

UL 60950-1

STANDARD FOR SAFETY

Information Technology Equipment – Safety – Part 1: General Requirements



MAY 9, 2019 – UL 60950-1 tr1

UL Standard for Safety for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1

Second Edition, Dated March 27, 2007

Summary of Topics

This revision of ANSI/UL 60950-1 dated May 9, 2019 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

As noted in the Commitment for Amendments statement located on the back side of the title page, UL and CSA are committed to updating this harmonized standard jointly. However, the revision pages dated May 9, 2019 will not be jointly issued by UL and CSA as these revision pages address UL ANSI approval dates only.

UL 60950-1 is an adoption of IEC 60950-1, Information Technology Equipment – Safety – Part 1: General Requirements (Second Edition, issued December 2005, including Amendment 1 issued December 2009 and Amendment 2 issued May 2013).

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.

In the revisions dated October 14, 2014 pages 177 and 178 have been intentionally deleted from the Standard due to the deletion or relocation of text.

The U.S. Department of Defense (DoD) has adopted UL 1950 on December 21, 1994. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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 MAY 9, 2019 – UL 60950-1

No Text on This Page

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

CSA Group Amendment 2:2014 (MOD) to National Standard of Canada CAN/CSA-C22.2 No. 60950-1-07 Second Edition (IEC 60950-1: 2005, MOD)

Underwriters Laboratories Inc. UL 60950-1 Second Edition





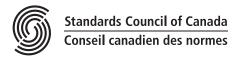
Information Technology Equipment – Safety – Part 1: General Requirements

March 27, 2007

(Title Page Reprinted: May 9, 2019)

This national standard is based on publication IEC 60950-1, Second Edition (2005), including Amendment 1 (2009) and Amendment 2 (2013).

Approved by





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

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.

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 the 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 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 store. csagroup.org or call toll-free 1-800-463-6727 or 416-747-4044.

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 Second Edition including revisions through May 9, 2019. The most recent designation of ANSI/UL 60950-1 as a Reaffirmed American National Standard (ANS) occurred on May 9, 2019. 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.

ISBN 1-55436-415-9

Copyright © 2019 Underwriters Laboratories Inc.

Copyright © 2007
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 is a preview. Click here to purchase the full publication.

CONTENTS

| PREFACE | 8 | DE |
|--|-----|----|
| FOREWORD | 11 | |
| INTRODUCTION | 14 | |
| 0 Principles of safety | | |
| 0.1 General principles of safety | | |
| 0.2 Hazards | | |
| 0.3 Materials and components | | |
| 1 General | | |
| 1.1 Scope | | |
| 1.2 Definitions | | |
| 1.3 General requirements | | |
| 1.4 General conditions for tests | | |
| 1.5 Components1.6 Power interface | | |
| 1.7 Markings and instructions | | |
| 2 Protection from hazards | | |
| 2.1 Protection from electric shock and energy hazards | | |
| 2.2 SELV circuits | | |
| 2.3 TNV circuits | | |
| 2.4 Limited current circuits | | |
| 2.5 Limited power sources | | |
| 2.6 Provisions for earthing and bonding | | |
| 2.7 Overcurrent and earth fault protection in primary circuits | | |
| 2.8 Safety interlocks | | |
| 2.9 Electrical insulation | 105 | |
| 2.10 Clearances, creepage distances and distances through insulation | 112 | |
| 3 Wiring, connections and supply | 146 | |
| 3.1 General | 146 | |
| 3.2 Connection to a mains supply | 151 | |
| 3.3 Wiring terminals for connection of external conductors | | |
| 3.4 Disconnection from the mains supply | | |
| 3.5 Interconnection of equipment | | |
| 4 Physical requirements | | |
| 4.1 Stability | | |
| 4.2 Mechanical strength | | |
| 4.3 Design and construction | | |
| 4.4 Protection against hazardous moving parts | | |
| 4.5 Thermal requirements | | |
| 4.6 Openings in enclosures | | |
| 4.7 Resistance to fire | | |
| · | | |
| 5.1 Touch current and protective conductor current | | |
| 5.3 Abnormal operating and fault conditions | | |
| 6 Connection to telecommunication networks | | |
| 6.1 Protection of telecommunication network service persons, and users | | |
| equipment connected to the network from hazards in the equipment | | |

D2

| | 6.2 Protection of equipment users from overvoltages on telecommunication networks |
|---------|--|
| | 6.4 <u>Protection against overvoltage from power line crosses</u> 243 |
| 7 C | onnection to cable distribution systems |
| | 7.1 General |
| | 7.2 Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment |
| | 7.3 Protection of equipment users from overvoltages on the cable distribution system |
| | 7.4 Insulation between primary circuits and cable distribution systems247 |
| Annex A | (normative) Tests for resistance to heat and fire |
| | A.1 Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg and of stationary equipment (see 4.7.3.2) |
| | A.2 Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4) |
| | A.3 Hot flaming oil test (see 4.6.2) |
| Annex B | (normative) Motor tests under abnormal conditions (see 4.7.2.2 and 5.3.2) |
| | B.1 General requirements.254B.2 Test conditions.254B.3 Maximum temperatures.255B.4 Running overload test.256B.5 Locked-rotor overload test.257B.6 Running overload test for d.c. motors in secondary circuits.258B.7 Locked-rotor overload test for d.c. motors in secondary circuits.259B.8 Test for motors with capacitors.260 |
| | B.9 Test for three-phase motors |
| Annex C | (normative) Transformers (see 1.5.4 and 5.3.3) |
| | Overload test |
| Annex D | (normative) Measuring instruments for touch-current tests (see 5.1.4) |
| | Measuring instrument |

Annex E (normative) Temperature rise of a winding (see 1.4.13)

Annex F (normative) Measurement of clearances and creepage distances (see 2.10 and Annex G)

Annex G (normative) Alternative method for determining minimum clearances

| G.1 | Clearances | 279 |
|-----|---|------|
| | G.1.1 General | 279 |
| | G.1.2 Summary of the procedure for determining minimum clearances | 279 |
| G.2 | Determination of mains transient voltage | 280 |
| | G.2.1 AC mains supply | 280 |
| | G.2.2 Earthed d.c. mains supplies | 281 |
| | G.2.3 Unearthed d.c. mains supplies | 281 |
| | G.2.4 Battery operation | 281 |
| G.3 | Determination of telecommunication network transient voltage | 281 |
| G.4 | Determination of required withstand voltage | 282 |
| | G.4.1 Mains transients and internal repetitive peaks | 282 |
| | G.4.2 Transients from telecommunication networks | 283 |
| | G.4.3 Combination of transients | 283 |
| | G.4.4 Transients from cable distribution systems | 283 |
| G.5 | Measurement of transient voltage levels | 284 |
| G.6 | Determination of minimum clearances | .284 |
| | | |

Annex H (normative) Ionizing radiation (see 4.3.13)

Annex J (normative) Table of electrochemical potentials (see 2.6.5.6)

Annex K (normative) Thermal controls (see 1.5.3 and 5.3.8)

| K.1 | Making and breaking capacity | .291 |
|-----|-------------------------------|------|
| K.2 | Thermostat reliability | .291 |
| K.3 | Thermostat endurance test | .292 |
| K.4 | Temperature limiter endurance | .292 |
| K.5 | Thermal cut-out reliability | .292 |
| K.6 | Stability of operation | .292 |

Annex L (normative) Normal load conditions for some types of electrical business equipment (see 1.2.2.1 and 4.5.2)

| L.1 | Typewriters | .293 |
|-----|------------------------------------|------|
| L.2 | Adding machines and cash registers | .293 |
| | Erasers | |
| L.4 | Pencil sharpeners | .293 |
| L.5 | Duplicators and copy machines | .294 |
| L.6 | Motor-operated files | .294 |
| L.7 | Other business equipment | .295 |

| Annex M | (normative) Criteria for telephone ringing and other signals(see 2.3.1) | DE |
|-------------------|---|----------|
| M.2 M.3 | Introduction.296Method A.296Method B.300M.3.1 Ringing signal.300M.3.2 Tripping device and monitoring voltage.301Other telecommunication signals.303 | D2 |
| IVI.4 | Other telecommunication signals | DΖ |
| | (normative) Impulse test generators(see 1.5.7.2, 1.5.7.3, 2.10.3.9, 6.2.2.1, 7.4.2, and Clause G.5) | |
| | ITU-T impulse test generators | |
| Annex P | (normative) Normative references | |
| | UL and CSA Component Requirements (mandatory) | DC DC |
| Annex Q | (normative) Voltage dependent resistors (VDRs)(see 1.5.9.1) | |
| Annex R | (informative) Examples of requirements for quality control programmes | |
| | Minimum separation distances for unpopulated coated printed boards (see 2.10.6.2) | |
| Annex S | (informative) Procedure for impulse testing(see 6.2.2.3) | |
| S.2 | Test equipment | |
| Annex T | (informative) Guidance on protection against ingress of water(see 1.1.2) | |
| Annex U 2.10.5 | (normative) Insulated winding wires for use without interleaved insulation(see 4) | |
| | General .334 Type tests .334 U.2.1 General .334 U.2.2 Electric strength .334 U.2.3 Flexibility and adherence .334B U.2.4 Heat shock .334B U.2.5 Retention of electric strength after bending .335 | |

| U.3 | Testing during manufacture U.3.1 General | .335 |
|---------|---|------|
| | U.3.2 Routine test | |
| Annex V | (normative) A.C. power distribution systems(see 1.6.1) | |
| | Introduction | |
| | TN power distribution systems | |
| | TT power distribution systems | |
| V.4 | IT power distribution systems | .344 |
| Annex W | (informative) Summation of touch currents | |
| W.1 | Touch current from electronic circuits | .346 |
| | W.1.1 Floating circuits | |
| | W.1.2 Earthed circuits | |
| W.2 | 2 Interconnection of several equipments | |
| | W.2.1 Isolation | |
| | W.2.2 Common return, isolated from earth | |
| | (informative) Maximum heating effect in transformer tests(see Clause C.1) Determination of maximum input current | 351 |
| | Overload test procedure | |
| Annex Y | (normative) Ultraviolet light conditioning test(see 4.3.13.3) | |
| Y.1 | Test apparatus | .353 |
| | Mounting of test samples | |
| | Carbon-arc light-exposure apparatus | |
| Y.4 | Xenon-arc light-exposure apparatus | .353 |
| Annex Z | (informative) Overvoltage categories (see 2.10.3.2 and Clause G.2) | |
| Annex A | A (normative) Mandrel test(see 2.10.5.8) | |
| | | |
| Annex B | B (informative) Changes in the second edition | |