ambient temperature	36
7.4 Determination of the energy efficiency during endurance tests at the minimum and maximum ambient temperature	38
7.5 Determination of waste heat generated during endurance tests at the maximum ambient temperature	42
7.6 Determination of energy requirements during periods of idle state at +25 °C ambient temperature	44
Annex A (informative) Battery-related hazards	47
A.1 General	47
A.2 Examples	47
Bibliography	49
Figure 1 – Boundary of the full-sized battery (FSB)	15
Figure 2 – Two-step selection process of the test object battery (TOB)	16
Figure 3 – Workflow for the determination of endurance properties and electrical performance of the TOB as governed by the sequence of test data generation within 6.2 to 6.5	17
Figure 4 – Sequence of performance tests carried out with TOB 1 within an endurance test 6.x	17
Figure 5 – Workflow and decision tree for endurance tests 6.2 through 6.5	19
Figure 6 – Frequency regulation service test routine profile (6.2) – Profile a	22
Figure 7 – Frequency regulation service test routine profile (6.2) – Profile b	22

Figure 8 – Frequency regulation service test routine profile (6.2) – Profile c	23
Figure 9 – Schematic view of the evolution of battery voltage over time during cycling with constant power discharge and charge pulses	24
Figure 10 – Load-following service test routine profile (6.3) – Profile a	26
Figure 11 – Load-following service test routine profile (6.3) – Profile b	27
Figure 12 – Load-following service test routine profile (6.3) – Profile c	27
Figure 13 – Daily peak-power shaving service test routine profile (6.4)	29
Figure 14 – Daily photovoltaic energy storage time-shift service test routine (6.5) – 3 kW	32
Figure 15 – Daily photovoltaic energy storage time-shift service test routine (6.5) – 30 kW	32
Figure 16 – Schematic view of the location of the two sets of energy values (energy to auxiliaries and energy to and from TOB) to be used for the determination of the energy storage efficiency factor η	37
Figure 17 – Schematic view of the location of the two sets of energy values (energy to auxiliaries and energy to and from battery) to be used for the determination of the amount of waste heat generated	43
Figure 18 – Schematic view of the location of the two sets of energy values (energy to auxiliaries and energy to battery) to be used for the determination of the energy requirements during periods of idle state of the battery	45
Table 1 – Summary of endurance test related electrical property data of the full-sized (FSB) and the test object (TOB) battery	34
Table 2 – Summary of physical dimension data of the full-sized battery (FSB)	35
Table 3 – Summary description of the full-sized battery (FSB)	35
Table 4 – Summary description of the test-object battery (TOB)	35
Table 5 – Summary of the constant power discharge performance of the TOB at an ambient temperature of $+25\text{ °C} \pm 3\text{ K}$	36
Table 6 – Summary of energy efficiencies determined in endurance tests at an ambient temperature of $+25\text{ °C} \pm 3\text{ K}$	38
Table 7 – Summary of energy efficiencies determined in endurance cycle tests at the minimum and maximum ambient temperature	40
Table 8 – Parameters to achieve and maintain the target operational state of charge, SoC_{OT} , during tests at the minimum ambient temperature	41
Table 9 – Parameters to achieve and maintain the target operational state of charge, SoC_{OT} , during tests at the maximum ambient temperature	42
Table 10 – Summary of energy released as heat during endurance tests at the maximum ambient temperature	44
Table 11 – Summary of energy required during idle state periods at $+25\text{ °C} \pm 3\text{ K}$ ambient temperature	46
Table A.1 – Non-exhaustive listing of potential battery-related hazards to be taken in consideration in risk assessment activities	47
Table A.2 – Non-exhaustive listing of potential installation-related hazards to be taken in consideration in risk assessment activities	48

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SECONDARY CELLS AND BATTERIES
FOR RENEWABLE ENERGY STORAGE –
GENERAL REQUIREMENTS AND METHODS OF TEST –****Part 2: On-grid applications**

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 61427-2 has been prepared by IEC technical committee 21: Secondary cells and batteries.

A list of all parts in the IEC 61427 series, published under the general title *Secondary cells and batteries for renewable energy storage – General requirements and methods of test*, can be found on the IEC website.

The text of this standard is based on the following documents:

FDIS	Report on voting
21/862/FDIS	21/863/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

SECONDARY CELLS AND BATTERIES FOR RENEWABLE ENERGY STORAGE – GENERAL REQUIREMENTS AND METHODS OF TEST

Part 2: On-grid applications

1 Scope

This part of IEC 61427 relates to secondary batteries used in on-grid Electrical Energy Storage (EES) applications and provides the associated methods of test for the verification of their endurance, properties and electrical performance in such applications. The test methods are essentially battery chemistry neutral, i.e. applicable to all secondary battery types.

On-grid applications are characterized by the fact that batteries are connected, via power conversion devices, to a regional or nation- or continent-wide electricity grid and act as instantaneous energy sources and sinks to stabilize the grid's performance when randomly major amounts of electrical energy from renewable energy sources are fed into it.

Related power conversion and interface equipment is not covered by this part of IEC 61427.

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.

None.

koniec náhľadu – text ďalej pokračuje v platenej verzii STN