

# Low-voltage fuses — Part 1: General requirements



# Legal Notice for Standards

Canadian Standards Association (operating as “CSA Group”) develops standards through a consensus standards development process approved by the Standards Council of Canada. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. Although CSA Group administers the process and establishes rules to promote fairness in achieving consensus, it does not independently test, evaluate, or verify the content of standards.

## Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document’s fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party’s intellectual property rights. CSA Group does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA Group makes no representations or warranties regarding this document’s compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA GROUP, ITS VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OR OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF CSA GROUP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA Group is not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and CSA Group accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA Group is a private not-for-profit company that publishes voluntary standards and related documents. CSA Group has no power, nor does it undertake, to enforce compliance with the contents of the standards or other documents it publishes.

## Intellectual property rights and ownership

As between CSA Group and the users of this document (whether it be in printed or electronic form), CSA Group is the owner, or the authorized licensee, of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. Without limitation, the unauthorized use, modification, copying, or disclosure of this document may violate laws that protect CSA Group’s and/or others’ intellectual property and may give rise to a right in CSA Group and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by treaty or by law, CSA Group reserves all intellectual property rights in this document.

## Patent rights

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. CSA Group shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

## Authorized use of this document

This document is being provided by CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF form.

Limited copies of this document in print or paper form may be distributed only to persons who are authorized by CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and may not permit others to

- alter this document in any way, or remove this Legal Notice from the attached standard;
- sell this document without authorization from CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents hereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.



# ***Standards Update Service***

## ***CSA C22.2 No. 248.1:22 October 2022***

**Title:** *Low-voltage fuses — Part 1: General requirements*

To register for e-mail notification about any updates to this publication

- go to [www.csagroup.org/store/](http://www.csagroup.org/store/)
- click on **Product Updates**

The **List ID** that you will need to register for updates to this publication is **24297.5**

If you require assistance, please e-mail [techsupport@csagroup.org](mailto:techsupport@csagroup.org) or call 416-747-2233.

Visit CSA Group's policy on privacy at [www.csagroup.org/legal](http://www.csagroup.org/legal) to find out how we protect your personal information.

**Canadian Standards Association (operating as “CSA Group”)**, under whose auspices this National Standard has been produced, was chartered in 1919 and accredited by the Standards Council of Canada to the National Standards system in 1973. It is a not-for-profit, nonstatutory, voluntary membership association engaged in standards development and certification activities.

CSA Group standards reflect a national consensus of producers and users — including manufacturers, consumers, retailers, unions and professional organizations, and governmental agencies. The standards are used widely by industry and commerce and often adopted by municipal, provincial, and federal governments in their regulations, particularly in the fields of health, safety, building and construction, and the environment.

More than 10 000 members indicate their support for CSA Group’s standards development by volunteering their time and skills to Committee work.

CSA Group offers certification and testing services in support of and as an extension to its standards development activities. To ensure the integrity of its certification process, CSA Group regularly and continually audits and inspects products that bear the CSA Group Mark.

In addition to its head office and laboratory complex in Toronto, CSA Group has regional branch offices in major centres across Canada and inspection and testing agencies in fourteen countries. Since 1919, CSA Group has developed the necessary expertise to meet its corporate mission: CSA Group is an independent service organization whose mission is to provide an open and effective forum for activities facilitating the exchange of goods and services through the use of standards, certification and related services to meet national and international needs.

For further information on CSA Group services, write to  
CSA Group  
178 Rexdale Boulevard  
Toronto, Ontario, M9W 1R3  
Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at [www.scc.ca](http://www.scc.ca).

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada’s economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at [www.scc.ca](http://www.scc.ca).

Standards Council of Canada  
600-55 Metcalfe Street  
Ottawa, Ontario, K1P 6L5  
Canada



La norme nationale du Canada n'est disponible qu'en anglais.

*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 to judge its suitability for their particular purpose.*

*\*A trademark of the Canadian Standards Association, operating as “CSA Group”*

*National Standard of Canada*

*CSA C22.2 No. 248.1:22*  
***Low-voltage fuses — Part 1: General requirements***



*®A trademark of the Canadian Standards Association,  
operating as "CSA Group"*



ICS 29.120.50

# ***CSA Technical Committee on Industrial Products***

<b>R. P. de Lhorbe</b>	Schneider Electric Canada, Inc., North Vancouver, British Columbia, Canada <i>Category: Producer Interest</i>	<i>Chair</i>
<b>M. Smith</b>	Kitchener, Ontario, Canada <i>Category: General Interest</i>	<i>Vice-Chair</i>
<b>A. Z. Tsisserev</b>	AES Engineering Ltd., Vancouver, British Columbia, Canada <i>Category: User Interest</i>	<i>Vice-Chair</i>
<b>B. M. Baldwin</b>	Baldwin Services Inc., Saskatoon, Saskatchewan, Canada <i>Category: General Interest</i>	
<b>R. M. Bartholomew</b>	Electric Power Equipment Ltd., Vancouver, British Columbia, Canada <i>Category: Producer Interest</i>	
<b>G. Benjamin</b>	ABB Électrification Canada SRI, Dorval, Québec, Canada <i>Category: Producer Interest</i>	
<b>C. C. Cormier</b>	Alberta Municipal Affairs, Edmonton, Alberta, Canada <i>Category: Regulatory Authority</i>	
<b>S. W. Douglas</b>	SPS Evaluation Services Inc., Toronto, Ontario, Canada <i>Category: General Interest</i>	
<b>T. S. Driscoll</b>	OBIEC Consulting Ltd., Calgary, Alberta, Canada <i>Category: User Interest</i>	
<b>V. Gagachev</b>	Eaton, Burlington, Ontario, Canada <i>Category: Producer Interest</i>	

<b>R. Leduc</b>	Marex Canada Limited, Calgary, Alberta, Canada <i>Category: User Interest</i>	
<b>M. Lusk</b>	CSA Group, Charlotte, North Carolina, USA <i>Category: General Interest</i>	
<b>D. Mascarenhas</b>	Brampton, Ontario, Canada <i>Category: General Interest</i>	
<b>S. Mercier</b>	Régie du bâtiment du Québec, Montréal, Québec, Canada <i>Category: Regulatory Authority</i>	
<b>M. Pilato</b>	Technical Safety BC, Kelowna, British Columbia, Canada <i>Category: Regulatory Authority</i>	
<b>L. G. Silecky</b>	Silecky Consulting Ltd., Mississauga, Ontario, Canada <i>Category: Producer Interest</i>	
<b>T. Simmons</b>	British Columbia Institute of Technology, Burnaby, British Columbia, Canada <i>Category: User Interest</i>	
<b>R. Yousef</b>	Electrical Safety Authority, Mississauga, Ontario, Canada <i>Category: Regulatory Authority</i>	
<b>C. Lee</b>	CSA Group, Mississauga, Ontario, Canada	<i>Project Manager</i>

# ***CSA Subcommittee on Fuses and Fuseholders***

**A. Gad** Eaton Canada, Bussmann Division,  
Mississauga, Ontario, Canada

**D. B. Giblin** Bel Fuse, Inc.,  
Ballwin, Missouri, USA

**W. Gonzalez** Littelfuse, Inc.,  
Champaign, Illinois, USA

**F. G. Ladonne** Underwriters Laboratories Inc.,  
Northbrook, Illinois, USA

**N. Mashayekh** Schneider Electric,  
Dollard-des-Ormeaux, Québec, Canada

**C. Miller** Littelfuse, Inc.,  
Champaign, Illinois, USA

**R. Multani** Team Power Solutions,  
Saskatoon, Saskatchewan, Canada

**E. Posma** Eaton,  
Mississauga, Ontario, Canada

**R. Tangirala** Toronto, Ontario, Canada

**C. Lee** CSA Group,  
Mississauga, Ontario, Canada

*Project Manager*

Standard for Safety for Low-Voltage Fuses – Part 1: General Requirements

Fourth Edition, Dated October 24, 2022

**Summary of Topics**

***This new edition of ANSI/UL 248-1 dated October 24, 2022 is issued to incorporate editorial maintenance updates to the style, format, numbering, re-organization of content and to update references.***

Currently in preview, click buy full version



Association of Standardization and Certification  
NMX-J-009/248/1-ANCE  
Third Edition



Canadian Standards Association  
CSA C22.2 No. 248.1:22  
Fourth Edition



Underwriters Laboratories Inc.  
UL 248-1  
Fourth Edition

## Low-Voltage Fuses – Part 1: General Requirements

October 24, 2022



ANSI/UL 248-1-2022



## **Commitment for Amendments**

This standard is issued jointly by the Association of Standardization and Certification (ANCE), 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 ANCE, CSA Group, or UL at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of ANCE, 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. ANCE will incorporate the same revisions into a new edition of the standard bearing the same date of issue as the CSA Group and UL pages.

---

## **Copyright © 2022 ANCE**

Rights reserved in favor of ANCE.

---

## **ISBN 978-1-4883-4012-3 © 2022 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. 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 [www.csagroup.org/store/](http://www.csagroup.org/store/) or call toll-free 1-800-463-6727 or 416-747-4044.

---

## **Copyright © 2022 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 Fourth Edition. The most recent designation of ANSI/UL 248-1 as an American National Standard (ANSI) occurred on October 24, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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**

<b>Preface</b> .....	<b>5</b>
1 Scope .....	7
2 Referenced Publications .....	7
3 Units of Measurement .....	7
4 Definitions .....	7
4.1 Fuse .....	7
4.2 General terms .....	8
4.3 Characteristic quantities .....	9
5 General .....	10
6 Service Conditions .....	10
7 Classification .....	10
8 Characteristics .....	10
8.1 General .....	10
8.2 Voltage rating .....	10
8.3 Current rating .....	11
8.4 Frequency rating .....	11
8.5 Interrupting rating .....	11
8.6 Peak let-through current and clearing $I^2t$ characteristics .....	11
9 Markings .....	11
10 Construction .....	12
11 Tests .....	12
11.1 General .....	12
11.2 Verification of temperature rise and current-carrying capacity .....	14
11.3 Verification of overload operation .....	16
11.4 Verification of operation at rated voltage .....	17
11.5 Verification of peak let-through current and clearing $I^2t$ characteristics .....	21

**ANNEX A (Normative) – CIRCUIT CALIBRATION FOR INTERRUPTING RATING TESTS**

A1 Galvanometers .....	22
A2 Circuit Calibration .....	23
A3 DC Circuit Calibration Example .....	25

**ANNEX B (Normative) – INSTRUMENTATION FOR INTERRUPTING RATING TESTS**

B1 Power Factor Determination .....	27
B2 Available Current .....	29
B3 Peak Let-Through Current .....	29
B4 Recovery Voltage .....	31
B5 Comparison of Instrumentation .....	33
B6 Determination of $I^2t$ .....	33
B7 Oscillogram Example .....	33

No Text on This Page

## Preface

This is the harmonized ANCE, CSA Group, and UL standard for Low-Voltage Fuses – Part 1: General Requirements. It is the third edition of NMX-J-009/248/1-ANCE, the fourth edition of CSA C22.2 No. 248.1-22, and the fourth edition of UL 248-1. This edition of NMX-J-009-248/1-ANCE cancels the previous edition published in 2017. This edition of CSA C22.2 No. 248.1-22 supersedes the previous editions published in 1994, 2000, and 2011. This edition of UL 248-1 supersedes the previous edition published in 2017.

This harmonized standard was prepared by the Association of Standardization and Certification, (ANCE), CSA Group and Underwriters Laboratories Inc. (UL).

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

The present Mexican Standard was developed by the CT 32 from the Comité de Normalización de la Asociación de Normalización y Certificación, A.C., CONANCE, with the collaboration of the fuse manufacturers and users.

This standard was reviewed by the CSA Subcommittee on Fuses and Fuseholders, under the jurisdiction of the CSA Technical Committee on Industrial Products 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 the 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 is published as an identical standard for ANCE, 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.

## 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.