UL 60065

STANDARD FOR SAFETY

Audio, Video and Similar Electronic Apparatus – Safety Requirements

UL Standard for Safety for Audio, Video and Similar Electronic Apparatus – Safety Requirements, UL 60065

Eighth Edition, Dated September 30, 2015

Summary of Topics

This new edition of ANSI/UL 60065 is being issued to update requirements to those published in IEC 60065, eighth edition. Technical changes to the IEC Standard have been incorporated into the new edition of the UL Standard. National Differences from the Seventh Edition of UL 60065 were reviewed and updated in the new edition.

UL 60065 is an adoption of IEC 60065, Audio, video and similar electronic apparatus – Safety requirements (Eighth Edition, issued June 2014). Please note that the national difference document incorporates all of the U.S. national differences for UL 60065.

The requirements are substantially in accordance with Proposal(s) on this subject dated May 15, 2015 and July 24, 2015.

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Standard for Audio, Video and Similar Electronic Apparatus – Safety Requirements

Prior to the seventh edition, the requirements for the products covered by this standard were included in the Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use, UL 6500, First and Second Editions. UL 60065, seventh edition, was a new edition of UL 6500. The standard number and edition number were changed to correspond with the equivalent IEC 60065 standard.

Seventh Edition – June, 2003

Eighth Edition

September 30, 2015

This ANSI/UL Standard for Safety consists of the Eighth Edition. The most recent designation of ANSI/UL 60065 as an American National Standard (ANSI) occurred on September 30, 2015. 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 http://csds.ul.com.

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Preface (UL)

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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.

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NATIONAL DIFFERENCES

GENERAL

National Differences from the text of International Electrotechnical Commission (IEC) Publication IEC 60065, Audio, video and similar electronic apparatus – Safety requirements, copyright 2014, are indicated by notations next to the clause, sub-clause, Table, Figure or Annex number.

There are four types of National Differences in this Standard as noted below.

DU – These are National Differences which are either (1) based on **basic safety principles and requirements**, elimination of which would compromise safety for U.S. consumers and users of products, or (2) based on **safety practices**, where the IEC requirements may be acceptable, but adopting the IEC requirements would require considerable retesting or redesign on the manufacturer's part.

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**.

DR – These are National Differences based on the **national regulatory requirements**.

National Differences have been incorporated into the body of the standard. If National Differences necessitate the deletion of the IEC 60065 text, the IEC 60065 text has been retained but has been ~~lined-out~~. Text added as a result of National Differences has been <u>underlined</u>. Text added as the UL Preface and UL Foreword is not underlined.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUDIO, VIDEO AND SIMILAR ELECTRONIC APPARATUS – SAFETY REQUIREMENTS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and nongovernmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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International Standard IEC 60065 has been prepared by IEC technical committee 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology. It has the status of a group safety publication in accordance with IEC Guide 104.

This eighth edition cancels and replaces the seventh edition published in 2001 including its Amendment 1 (2005) and Amendment 2 (2010). It constitutes a technical revision.

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The principal changes in this edition as compared with the seventh edition are as follows:

– new requirements for wall and ceiling mounting means;

– new requirements for coin / button cell batteries;

– all notes have been reviewed to comply with the new directives;

– addition of requirements for LEDs;

– requirements for creepage distances are aligned with IEC 60950-1;

– change in optocoupler requirements.

The text of this standard is based on the following documents:

FDIS	Report on voting
108/523/FDIS	108/541/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this standard, the following print types or formats are used:

– requirements proper and normative annexes: in roman type;

– compliance statements and test specifications: *italic type*;

– notes/explanatory matter: in smaller roman type;

– normative conditions within tables: in smaller roman type;

– terms defined in Clause 2: SMALL CAPITALS.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under ″http://webstore.iec.ch″ in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

Principles of safety

General

This introduction is intended to provide an appreciation of the principles on which the requirements of this standard are based. Such an understanding is essential in order that safe apparatus can be designed and manufactured.

The requirements of this standard are intended to provide protection to persons as well as to the surroundings of the apparatus.

Attention is drawn to the principle that the requirements, which are standardized, are the minimum considered necessary to establish a satisfactory level of safety.

Further development in techniques and technologies may entail the need for future modification of this standard.

NOTE The expression ″protection to the surroundings of the apparatus″ implies that this protection should also include protection of the natural environment in which the apparatus is intended to be used, taking into account the life cycle of the apparatus, i.e. manufacturing, use, maintenance, disposal and possible end-of-life recycling of parts of the apparatus.

Hazards

The application of this standard is intended to prevent injury or damage due to the following hazards:

– electric shock;

– excessive temperatures;

– radiation;

– implosion;

– mechanical hazards;

– fire;

– chemical burns (for example, as a result of the ingestion of lithium chemistry button/coin cells).

Electric shock

Electric shock is due to current passing through the human body. Currents of the order of a milliampere can cause a reaction in persons in good health and may cause secondary risks due to involuntary reaction. Higher currents can have more damaging effects. Voltages below certain limits are generally regarded as not dangerous under specified conditions. In order to provide protection against the possibility of higher voltages appearing on parts that may be touched or handled, such parts are either earthed or adequately insulated.

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For parts which can be touched, two levels of protection are normally provided to prevent electric shock caused by a single fault. Thus a single fault and any consequential faults will not create a hazard. The provision of additional protective measures, such as SUPPLEMENTARY INSULATION or protective earthing, is not considered a substitute for, or a relief from, properly designed BASIC INSULATION.

Cause	Prevention
Contacts with parts normally at hazardous voltage	Prevent access to parts at hazardous voltage by fixed or locked covers, interlocks, etc. Discharge capacitors at hazardous voltages.
Breakdown of insulation between parts normally at hazardous voltage and accessible parts.	Either use double or reinforced insulation between parts normally at hazardous voltages and accessible parts so that breakdown is not likely to occur, or connect accessible conductive parts to protective earth so that the voltage which can develop is limited to a safe value. Provide adequate mechanical and electrical strength.
Breakdown of insulation between parts normally at hazardous voltage and circuits normally at non-hazardous voltages, thereby putting accessible parts and terminals at hazardous voltage.	Segregate hazardous and non-hazardous voltage circuits either by double or reinforced insulation so that breakdown is not likely to occur, or by a protective earthed screen, or connect the circuit normally at non-hazardous voltage to protective earth, so that the voltage which can develop is limited to a safe value.
Touch current from parts at hazardous voltage through the human body. (Touch current can include current due to RFI filter components connected between mains supply circuits and accessible parts or terminals.)	Limit touch current to a safe value or provide a protective earthing connection to the accessible parts.

Excessive temperatures

Requirements are included to prevent injury due to excessive temperatures of accessible parts, to prevent damaging of insulation due to excessive internal temperatures, and to prevent mechanical instability due to excessive temperatures developed inside the apparatus.

Radiation

Requirements are included to prevent injury due to excessive energy levels of ionizing and laser radiation, for example by limiting the radiation to non-hazardous values.

Implosion

Requirements are included to prevent injury due to implosion of picture tubes.

Mechanical hazards

Requirements are included to ensure that the apparatus and its parts have adequate mechanical strength and stability, to avoid the presence of sharp edges and to provide guarding or interlocking of dangerous moving parts.

Fire

A fire can result from:

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– heat;

– arcing;

caused by

– overloads;

– component failure;

– insulation breakdown;

– bad connections;

– conductor breakage.

Requirements are included that are intended to prevent fire originating within the apparatus from spreading beyond the immediate vicinity of the source of the fire or from causing damage to the surroundings of the apparatus.

The following preventive measures are recommended:

– the use of suitable components and sub-assemblies;

– the prevention of excessive temperature rise that might cause ignition under normal or fault conditions;

– the use of measures to eliminate POTENTIAL IGNITION SOURCES such as inadequate contacts, bad connections, interruptions;

– the limitation of the quantity of combustible material used;

– the control of the position of combustible materials in relation to POTENTIAL IGNITION SOURCES;

– the use of materials with high resistance to fire in the vicinity of POTENTIAL IGNITION SOURCES;

– the use of encapsulation or barriers to limit the spread of fire within the apparatus;

– the use of suitable fire retardant materials for the enclosure.

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AUDIO, VIDEO AND SIMILAR ELECTRONIC APPARATUS – SAFETY REQUIREMENTS

1 General

1.1 Scope

1.1.1 DU This International Safety Standard applies to electronic apparatus designed to be fed from the MAINS, from a SUPPLY APPARATUS, from batteries or from REMOTE POWER FEEDING and intended for reception, generation, recording or reproduction of audio, video and associated signals. It also applies to apparatus designed to be used exclusively in combination with the above-mentioned apparatus.

This standard primarily concerns apparatus intended for household and similar general use. ~~but~~ It also covers COMMERCIAL APPARATUS and PROFESSIONAL APPARATUS which may ~~also~~ be used in places of public assembly such as schools, theatres, places of worship and the workplace. PROFESSIONAL APPARATUS intended for use as described above ~~is also covered unless falling specifically within the scope of other standards~~ may be evaluated to requirements in this standard, or to the requirements in UL 1419.

This standard concerns only safety aspects of the above apparatus; it does not concern other matters, such as style or performance.

This standard applies to the above-mentioned apparatus, if designed to be connected to the TELECOMMUNICATION NETWORK or similar network, for example by means of an integrated modem.

Some examples of apparatus within the scope of this standard are:

– receiving apparatus and amplifiers for sound and/or vision;

– independent LOAD TRANSDUCERS and SOURCE TRANSDUCERS;

– SUPPLY APPARATUS intended to supply other apparatus covered by the scope of this standard;

– ELECTRONIC MUSICAL INSTRUMENTS, and electronic accessories such as rhythm generators, tone generators, music tuners and the like for use with electronic or non-electronic musical instruments;

– audio and/or video educational apparatus;

– video projectors;

NOTE 1 Film projectors, slide projectors and overhead projectors are covered by ~~IEC 60335-2-56~~ UL 122

– video cameras and video monitors;

– household video games and flipper games;

– juke boxes;

– electronic gaming and scoring machines;

NOTE 2 Video games, flipper games and gaming machines and other amusement games for commercial use are covered by ~~IEC 60335-2-82~~ UL 22

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– teletext equipment;

– record and optical disc players;

– tape and optical disc recorders;

– antenna signal converters and amplifiers;

– satellite receiver antenna positioners;

NOTE 3 UHF and VHF antenna rotators are covered by UL 150

– Citizen's Band apparatus;

– apparatus for IMAGERY;

– electronic light effect apparatus;

– apparatus for use in alarm systems;

NOTE 4 Includes cameras, stop motion recorders and the like used in alarm systems. This Standard does not cover the investigation of the actual alarm system.

– intercommunication apparatus, using low voltage MAINS as the transmission medium;

– cable head-end receivers;

– professional general use amplifiers, record or disc players, tape players, recorders, and public address systems;

– professional sound/video systems;

NOTE 5 The requirements of UL 1419 may also be used to meet the requirements for safety of PROFESSIONAL APPARATUS.

– electronic flash apparatus for photographic purposes ~~(see Annex L)~~ covered by UL 122; and

– multimedia apparatus.

The requirements of ~~IEC 60950-1~~ UL 60950-1 or UL 62368-1 may also be used to meet the requirements for safety of multimedia apparatus (see also IEC Guide 112).

MAINS connected apparatus covered by this standard is intended for installation in compliance with the National Electrical Code, ANS/NFPA 70.

1.1.2 This standard applies to apparatus with a RATED SUPPLY VOLTAGE not exceeding

– 250 V a.c. single phase or d.c. supply;

– 433 V a.c. in the case of apparatus for connection to a supply other than single-phase.

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1.1.3 DU This standard applies to apparatus for use at altitudes not exceeding 2 000 m above sea level, primarily in dry locations and in regions with moderate or tropical climates.

For apparatus ~~with protection against splashing water~~ intended for outdoor use, additional requirements are given in Annex A.

For apparatus to be connected to TELECOMMUNICATION NETWORKS, additional requirements are given in Annex B.

For apparatus intended to be used in vehicles, ships or aircraft, or at altitudes exceeding 2 000 m above sea level, additional requirements may be necessary.

NOTE 1 See Table A.2 of IEC 60664-1:2007.

NOTE 2 China has special requirement in choosing multiplication factors at altitude above 2 000 m.

Requirements, additional to those specified in this standard, may be necessary for apparatus intended for special conditions of use.

1.1.4 For apparatus designed to be fed from the MAINS, this standard applies to apparatus intended to be connected to a MAINS supply with transient overvoltages not exceeding overvoltage category II according to IEC 60664-1.

For apparatus subject to transient overvoltages exceeding those for overvoltage category II, additional protection may be necessary in the MAINS supply of the apparatus.

1.1.5 DU Certain apparatus covered by the requirements in this standard are also required to comply with applicable requirements in other appropriate standards because of their intended end use applications or environmental conditions.

1.1.6 DR Audio and video apparatus with nonmetallic enclosures, intended to be installed in air-handling spaces shall additionally comply with the requirements in UL 2043.

NOTE Apparatus such as dome cameras and public address system speakers having nonmetallic enclosures that extend inside the air-handling space after installation are subject to this requirement.

1.1.7 DU Baby monitors shall comply with ASTM F2951.

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1.2 DC Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM D495, *Standard Test for High-Voltage, Low-Current, Arc Resistance of Solid Electrical Insulating Material*

ASTM F2951, *Consumer Safety Specification for Baby Monitors*

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60038:2009, *IEC standard voltages*

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-31:2008, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

~~IEC 60086-4, *Primary batteries – Part 4: Safety of lithium batteries*~~

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

~~IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*~~
~~Amendment 1:2009~~

IEC 60127 (all parts), *Miniature fuses*

IEC 60127-6, *Miniature fuses. Part 6: Fuse-holders for miniature cartridge fuse-links*

IEC 60167:1964, *Methods of test for the determination of the insulation resistance of solid insulating materials*

IEC 60216 (all parts), *Electrical insulating materials – Thermal endurance properties*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60227-2:1997, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*

~~IEC 60245 (all parts), *Rubber insulated cables – Rated voltages up to and including 450/750 V*~~

~~IEC 60249-2 (all parts), *Base materials for printed circuits – Part 2: Specifications*~~

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