

Sealed wire connector systems



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 format.

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.



Revision History

CSA C22.2 No. 198.2:15, Sealed wire connector systems — originally published June 2015

National Standard of Canada — June 2020
Outside front cover, National Standard of Canada text, and title page.
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.

Currently in preview, click buy full version

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.

Individuals, companies, and associations across Canada indicate their support for CSA Group’s standards development by volunteering their time and skills to Committee work and supporting CSA Group’s objectives through sustaining memberships. The more than 7000 committee volunteers and the 2000 sustaining memberships together form CSA Group’s total membership from which its Directors are chosen. Sustaining memberships represent a major source of income for CSA Group’s standards development activities.

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 eight 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.

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.

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



Standards Council of Canada
Conseil canadien des normes

Cette 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. 198.2:15
Sealed wire connector systems



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



ICS 29.060.20; 29.120.20
ISBN 978-1-77139-893-0



Association of Standardization and Certification
NMX-J-519-ANCE
Third Edition



Canadian Standards Association
CSA C22.2 No. 198.2
Third Edition



Underwriters Laboratories Inc.
UL 486D
Sixth Edition

Sealed Wire Connector Systems

June 19, 2015



ANSI/UL 486D-2017



Update No. 1

C22.2 No. 198.2-15

October 2017

Note: For information about the **Standards Update Service**, go to **shop.csa.ca** or e-mail **techsupport@csagroup.org**.

Title: *Sealed wire connector systems* — originally published June 2015

The following revisions have been formally approved and are marked by a vertical line in the margin on the attached replacement pages:

Revised	Cover, Copyright page, Preface, Clauses 1.1, 1.3, 2.2, 2.2.4, 4.2, 9.2.3, and 9.2.9.1 and Tables 1 and 2
New	Clauses 1.4, 4.3–4.5, 7.9, 7.10, 8.9, 8.10, 9.2.9.2, 9.9, 9.10, and 10.3 d)–g)
Deleted	None

- Update your copy by inserting these revised pages.
- Keep the pages you remove for reference.



Association of Standardization and Certification
NMX-J-519-ANCE
Third Edition



Canadian Standards Association
CSA C22.2 No. 198.2
Third Edition



Underwriters Laboratories Inc.
UL 486D
Sixth Edition

Sealed Wire Connector Systems

June 19, 2015



ANSI/UL 486D-2017

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 © 2017 ANCE

Rights reserved in favor of ANCE

ISBN 978-1-77139-893-0 © 2017 CSA Group

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 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 inquires@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 shop.csa.ca or call toll-free 1-800-463-6727 or 416-741-1014.

Copyright © 2017 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 Sixth Edition. The most recent designation of ANSI/UL 486D as an American National Standard (ANSI) occurred on October 20, 2017. 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

PREFACE	5
1 Scope	7
2 Reference publications	7
2.1 Undated and dated references	7
2.2 Normative references	8
3 Units of measurement	8
4 Definitions	8A
5 Symbols and abbreviations	8B
6 Construction	9
6.1 Wire connectors	9
6.2 Insulation	10
7 Test requirements	10
7.1 General	10
7.2 Test sequence A, General	10
7.3 Test sequence B, shelf aging	11
7.4 Test sequence C, use aging	11
7.5 Test sequence D, direct burial	11
7.6 Test sequence E, rain	11
7.7 Test sequence F, hosedown	12
7.8 Test sequence G, submersion	12
7.9 Test sequence H, weather (sunlight) resistance	12
7.10 Salt water immersion test	12
8 Sampling requirements	12
8.1 General	12
8.2 Test sequence A, general	13
8.3 Test sequence B, shelf aging	13
8.4 Test sequence C, use aging	13
8.5 Test sequence D, direct burial	13
8.6 Test sequence E, rain	13
8.7 Test sequence F, hosedown	14
8.8 Test sequence G, submersion	14
8.9 Test sequence H, sunlight resistance	14
8.10 Test sequence I, salt water	14
9 Test methods	14
9.1 General	14
9.2 Test sequence A, general	14A
9.3 Test sequence B, shelf aging	16
9.4 Test sequence C, use aging	17
9.5 Test sequence D, direct burial	17
9.6 Test sequence E, rain	18
9.7 Test sequence F, hosedown	19
9.8 Test sequence G, submersion	19
9.9 Test sequence H, sunlight resistance test	19
9.10 Test sequence I, salt water resistant	20
10 Marking, labeling, and packaging	20A
Tables	21
Figures	22

Annex A – Impact Test Apparatus**Annex B – Guarded Circuit**

PREFACE

This is the harmonized ANCE, CSA Group, and UL standard for sealed wire connector systems. It is the third edition of NMX-J-519-ANCE, the third edition of CSA C22.2 No. 198.2, and the sixth edition of UL 486D. This edition of NMX-J-519-ANCE supersedes the previous edition published in 2006. This edition of CSA C22.2 No. 198.2 supersedes the previous edition published in 2005. This edition of UL 486D supersedes the previous edition published in 2005.

This harmonized standard was prepared by the Association of Standardization and Certification (ANCE), CSA Group, and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Committee for Connectors, THC 99, of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), are gratefully acknowledged.

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 SC 20D – Conectores part of the CT 20 - Conductores from the Comité de Normalización de la Asociación de Normalización y Certificación, A.C., CONANCE, with the collaboration of the connectors manufacturers and users.

This standard was reviewed by the CSA Subcommittee on C22.2 No. 198.2, under the jurisdiction of the CSA Technical Committee on Wiring 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 approved by the American National Standards Institute (ANSI) as an American National Standard.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number shall 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 uses the IEC format but is not based on, nor shall it be considered equivalent to, an IEC standard. This standard is published as an equivalent standard for ANCE, CSA, and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for Differences from IEC

At present there is no IEC standard for sealed wire connector systems. Therefore, this standard does not employ any IEC standard for base requirements.

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.

1 Scope

1.1 The requirements in this standard cover sealed wire connector systems, including insulating caps, covers, resins, tubing, and tapes provided with, or for use with, specific wire connectors. These systems are intended for wet or damp locations, and other installations such as direct burial, below grade, or above grade where protected from direct exposure to sunlight. The wire connectors covered by these requirements are intended for use with copper conductor, aluminum conductor, or both in accordance with installations covered by the National Electrical Code, NFPA 70; the Canadian Electrical Code, Part I, C22.1; and NOM 001 SEDE, Standard for Electrical Installations.

Note 1: Unless marked for the purpose, these wire connector systems have not been evaluated for direct exposure to sunlight. Additional performance considerations to show equivalency to the connected conductors should be considered for UV exposure.

Note 2: These wire connector systems have only been evaluated for fresh water unless marked for direct exposure to salt or seawater.

Note 3: These wire connector systems may also be used indoors.

1.2 These requirements also cover sealed wire connector systems intended for use with single or multiple conductor underground feeder cable, golf course sprinkler cable, underground low energy cable, irrigation cable, or other cable with insulation acceptable for direct burial, below grade use, or wet locations.

1.3 These requirements apply to sealed wire connector systems intended for use with 30 AWG (0.05 mm²) through 2,000 kcmil (1,012 mm²) conductors with currents not exceeding the ampacity of insulated conductors rated either 75°C (167°F) or 90°C (194°F) and intended for use at 1500 V or less.

1.4 This standard does not apply to twist-on style splicing sealed wire connectors.

2 Reference publications

2.1 Undated and dated references

2.1.1 Products covered by this standard shall comply with the reference installation codes and standard as appropriate for the country where the product is to be used. When the product is intended for use in more than one country, the product shall comply with the installation codes and standards for all countries where it is intended to be used.

2.1.2 Where reference is made to any Standards, such reference shall be considered to refer to the latest editions and revisions thereto available at the time of printing, unless otherwise specified.