PD IEC/TR 62914:2014

BSI Standards Publication

Secondary cells and batteries containing alkaline or other non-acid electrolytes — Experimental procedure for the forced internal short-circuit test of IEC 62133:2012

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of IEC/TR 62914:2014.

The UK participation in its preparation was entrusted by Technical Committee PEL/21, Secondary cells and batteries, to Subcommittee PEL/21/1, Secondary cells and batteries containing alkaline and other non-acidic electrolytes.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2014

ISBN 978 0 580 85992 2
ICS 29.220.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 September 2014.

Amendments/corrigenda issued since publication

Date	Text affected

IEC TR 62914

Edition 1.0 2014-05

TECHNICAL REPORT

colour inside

Secondary cells and batteries containing alkaline or other non-acid electrolytes – Experimental procedure for the forced internal short-circuit test of IEC 62133:2012

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE L

ICS 29.220.30

ISBN 978-2-8322-1622-4

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – EXPERIMENTAL PROCEDURE FOR THE FORCED INTERNAL SHORT-CIRCUIT TEST OF IEC 62133:2012

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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC/TR 62914, which is a technical report, has been prepared by subcommittee 21A: Secondary cells and batteries containing alkaline or other non-acid electrolytes, of IEC technical committee 21: Secondary cells and batteries.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
21A/537/DTR	21A/549/RVC

Full information on the voting for the approval of this technical report 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 web site 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.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

The second edition of IEC 62133 was published on December, 2012. This technical report provides supplemental information to perform the forced internal short-circuit test of IEC 62133:2012.

SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – EXPERIMENTAL PROCEDURE FOR THE FORCED INTERNAL SHORT-CIRCUIT TEST OF IEC 62133:2012

1 Scope

This Technical Report identifies experimental procedures for the forced internal short-circuit tests in terms of designation, dimensions, tests and requirements. It supplements 8.3.9 of IEC 62133:2012.

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.

IEC 62133:2012, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications*

3 Experimental procedure of the forced internal short-circuit test

3.1 Example of preparation of nickel particle

3.1.1 Material and tools

The necessary material and tools required for this preparation are listed below.

a) a nickel piece: Prepare nickel plate (soft temper; ISO 6208, NW2200 (Ni 99.0) or NW2201 (Ni 99.0 -LC) 0,10 ± 0,01 mm thick made into a piece $0,20\ ^{+0,05}_{-0,03}$ mm wide and 2,00 ± 0,30 mm long by slit processing or using a punching press;
b) a stereomicroscope;
c) a cutter knife;
d) glass slides (2 slides: 1 mm or thicker with square corners);
e) a graph paper (1 mm square);
f) a storage container for nickel particles.

3.1.2 Example of a nickel particle preparation procedure

The following steps are to be undertaken:

a) place graph paper on the stage of the stereomicroscope and focus the microscope on the lines of the graph paper;
b) while looking through the microscope, place the nickel piece parallel to a line of the graph paper. The nickel piece should be placed horizontally, with its 0,20 mm sides extending downward perpendicularly from and its 2,0 mm sides running parallel to the line on the graph paper;
c) place a glass slide vertically over the left half (1,0 mm) of the nickel piece. Use a line of the graph paper as a guide to position the edge of the glass slide;

d) while holding the glass slide in place with your fingers, fold and raise the right half (1,0 mm) of the nickel piece using a cutter;

e) place the other glass slide to the right of the nickel piece to sandwich the raised part. Slightly press the right slide against the raised part so that the nickel piece is bent to an angle of 90°;

f) Store the completed nickel particles in a storage container to prevent it from being deformed before the test.

NOTE The completed nickel particles can also be obtained in using a press machine.

Figure 1 shows the nickel material after folding to a nickel particle.

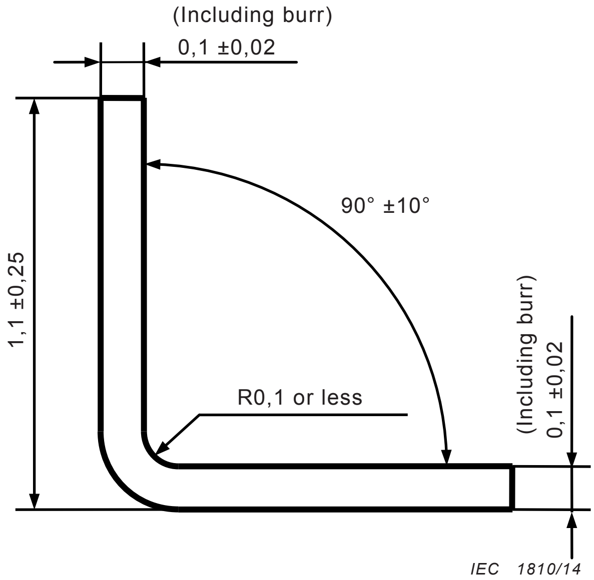

Figure 1 – Dimensions of a completed nickel particle

3.2 Positioning (or placement) of a nickel particle

The following represents some recommendations on the way to place nickel particule:

a) In the case that nickel particle cannot be placed in the position as described in draft IEC 62133, the position can be changed.

b) For a prismatic cell, you may place a nickel particle in a flat area. However, it shall be positioned in the center of the pressurized surface. If it is difficult to place a nickel particle under the most outside layer, it may be placed under an inside layer as shown in Figure 2.

c) A nickel particle shall not be placed in an area where the positive active material has come off from the aluminum foil. If the material has come off in the specified area, place the nickel particle in another area where the positive active material exists, where the position can be pressed with the centre of the pressuring jig.

d) The position of nickel particle may be determined by the cell manufacturer and the test agent.

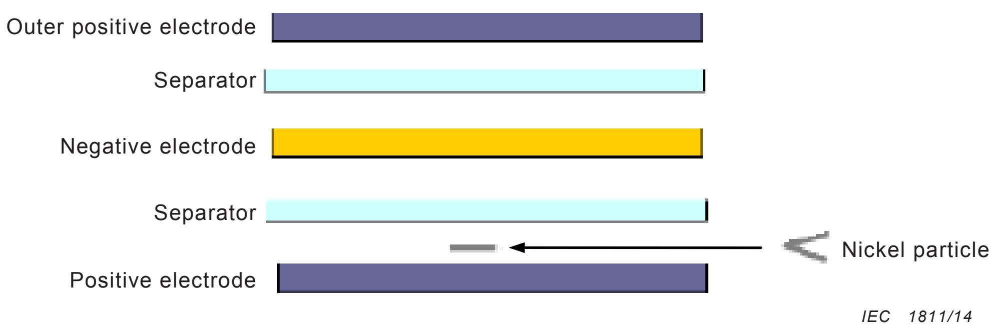

Figure 2 – Positioning of nickel particle when it cannot be placed in the specified area

3.3 Damaged separator precaution

The sample for evaluation shall not be used when a separator is damaged during preparation e.g., separator is torn.

(When a separator is damaged, e.g., the membrane is ruptured; the cell shall not be used as a sample for evaluation)

3.4 Caution for rewind separator and electrode

During rewinding the core to original position by pulling the positive, negative and separator, pay attention to avoid loosening the wound core.

Figure 3 below shows an example of cylindrical cell.

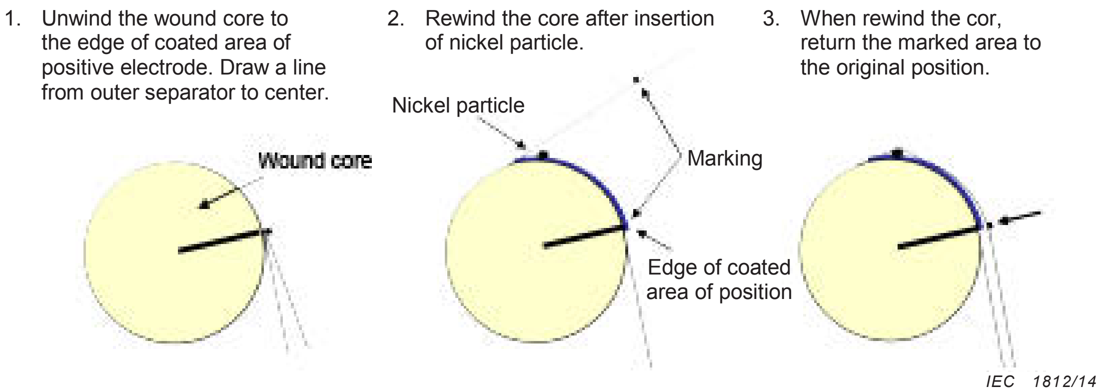

Figure 3 – Cylindrical cell

3.5 Insulation film for preventing short circuit

To prevent short circuit before the test, it is recommended to insert an insulation film of a thickness of 25 μm or less.

3.6 Cautions on disassembling cell

The following represents some recommendations on the way to disassemble the cell:

a) Cells should be disassembled in an open-type dry chamber or a dry room, where the temperature is 20 °C ± 5 °C and the dew point temperature is below –25 °C.

b) Be careful not to short-circuit cells during disassembling. For example, use tools whose edges are made of ceramics or insulated. Take great care to disassemble sealing area of cells in particular.

c) There are many different cell structures, so it is recommended to check with the manufacturer for the most appropriate structure and part where a short-circuit may easily happen.

d) Cells short-circuited during disassembling should not be used for the following test.

3.7 Protective goods for safety

It is recommended that long sleeved protective clothing, protective glasses, a mask and gloves should be worn.

3.8 Cautions in case of fire during disassembling

The following represents some recommendations on the way to manage a fire:

a) To prevent fire spreading, unnecessary flammable materials should not be placed in the work area.

b) Take countermeasures to prevent the cell contents scattering when cells catch fire. For example, a fire protection cloth or sand should be available in the work area, and the gas should be exhausted effectively.

3.9 Cautions for disassembling process and pressurizing electrode core

The following represents some recommendations on the way to handle the wound core:

a) Place one wound core in one zip-lock polyethylene bag, and then place them in one aluminum laminated bag. To minimize vaporization of the electrolyte, use bags as small as possible. For example, use a polyethylene bag of 100 mm (W) × 140 mm (H) × 0,04 mm (T) and an aluminum laminated bag of 120 mm (W) × 180 mm (H) × 0,11 mm (T).

b) Carry out the work from cell disassembling to placing in the aluminum laminated bag within 30 min.

c) The storage period in the aluminum laminated bag should be within 12 h.

   1) The wound core should be placed on the testing machine within 2 min after taking out the wound core from the bags.

   2) When the temperature of the wound core reaches the testing temperature, start pressurizing.

   3) When the test is conducted at a high temperature, to minimize vaporization of the electrolyte, it is desirable to start pressurizing within 3 min after placing the wound core on the testing machine. When the test is conducted at a low temperature, it is desirable to start the test within 10 min.

3.10 Recommended specifications of a pressurizing device

The locus of the servo-motor press moves linearly, however the one of the hydraulic press does not. When the internal short-circuit occurs, the pressurizing device shall stop immediately by detecting the cell voltage drop. The servo-motor press can stop immediately. However, the hydraulic press cannot. Therefore, the servo-motor press is recommended for the pressurizing device.

The recommended specifications of the servo-motor press are shown in Table 1.

Table 1 – Recommended specifications of a pressurizing device

Item	Specifications in IEC 62133:2012	Recommendation
Pressurizing method	–	Servo-motor press
Press speed	0,1 mm/s	0,1 ± 0,01 mm/s
Position stability after pressurizing	–	±0,02 mm
Maximum pressurizing capability	Cylindrical: 800 N MAX Prismatic: 400 N MAX	1 000 N or more (recommended press capability to achieve the specification in left column)
Pressure measuring method	–	Directly measured with a load cell
Pressure measuring period	–	5 m s or less
Time to stop pressure head after 50 mV delta is detected	–	100 m s or less

Figure 4 shows the plots of the distance from the start point of the pressurizing devices.

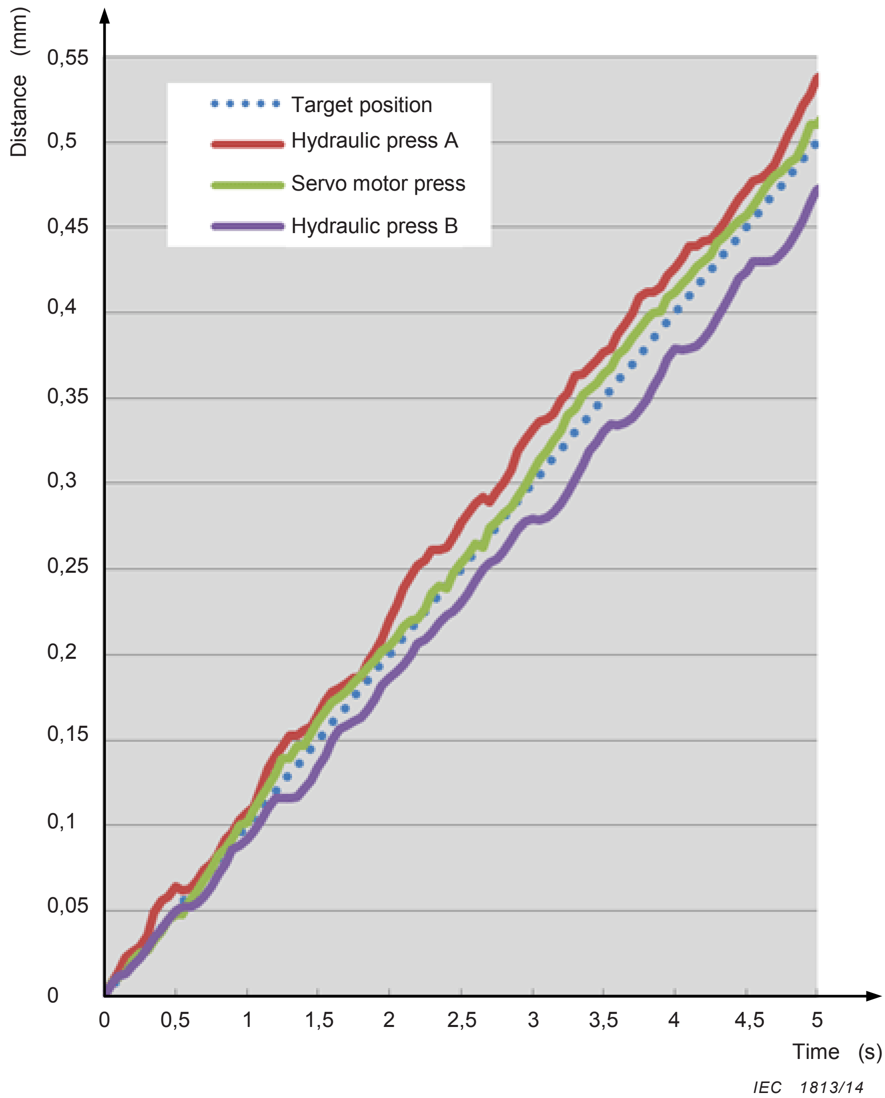

Figure 4 – Distance / time ratio of several types of pressurizing devices

Bibliography

ISO 6208:1992, *Nickel and nickel alloy plate, sheet and strip*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

bsi.

...making excellence a habit.™