Advanced Energy

IEC/EN/UL 62368-1 Introduction to Audio/Video, Information and Communication Technology Equipment for Power Supplies

INTRODUCTION

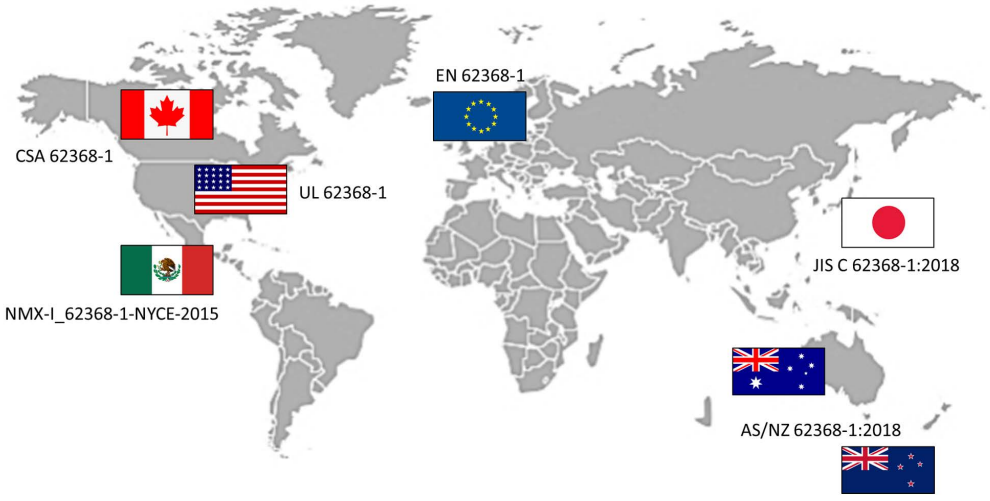
For years, original equipment manufacturers have been designing Information Technology Equipment (ITE) to meet IEC 60950-1 and Audio/Video (AV) equipment to meet IEC 60065. Within two years these standards will be obsoleted. OEMs need to transition all relevant products to the new IEC/EN/UL 62368-1 standard. The IEC 62368-1 covers Audio/Video Information and Communication Technology Equipment and is a completely new standard, not a combination of the two legacy standards. Manufacturers beware, there are two years left to convert new and existing products to the new standard to be able to sell into North American and European markets.

This paper will highlight some of the main features of the IEC 62368-1 standard and identify some of the key differences from the legacy 60065 and 60950-1 safety standards. As of today, the United States and European Union have harmonized the implementation date to December 20, 2020, when 60065 and 60950-1 will no longer be accepted and 62368-1 will be the safety standard.

HISTORY

The world is changing faster than ever. Not long ago, society was using analog electronic devices and computers were the new wave of the future. Now the ability to make most devices into "smart" devices has blurred the lines between information technology equipment and audio/video equipment. To keep up with these technology changes, the International Electrotechnical Commission (IEC) standards committee developed a new hazard-based product-safety standard to proactively cover the needs of components and end-user products safety. IEC62368-1 was originally published in January 2010 and the latest 3rd edition has been published on October 4, 2018. Compared to the IEC 60065 and IEC 60950-1 safety standards which identify risks after an incident occurs, the IEC 62368-1 standard takes a proactive risk-based approach to safety by identifying potential hazards upfront.

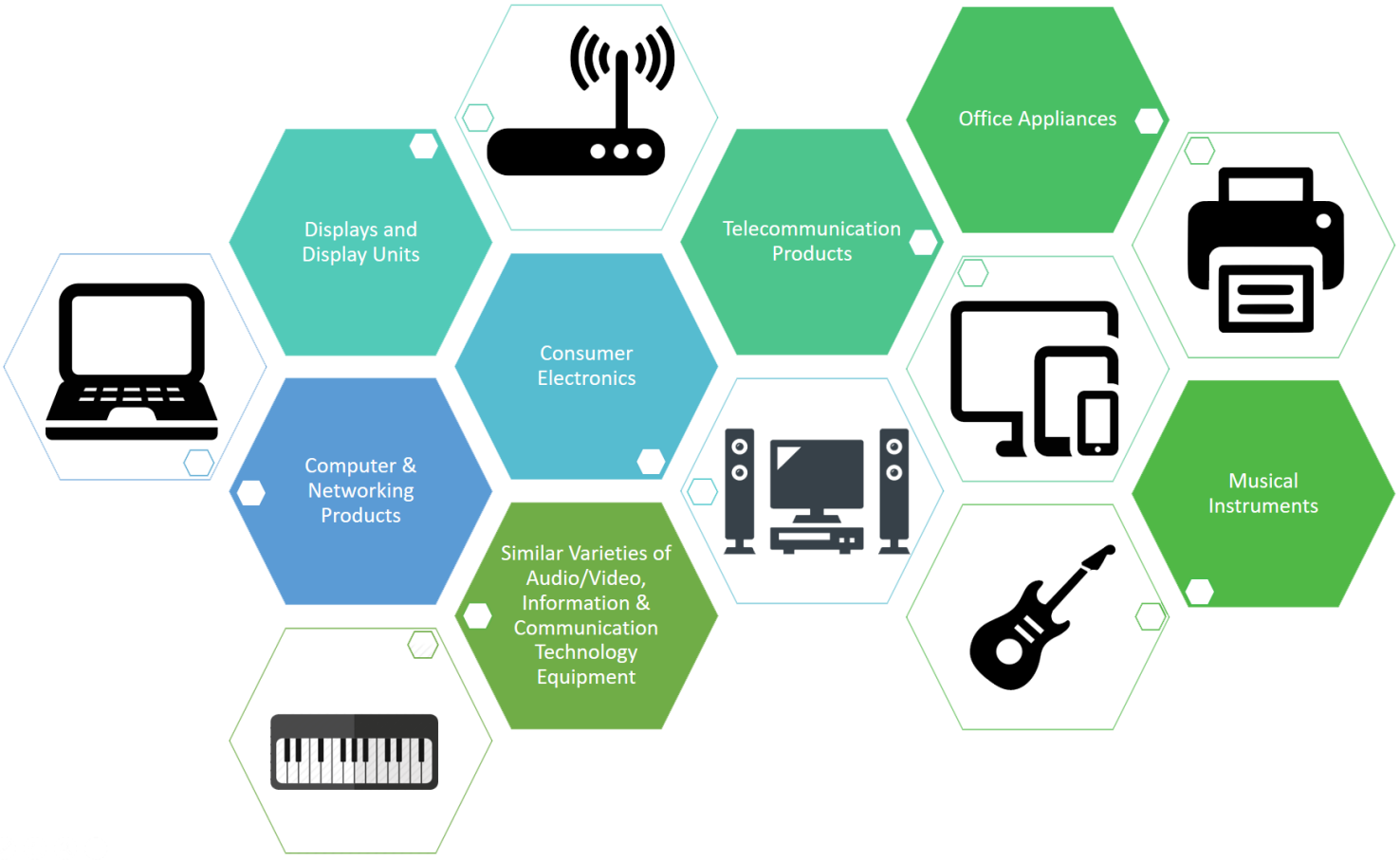
Other international countries are publishing their national equivalents and implementation dates may differ from other countries.



Although countries are adopting their national equivalents, many of the underlying principles and features remain the same. In general, the products covered by IEC 60950-1 and IEC 60065 are covered under IEC 62368-1. The product categories are expected to expand in the future as technology evolves.

PRODUCTS COVERED

The new standard covers a wide range of products including but not limited to the following categories.



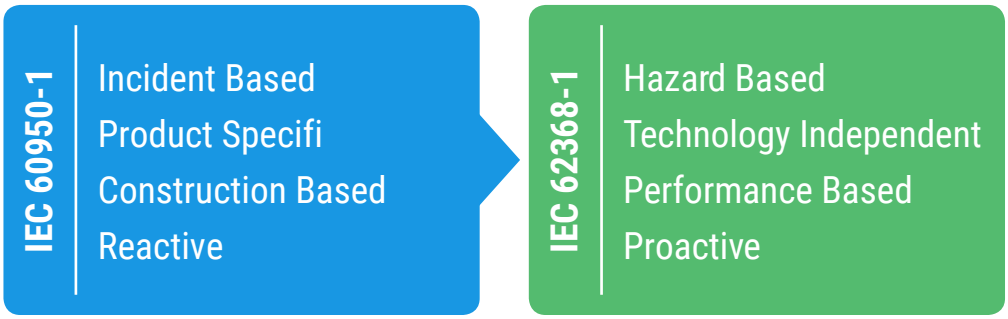
Included are machines and equipment with rated voltage not exceeding 600V and includes 400/690V equipment. Note included are power supply systems which are not an integral part of the equipment, such as motor-generator sets, battery backup systems, and distribution transformers.

IEC 62368-1 applies to subsystem components, such as power supplies, in addition to end-user products. Equipment currently approved to IEC 60950-1 and IEC 60065 will need to be approved to IEC 62368-1. Complying with one or both legacy standards will not guarantee compliance with IEC 62368-1. Those familiar with the legacy standards will notice the transition to Hazard-Based Safety Engineering as one of the main changes.

HAZARD-BASED SAFETY ENGINEERING (HBSE)

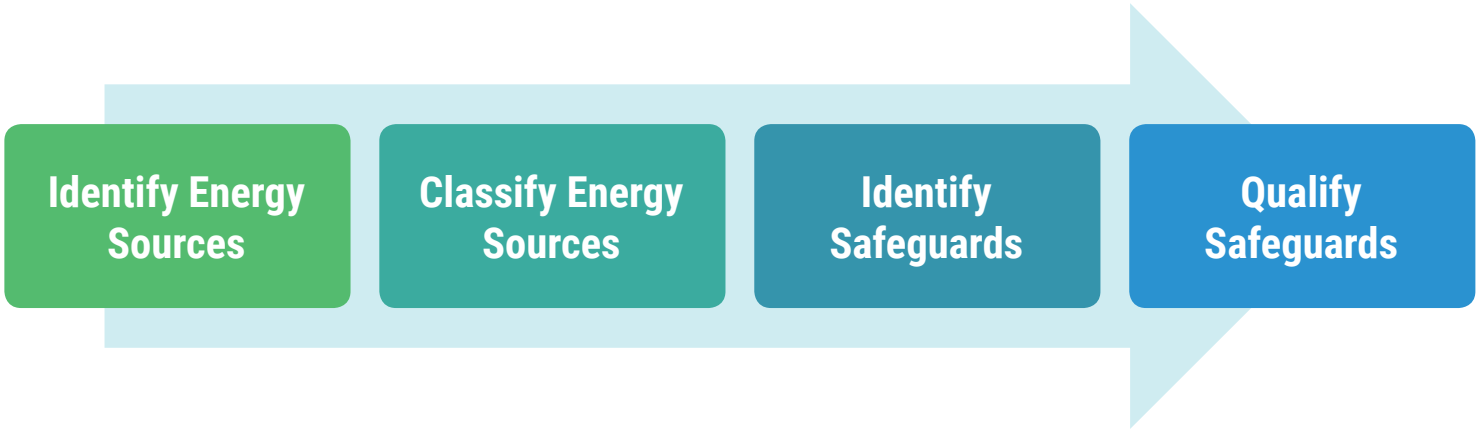
Hazard-Based Safety Engineering was adopted to be more proactive in determining potential hazards and how to mitigate them. Compared to the IEC 60950-1 which is in line with the adage, "the squeaky wheel gets the grease", there was typical a product which had a safety incident, and new safeguards were created to protect users. HBSE is intended to identify potential hazards upfront and develop safety measures to mitigate user risk of injury. The methodology is simplified into two basic questions:

- What types of hazards are associated with my product?
- What safeguards must be implemented to prevent this?



The Hazard-Based Safety Engineering methodology has a Four Block Model for Pain and Injury to simplify the compliance process.

1. Identify energy sources in the product that can cause pain or injury (i.e. electrical, mechanical, thermal, etc.).
2. Classify those energy sources effect on the body or their potential for combustion (i.e. not painful/painful but not injurious/injury-causing, as well as ignition not likely/possible/likely).
3. Identify safeguards that are needed to protect against the above: Some safeguard types include Equipment Safeguards, Instructional Safeguards, and Installation Safeguards.
4. Qualify those safeguards using performance or construction-based criteria.



Each of these steps are broken down into individual models. The three-block model for injury was introduced for identifying energy sources.

THREE BLOCK MODELS

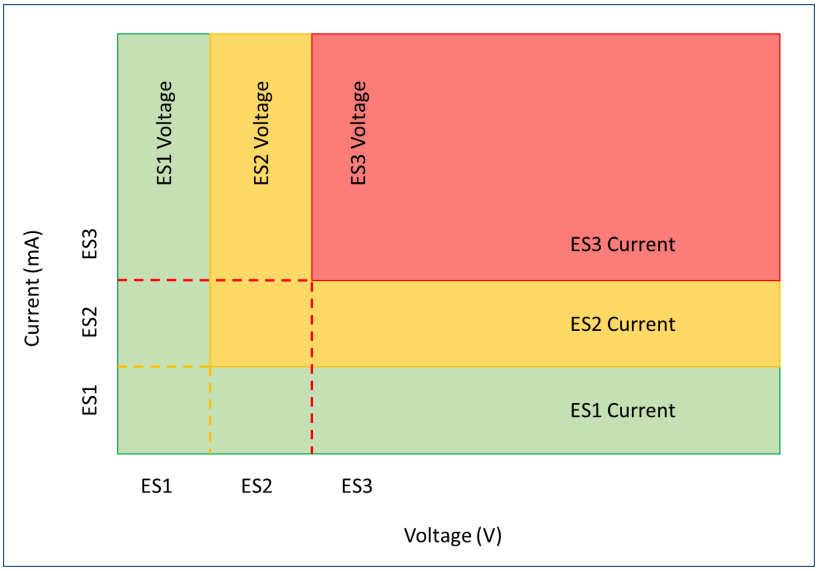
The three-block model visualizes the link between energy source, energy transfer mechanism or safeguard and the user. The concept for the model is that any product that causes injury must have an originating energy source and must have a form of energy transfer to the body to cause injury.

Energy Source Capable of Causing Pain or Injury → **Energy Transfer** → **Body Part**

Four of the major changes from the legacy standards are how energy sources are identified and quantified as hazards. This includes energy hazard limits, mechanical hazards, components, touch temperature limits and radiated energy sources. Energy sources are broken down into three classifications based on their danger levels. The table below shows the energy class magnitudes for some of the potential hazard categories as they would be applicable for a typical power supply application.

Energy Source Class	Electric Shock Injury (>1kHz Vac)	Electrically-Caused Fire	Mechanical Injury (Equipment Mass)	Thermal Injury (>1 min)
	ES-1 / ES-2 / ES-3	PS-1 / PS-2 / PS-3	MS-1 / MS-2 / MS-3	TS-1 / TS-2 / TS-3
Class 1 Not painful, but may be detectable	<30V rms or < 0.5mA	< 15W @3s	< 7kg mass	< 48^{0}C
Class 2 Painful, but not an injury	< 50V rms or < 5mA	< 100W @5s	< 25kg mass	< 58^{0}C
Class 3 Injury	> 50V rms or > 5mA	< 100W @5s	> 25kg mass	> 58^{0}C

A pictorial example of energy levels for electrical shock injury is pictured below.



For any identified energy source that is classified as either Class 2 or Class 3, there will need to be an investigation of safeguards to mitigate the risk to the user.

SAFEGUARDS

The Hazard Based Safety Engineering model includes a link between energy source, safeguards, and the end user. The safeguard levels are defined below.

- Basic Safeguards – Lowest level
- Supplementary Safeguards - Become operational if the basic safeguard fails
- Double Safeguards – E.g. double insulation
- Reinforced Safeguards – Single safeguards that offer protection equivalent to that of a double safeguard

Basic Safety – Freedom from unacceptable risk caused by physical hazards because of the product's physical construction or design.

Functional Safety – Freedom from unacceptable risk caused by physical hazards that depends on a (programmable) electronic safety related function.

After determining the intensity class of the energy source and the type of user, there are several types of safeguards that are required for each scenario. The goal is to bring all energy sources that may contact a user down to class 1 levels. If class 1 levels are not possible, then the skill level of the user must be increased to use the equipment.

TYPES OF PERSONS

Protecting the end users is the goal of the standard incurring any circumstance of use. This is not always available for devices that are inherently dangerous and thus, special people still can use and maintain products. Three classifications have been created for different kinds of users. The terminology of types of persons has been modified from previous standards. For those familiar with the user, supervised or service person labels, these are now changed to ordinary, instructed and skilled as follows.

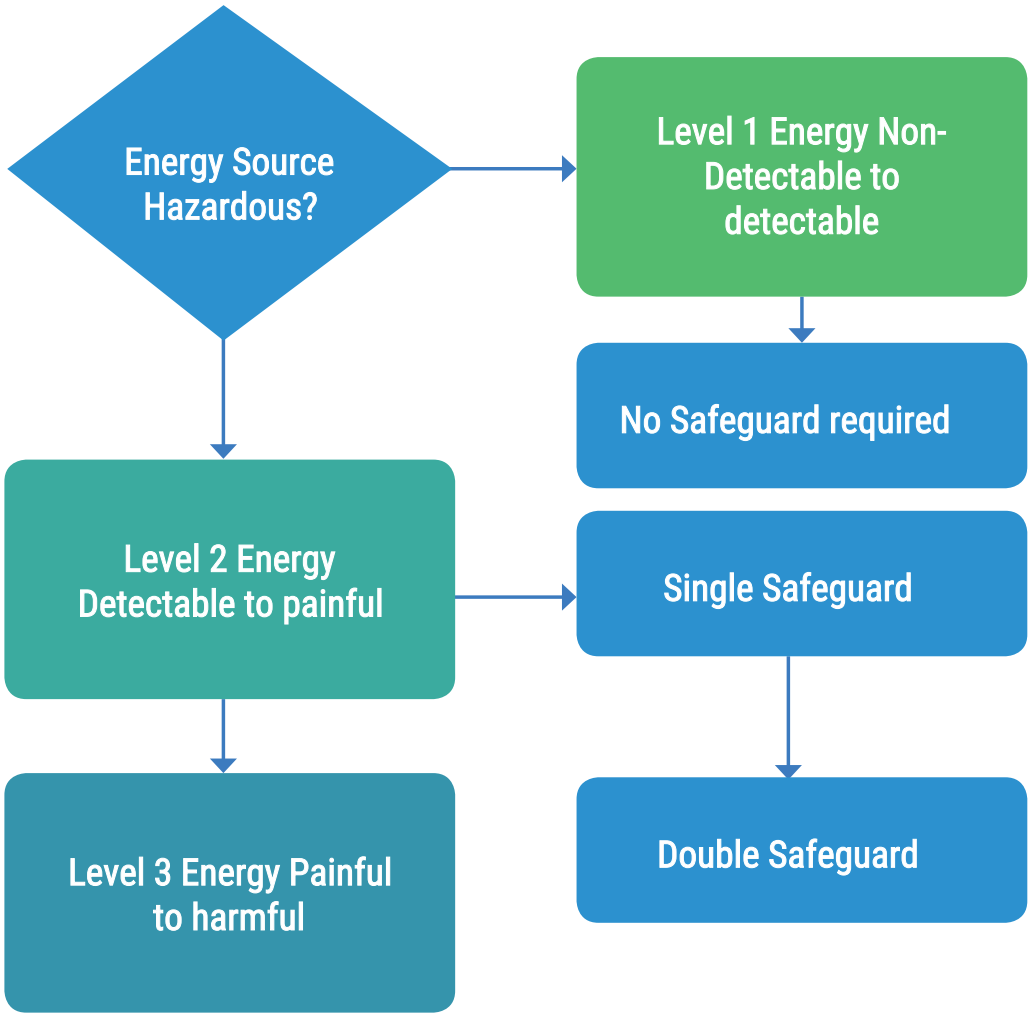
- "User/Operator" is now classified as "O dinary Person"
- "Instructed and trained, or supervised, by a skilled person" is now classified as "Instructed erson"
- "Service Person" is now classified as "Skilled erson"

The table below summarizes the types of persons as well as the types of safeguards needed for the different energy class levels.

Person	Who	Minimum Required Safeguards	
		Class 2	Class 3
Ordinary (User/Operator)	All persons	Basic	Basic + Supplementary, or Reinforced
Instructed (Instructed and trained, or supervised, by a skilled person)	Persons who have been instructed and trained by a Skilled Person	Single Safeguards	Basic + Supplementary, or Reinforced
Skilled (Service Person)	Persons who have been trained or experienced in Class 2 and 3 energy sources	Double Safeguard	

SAFEGUARD MODELS

To simplify the safeguard requirements, the logic diagram below shows the required safeguards in IEC 62368-1. If the energy source is not hazardous to an ordinary person, no additional safeguards are required. If at energy level three, then a double safeguard is required for a skilled person to interact with the product. If at an energy level two, either a single safeguard or double safeguard is required depending on the skill level of the user.



Source: Intertek "Overview & Gap Analysis…"

SL POWER

SL Power has laboratories in both the US and Asia that are approved to test to the new standard. While new products will be certified to the new 62368-1 standard, customers can still have products tested to 60950-1 upon request. With most of the hazardous voltages being converted to safer lower voltages at the power supply, fewer electrical hazards will need to be investigated for the rest of the system.

New releases of power supply products comply with IEC 62368-1 and all active products are transitioning to the new standard.

CONCLUSION

SL Power is committed to providing power solutions to our customers and will have all applicable power supplies compliant to the new standard to insure OEMs can meet the compliance deadline. The IEC 62368-1 harmonization date, December 20, 2020, is arriving soon and market adoption has already begun to transition from legacy standards. The standard has made several updates to how products are viewed with respect to energy hazard limits, mechanical hazards, components, and touch temperature limits. The new standard is proactive in its methodology to be applicable to the rapidly changing technologies. While this currently affects products that comply with IEC 60950-1 and IEC 60065, there may be other products and standards in the future that convert to 62368-1.

SOURCES

BS EN 62368-1:2014, “Audio/Video, Information and Communication Technology Equipment”.

Intertek, “Overview & Gap Analysis of Hazard Based Safety Engineering (HBSE) IEC/UL/CSA 60950-1 and 62368-1 Standards”.

Nute, Richard, “Introduction to IEC 62368-1”; https://ewh.ieee.org/r6/ocs/pses/1202_portland.pdf; 2012-02-12.

Pasternak, Jeff; Montrose, Mark; Allen, John, “International Product Compliance and Certifications – Sa ety and EMC Compliance 101”. APEC San Antonio, Texas. March 4-8, 2018.

Pescatore, Richard, “IEC 62368, A Revolution in Standards Development”. IEEE PSES. April 14, 2008.

UL, “The Road Toward a New Hazard-Based Standard: IEC62368-1”. https://www.ul.com/global/documents/offerings/industries/hightech/resources/general/hbse_brochure_final.pd . 2012.

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