



# UL 62133-2

## STANDARD FOR SAFETY

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 – Part 2:  
Lithium Systems

ULNORM.COM: click to view the full PDF of UL 62133-2:2020

[ULNORM.COM](https://www.ulnorm.com) : Click to view the full PDF of UL 62133-2 2020

UL Standard for Safety for 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 – Part 2: Lithium Systems, UL 62133-2

First Edition, Dated January 10, 2020

### **Summary of Topics**

***The first edition of UL 62133-2 reflects the latest approval date as an American National Standard and is an adoption of IEC 62133-2, First Edition, issued by the IEC February 2017. Please note that the National Difference document incorporates all of the U.S. national differences for UL 62133-2.***

The new requirements are substantially in accordance with Proposal(s) on this subject dated April 12, 2019.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page

[ULNORM.COM](http://ULNORM.COM) : Click to view the full PDF of UL 62133-2 2020



CSA Group  
CSA C22.2 No. 62133-2:20  
First Edition  
(IEC 62133-2:2017, MOD)



Underwriters Laboratories Inc.  
UL 62133-2  
First Edition

## 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 – Part 2: Lithium Systems

January 10, 2020

This national standard is based on publication IEC 62133-2, First Edition (2017).



ANSI/UL 62133-2-2020



## Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

---

## ISBN 978-1-4883-2127-6 © 2020 Canadian Standards Association

All rights reserved. No part of this publication may be reproduced in any form whatsoever without the prior permission of the publisher.

This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. The technical content of IEC and ISO publications is kept under constant review by IEC and ISO. To submit a proposal for change, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

To purchase CSA Group Standards and related publications, visit CSA Group's Online Store at [store.csagroup.org](http://store.csagroup.org) or call toll-free 1-800-463-6727 or 416-747-4044.

---

## Copyright © 2020 Underwriters Laboratories Inc.

UL's Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

This ANSI/UL Standard for Safety consists of the First Edition.

The most recent designation of ANSI/UL 62133-2 as an American National Standard (ANSI) occurred on January 10, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

To purchase UL Standards, visit UL's Standards Sales Site at <http://www.shopulstandards.com/HowToOrder.aspx> or call toll-free 1-888-853-3503.

---

## CONTENTS

Preface .....	5
<b>NATIONAL DIFFERENCES .....</b>	<b>7</b>
<b>FOREWORD .....</b>	<b>9</b>
1 Scope .....	11
1DV.1 Modification to add the following paragraph and note to Clause <a href="#">1</a> : .....	11
1DV.2 Modification to add the following paragraph to Clause <a href="#">1</a> (Canada only): .....	11
2 Normative references .....	11
2DV.1 Modification to add the following to Clause <a href="#">2</a> (Canada only): .....	11
2DV.2 Modification to add the following to Clause <a href="#">2</a> : .....	12
2DV.3 Modification to add the following to Clause <a href="#">2</a> (US only): .....	12
3 Terms and definitions .....	12
4 Parameter measurement tolerances .....	15
5 General safety considerations .....	15
5.1 General .....	15
5.2 Insulation and wiring .....	16
5.3 Venting .....	16
5.4 Temperature, voltage and current management .....	16
5.5 Terminal contacts .....	16
5.6 Assembly of cells into batteries .....	17
5.7 Quality plan .....	18
5.8 Battery safety components .....	18
6 Type test and sample size .....	18
7 Specific requirements and tests .....	19
7.1 Charging procedures for test purposes .....	19
7.2 Intended use .....	20
7.3 Reasonably foreseeable misuse .....	21
8 Information for safety .....	28
8.1 General .....	28
8.2 Small cell and battery safety information .....	29
9 Marking .....	29
9.1 Cell marking .....	29
9.2 Battery marking .....	30
9.2DV.1 Modification to add the following after the first paragraph of Clause <a href="#">9.2</a> : .....	30
9.2DV.2 Modification to add the following after Clause <a href="#">9.2DV.1</a> (Canada only): .....	30
9.3 Caution for ingestion of small cells and batteries .....	30
9.4 Other information .....	30
10 Packaging and transport .....	31

## Annex A (normative) Charging and discharging range of secondary lithium ion cells for safe use

A.1 General .....	32
A.2 Safety of lithium ion secondary battery .....	32
A.3 Consideration on charging voltage .....	32
A.3.1 General .....	32
A.3.2 Upper limit charging voltage .....	32
A.4 Consideration of temperature and charging current .....	34
A.4.1 General .....	34
A.4.2 Recommended temperature range .....	34
A.4.3 High temperature range .....	35

A.4.4	Low temperature range .....	36
A.4.5	Scope of the application of charging current.....	37
A.4.6	Consideration of discharge .....	37
A.5	Sample preparation.....	38
A.5.1	General.....	38
A.5.2	Insertion procedure for nickel particle to generate internal short.....	39
A.5.3	Disassembly of charged cell .....	39
A.5.4	Shape of nickel particle .....	39
A.5.5	Insertion of nickel particle to cylindrical cell .....	39
A.5.6	Insertion of nickel particle in prismatic cell.....	43
A.6	Experimental procedure of the forced internal short-circuit test .....	47
A.6.1	Material and tools for preparation of nickel particle .....	47
A.6.2	Example of a nickel particle preparation procedure.....	47
A.6.3	Positioning (or placement) of a nickel particle.....	48
A.6.4	Damaged separator precaution.....	49
A.6.5	Caution for rewinding separator and electrode .....	49
A.6.6	Insulation film for preventing short-circuit.....	50
A.6.7	Caution when disassembling a cell.....	50
A.6.8	Protective equipment for safety.....	50
A.6.9	Caution in the case of fire during disassembling .....	50
A.6.10	Caution for the disassembling process and pressing the electrode core .....	50
A.6.11	Recommended specifications for the pressing device .....	51

## **Annex B (informative) Recommendations to equipment manufacturers and battery assemblers**

## **Annex C (informative) Recommendations to the end-users**

## **Annex D (normative) Measurement of the internal AC resistance for coin cells**

D.1	General.....	56
D.2	Method .....	56

## **Annex E (informative) Packaging and transport**

## **Annex F (informative) Component standards references**

Annex DVF	Modification of Annex <a href="#">F</a> to add Clause <a href="#">DVF.1</a> and replace <a href="#">Table F.1</a> with <a href="#">Table DVF.1</a> and make Annex <a href="#">E</a> (normative): .....	58
-----------	--	----

## **Bibliography**

## Preface

This is the harmonized CSA Group and UL standard for 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 – Part 2: Lithium Systems. It is the first edition of CSA C22.2 No. 62133-2, and the first edition of UL 62133-2. This edition of CSA C22.2 No. 62133-2 replaces CAN/CSA-C22.2 No. 62133:17 (adopted 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. This edition of UL 62133-2 replaces the second edition UL 62133, 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, published September 5, 2017.

This harmonized standard is based on IEC Publication 62133-2: first edition, 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 – Part 2: Lithium Systems, issued February 2017. IEC 62133-2 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the International Harmonization Committee for 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 are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This standard was reviewed by the CSA Subcommittee on Batteries and Battery Systems, under the jurisdiction of the CSA Technical Committee on General Requirements, CE Code, Part II and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

### Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

### Level of Harmonization

This standard adopts the IEC text with national differences.

This standard is published as an identical standard for CSA Group and UL.

An identical standard is a standard that is exactly the same in technical content except for national differences resulting from conflicts in codes and governmental regulations. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

## Reasons for Differences From IEC

National differences from the IEC are being added in order to address editorial, component, safety and regulatory situations present in the US and Canada.

## Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

## IEC Copyright

For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication 62133-2, 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 – Part 2: Lithium Systems, copyright 2017, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword is not a part of the requirements of this standard but is included for information purposes only.

These materials are subject to copyright claims of IEC and UL. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of UL. All requests pertaining to the 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 – Part 2: Lithium Systems, UL 62133-2 Standard should be submitted to UL.

ULNORM.COM : Click to view the full PDF only 62133-2:2020

## NATIONAL DIFFERENCES

In the CSA Group and UL publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 62133-2, 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 – Part 2: Lithium Systems, copyright 2017, are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

**DR** – These are National Differences based on the **national regulatory requirements**.

**D1** – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

**D2** – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

**DC** – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

**DE** – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

**Addition / Add** - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

**Modification / Modify** - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

**Deletion / Delete** - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

No Text on This Page

[ULNORM.COM](https://www.ulnorm.com) : Click to view the full PDF of UL 62133-2:2020