

UL 62109-1

STANDARD FOR SAFETY

Safety of power converters for use in photovoltaic power systems – Part 1: General requirements



APRIL 30, 2019 – UL 62109-1 tr1

UL Standard for Safety for Safety of power converters for use in photovoltaic power systems – Part 1: General requirements, UL 62109-1

First Edition, Dated July 18, 2014

Summary of Topics

This revision of ANSI/UL 62109-1 dated April 30, 2019 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS).

Please note that the national difference document incorporates all of the U.S. national differences for UL 62109-1.

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

The requirements are substantially in accordance with Proposal(s) on this subject dated February 22, 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.

tr2 APRIL 30, 2019 – UL 62109-1

No Text on This Page

This is a preview. Click here to purchase the full publication.

JULY 18, 2014

(Title Page Reprinted: April 30, 2019)



1

UL 62109-1

Standard for Safety of power converters for use in photovoltaic power

systems - Part 1: General requirements

First Edition

July 18, 2014

This ANSI/UL Standard for Safety consists of the First Edition including revisions through April 30, 2019.

The most recent designation of ANSI/UL 62109-1 as a Reaffirmed American National Standard (ANS) occurred on April 30, 2019. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or 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.

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.

COPYRIGHT © 2019 UNDERWRITERS LABORATORIES INC.

No Text on This Page

CONTENTS

NATIONAL DIFFERENCES	
FOREWORD	
FOREWORD	٥
INTRODUCTION	
1 Scope and object	
1.1 Scope	
1.2 Object	
2 Normative references	
3 Terms and definitions	
4 General testing requirements	
4.1 General	
4.2 General conditions for testing	
4.3 Thermal testing	
4.4 Testing in single fault condition	
4.5 Humidity preconditioning	
4.6 Backfeed voltage protection	
4.7 Electrical ratings tests	
5.1 Marking	
5.2 Warning markings	
5.3 Documentation	
6 Environmental requirements and conditions	
6.1 Environmental categories and minimum environmental condition	
6.2 Pollution degree	
6.3 Ingress protection	
6.4 UV exposure	
6.5 Temperature and humidity	
7 Protection against electric shock and energy hazards	
7.1 General	
7.2 Fault conditions	
7.3 Protection against electric shock	
7.4 Protection against energy hazards	
7.5 Electrical tests related to shock hazard	
8 Protection against mechanical hazards	
8.1 General	
8.2 Moving parts	
8.3 Stability	
8.4 Provisions for lifting and carrying	
8.5 Wall mounting	
8.6 Expelled parts	
9 Protection against fire hazards	
9.2 Limited power sources	
9.3 Short-circuit and overcurrent protection	
10 Protection against sonic pressure hazards	
10.1 General	
10.2 Sonic pressure and sound level	
11 Protection against liquid hazards	
J 1	

	11.1 Liquid containment, pressure and leakage	133
	11.2 Fluid pressure and leakage	
	11.3 Oil and grease	
12	Chemical hazards	
	12.1 General	
13	Physical requirements	136
	13.1 Handles and manual controls	136
	13.2 Securing of parts	
	13.3 Provisions for external connections	137
	13.4 Internal wiring and connections	
	13.5 Openings in enclosures	149
	13.6 Polymeric materials	
	13.7 Mechanical resistance to deflection, impact, or drop	
	13.8 Thickness requirements for metal enclosures	
14	Components	
	14. General	
	14.2 Motor overtemperature protection	
	14.3 Overtemperature protection devices	
	14.4 Fuse holders	
	14.5 Mains voltage selecting devices	
	14.6 Printed circuit boards	163
	14.7 Circuits or components used as transient overvoltage limiting devices	
	14.8 Batteries	
15	Software and firmware performing safety functions	
Annex <i>i</i>	A (normative) Measurement of clearances and creepage distances	
Annex I	B (normative) Programmable equipment	
R f	Software or firmware that performs safety critical functions	170
	2 Evaluation of controls employing software	
٥.٤	B.2.1 Risk analysis	
	D.E.T Flior analysis	
Annex (C (normative) Symbols to be used in equipment markings	
Annex I	D (informative) Test probes for determining access	
Annex I	E (informative) RCDs	
F ·	1 Selection of RCD type in AC circuits	188
	1 Colocitor of Fiod type in Ac entrained	

Annex F (informative) Altitude correction for clearances

	G (informative) Clearance and creepage distance determination for frequencies g 30 kHz	reater
	1 Clearances	
Annex F	H (informative) Measuring instrument for touch current measurements	
H.1 H.2	Measuring instrument	196 198
Annex I for Po	(informative) Examples of protection, insulation, and overvoltage category required	nents
	Numerical example	
Annex J	J (normative) Ultraviolet light conditioning test	
	General	
	Mounting of test samples	
	Carbon-arc light-exposure apparatus	
.1./1	XANON-ARC HONT-AYNOCHRA ANNARATHS	シハソ

Annex DVA (informative) Standards for Components (See 14.1DV)

Preface (UL)

This UL Standard is based on IEC Publication 62109-1: First edition Standards for Safety of power converters for use in photovoltaic power systems – Part 1: General requirements. IEC publication 62109-1 is copyrighted by the IEC.

The text, figures and tables of IEC Publication Safety of power converters for use in photovoltaic power systems – Part 1: General requirements, 62109-1 copyright April 2010 are used in this Standard with the consent of the IEC and the American National Standards Institute (ANSI). The IEC copyrighted material has been reproduced with permission from ANSI. ANSI should be contacted regarding the reproduction of any portion of the IEC material. The IEC Foreword and Introduction are not a part of the requirements of this Standard but are included for information purposes only. Copies of IEC Publication 62109-1 may be purchased from ANSI, 11 West 42nd Street, New York, New York, 10036, (212) 642-4900.

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.

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 UL 62109-1 standard should be submitted to UL.

NATIONAL DIFFERENCES

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.