UL 60947-4-2:2026

(IEC 60947-4-2:2011, MOD)

STANDARD FOR SAFETY

Low-Voltage Switchgear and Controlgear – Part 4-2: Contactors and Motor-Starters – AC Semiconductor Motor Controllers and Starters

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER
REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

UL Standard for Safety for Low-Voltage Switchgear and Controlgear – Part 4-2: Contactors and Motor-Starters – AC Semiconductor Motor Controllers and Starters, UL 60947-4-2

Second Edition, Dated May 31, 2022

Summary of Topics

This revision of ANSI/UL 60947-4-2 dated May 29, 2026 includes the following changes in requirements:

– Revision to Standard Fault Short Circuit Test Currents; 9.3.4.3DV.3.1.

– Revision to Short Circuit Rating Marking; 6.2DV.2.2.

– Allowance to Provide User or Installation Manual Information Via the Internet; 6.2DV.1.1, Table 6.2DV.1, 6.2DV.1.2, 6.2DV.1.3, Figure 6.2DV.1, Figure 6.2DV.2, and Figure 6.2DV.3.

– Correction to Annex DVC References to Calibration Test; Table DVC.4.2.

– Overload, Endurance and Breakdown of Components Tests; 8.2.4.1DV, 8.2.4.2DV, 9.3.1DV, and 9.3.3.6DV.

UL 60947-4-2 is an adoption of IEC 60947-4-2, Edition 3.0, issued May 2011 and corrigendum 1, issued July, 2012. Please note that the National Difference document incorporates all of the U.S. national differences for UL 60947-4-2.

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated July 25, 2025 and January 30, 2026.

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 ULSE Inc. (ULSE).

ULSE 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 ULSE 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 ULSE or an authorized ULSE representative has been advised of the possibility of such damage. In no event shall ULSE'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 ULSE 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.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

No Text on This Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA Group
CSA C22.2 No. 60947-4-2:22
Second Edition
(IEC 60947-4-2:2011, MOD)

ULSE Inc.
UL 60947-4-2
Second Edition
(IEC 60947-4-2:2011, MOD)

Low-Voltage Switchgear and Controlgear – Part 4-2: Contactors and Motor-Starters – AC Semiconductor Motor Controllers and Starters

May 31, 2022

(Title Page Reprinted: May 29, 2026)

This national Standard is based on IEC 60947-4-2, edition 3.0 (2011) and corrigendum 1 (2012).

ANSI/UL 60947-4-2-2026

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Commitment for Amendments

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

ISBN 978-1-4883-4492-3 © 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. 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 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/ or call toll-free 1-800-463-6727 or 416-747-4044.

© 2026 ULSE Inc. All rights reserved.

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

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through May 29, 2026. The most recent designation of ANSI/UL 60947-4-2 as an American National Standard (ANSI) occurred on May 29, 2026. 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 ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

For information on ULSE Standards, visit https://www.shopulstandards.com, call toll free 1-888-853-3503 or email us at ClientService@shopULStandards.com.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CONTENTS

PREFACE **7**

NATIONAL DIFFERENCES **9**

FOREWORD **11**

INTRODUCTION **15**

1 Scope 17
1DV Modification of Clause 1 by adding the following: 18
2 Normative references 18
2DV Modification of Clause 2 by adding the following: 18
3 Terms, definitions, symbols and abbreviations 18
3.1 General 18
3.2 Alphabetical index of terms 19
3.3 Terms and definitions concerning a.c. semiconductor motor controllers and starters 20
3.4 Terms and definitions concerning hybrid motor controllers and starters 24
3.5 Terms and definitions concerning EMC definitions 27
3.6 Symbols and abbreviations 29
4 Classification 29
5 Characteristics of a.c. semiconductor motor controllers and starters 29
5.1 Summary of characteristics 29
5.2 Type of equipment 30
5.3 Rated and limiting values for main circuits 31
5.4 Utilization category 36
5.5 Control circuits 38
5.6 Auxiliary circuits 38
5.7 Characteristics of relays and releases (overload relays) 38
5.8 Co-ordination with short-circuit protective devices (SCPD) 41
6 Product information 41
6.1 Nature of information 41
6.1DV Modification of 6.1 as follows: 43
6.2 Marking 43
6.2DV Add Subclauses 6.2DV.1 to 6.2DV.3 and Table 6.2DV.1 to Clause 6.2 as follows: 44
6.3 Instructions for installation, operation, and maintenance 48
7 Normal service, mounting and transport conditions 48
7.1 Normal service conditions 49
7.2 Conditions during transport and storage 49
7.3 Mounting 49
7.4 Electrical system disturbances and influences 49
8 Constructional and performance requirements 49
8.1 Constructional requirements 49
8.2 Performance requirements 51
8.3 EMC requirements 68
8.3DV Modification of 8.3 and all subclauses by adding the following: 68
9 Tests 71
9.1 Kinds of tests 71
9.2 Compliance with constructional requirements 73
9.3 Compliance with performance requirements 73

Annex A (normative) Marking and identification of terminals

Annex ADV Modification to Annex A by changing “normative” to “informative”: 99

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

A.1 General 99
A.2 Marking and identification of terminals of semiconductor controllers and starters 99
A.2.1 Marking and identification of terminals of main circuits 99
A.2.2 Marking and identification of terminals of control circuits 99
A.2.3 Marking and identification of auxiliary circuits 99
A.3 Marking and identification of terminals of overload relays 102

Annex B Vacant

Annex C (normative) Co-ordination at the crossover current between the starter and associated SCPD

Annex CDV Modification to Annex C by changing “normative” to “informative”: 104
C.1 Scope of this annex 104
C.2 General and definitions 104
C2.1 General 104
C.2.2 Terms and definitions 104
C.3 Condition for the test for the verification of co-ordination at the crossover current by a direct method 104
C.4 Test currents and test circuits 105
C.5 Test procedure and results to be obtained 105
C.5.1 Test procedure 105
C.5.2 Results to be obtained 105
C.6 Verification of co-ordination at the crossover current by an indirect method 105
C.6.1 General 105
C.6.2 Test for I_{cd} 106
C.6.3 Time-current characteristic withstand capability of controllers/starters 106

Annex D Vacant

Annex E Vacant

Annex F (informative) Operating capability

Annex G (informative) Examples of control circuit configurations

G.1 External control device (ECD) 113
G.1.1 Definition of an ECD 113
G.1.2 Diagrammatic representation of an ECD 113
G.1.3 Parameters of an ECD 113
G.2 Control circuit configurations 114
G.2.1 Controllers with external control supply 114
G.2.2 Controllers with an internal control supply and control input only 115

Annex H Vacant

Annex I (normative) Modified test circuit for short-circuit testing of semiconductor motor controllers and starters

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Annex J (informative) Flowchart for constructing bypassed semiconductor controllers tests

Annex K (normative) Extended functions within electronic overload relays

K.1 Scope of this annex 120
K.1.1 General 120
K.1.2 Residual current function 120
K.2 Terms and definitions 120
K.3 Classification of electronic overload relays 121
K.4 Type of relays 121
K.5 Performance requirements 121
K.5.1 Limits of operation of residual current electronic overload relays 121
K.5.1DV Modification of K.5.1 by replacing it with the following: 121
K.5.2 Limits of operation of residual current sensing electronic relays Type B 121
K.5.2DV Modification of K.5.2 by replacing it with the following: 121
K.5.3 Limits of operation of voltage asymmetry relays 122
K.5.4 Limits of operation of phase reversal relays 122
K.5.5 Limits of operation of current asymmetry relays 122
K.5.6 Limits of operation of over-voltage relays and releases 122
K.6 Tests 122
K.6.1 Limits of operation of residual current sensing electronic relays Type A 122
K.6.1DV Modification of K.6.1 by replacing it with the following: 122
K.6.2 Limits of operation of residual current sensing electronic relays Type B 123
K.6.3 Current asymmetry relays 123
K.6.4 Voltage asymmetry relays 123
K.6.5 Phase reversal relays 123
K.6.6 Over-voltage relays 123
K.7 Routine and sampling tests 123

Annex DVA (normative) Reference Standards

Annex DVA Add Annex DVA as follows: 125

Annex DVB (normative) Standards for components

Annex DVB Add Annex DVB as follows: 126

Annex DVC (normative) Combination motor controllers

Annex DVC Add Annex DVC as follows: 129

Annex DVD (normative) Clearances and creepage distances for AC semiconductor motor controllers and starters

Annex DVD Add Annex DVD as follows: 138

Annex DVE (normative) Operations tests for solid state motor controllers with reduced voltage starting feature

Annex DVE Add Annex DVE as follows: 142

Bibliography

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

No Text on This Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

PREFACE

This is the harmonized CSA Group and UL standard for Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters. It is the second edition of CSA C22.2 No. 60947-4-2 and the second edition of UL 60947-4-2. This edition of CSA C22.2 No. 60947-4-2 supersedes the previous edition published in 2014 as CAN/CSA-C22.2 No. 60947-4-2 (adopted IEC 60947-4-2:1999+A1:2001+A2:2006). This harmonized standard has been jointly revised on May 29, 2026. For this purpose, CSA Group and ULSE are issuing revision pages dated May 29, 2026.

This harmonized standard is based on IEC publication 60947-4-2, third edition, Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters, issued May 2011 as revised by corrigendum 1 issued July 2012. IEC 60947-4-2 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and ULSE. The efforts and support of the Technical Harmonization Committee for Industrial Control Equipment, 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.

This Standard was reviewed by the CSA Integrated Committee on Industrial Controls, 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 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.

CSA C22.2 No. 60947-4-2 is to be used in conjunction with the third edition of CSA C22.2 No. 60947-1. Requirements of this Standard, where stated, amend the requirements of CSA C22.2 No. 60947-1.

UL 60947-4-2 is to be used in conjunction with the sixth edition of UL 60947-1. Requirements of this Standard, where stated, amend the requirements of UL 60947-1.

Level of Harmonization

This standard adopts the IEC text with national differences.

This standard is published as an equivalent standard for CSA Group and ULSE.

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.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

All national differences from the IEC text are included in the CSA Group and ULSE 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 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 60947-4-2, Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters, copyright 2011, are used in this Standard with the consent of the International Electrotechnical Commission. The IEC Foreword and Introduction are not a part of the requirements of this Standard but are included for information purposes only.

These materials are subject to copyright claims of IEC and ULSE. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of ULSE. All requests pertaining to the Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters, UL 60947-4-2 Standard should be submitted to ULSE.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

NATIONAL DIFFERENCES

National Differences from the text of International Electrotechnical Commission (IEC) Publication 60947-4-2, Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters, copyright 2011, 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.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.