IEC 62368-1 Knowledge HUB FAQ

1. Does Subclause 5.4.5 of IEC 62368-1:2018, Ed. 3, apply to both a device connected to an outdoor antenna and an indoor device with a small integral antenna, like a wireless router? Why does a test voltage of 10kV apply?

More specifically, you asked: For the purposes of testing insulation, Subclause 5.4.5 in Ed.3 states that the insulation between mains and antenna terminals, and mains and external circuits providing non-mains supply to equipment having antenna terminals shall withstand electrostatic discharges at the antenna terminals. Does this requirement apply to any type of antenna? Why is the accessible terminal tested 50 times at 10kV while the accessible conductor on a USB or ethernet port or similar component is tested against a different voltage? Is Clause 5.4.5 only meant for outdoor antennas, or would the tiny antenna on an indoor wireless router also need to be tested if it is supplied by a mains power module? If so, what are the dangers addressed in the case of small indoor devices with tiny antennas such that regular insulation tests are inadequate to deal with them?

In response, Subclause 5.4.5 of IEC 62368-1:2018, Ed. 3, does not apply to equipment connected to every type of antenna. The requirement does not apply to indoor devices with an indoor antenna, e.g., on a wireless router. The test voltage applies between mains and any terminals directly or indirectly connected to an outdoor antenna only. For equipment connected to an outdoor antenna, the specified insulation is required to withstand electrostatic discharges because a high voltage (up to 10kV) caused by an electrostatic charge may accumulate over time on the outdoor antenna due to environmental effects like dust blowing against the antenna. For a more detailed background of this requirement, please consult Subclause 5.4.5 in the rationale document IEC TR 62368-2:2019.

2. What are the rules for opening size, number of openings and minimum spacings between the openings per Subclauses 6.4.8.3.3 and 6.4.8.3.4 of a fire enclosure? When is testing required? Does the standard allow for a mesh or grid to cover the openings?

(References are to IEC 62368-1:2014, Ed. 2, except where otherwise noted.)

As stated in Subclause 6.4.8.3.3, top/side openings that are within the fire cone of Figure 41 are treated as top openings and shall not exceed 5 mm in any dimension or 1 mm in width, regardless of the length. If the openings exceed those dimensions, the standard requires the needle flame test of Clause S.2, which shall be applied as explained in 6.4.8.3.3.

The standard does not rule out other options, such as providing a mesh or barrier, the acceptability of which will need to be determined upon review of an actual sample. Additionally, the standard has no requirement specifying the maximum number of top/side openings that may be provided. There are also no requirements regarding the spacings between the openings for top/side openings. However, keep in mind that too many openings may affect the strength of the enclosure. The robustness of an enclosure safeguard will be assessed per 4.4.4 by the mechanical strength tests of Annex T if deemed necessary. An enclosure functioning as an electrical and fire enclosure (safeguard) will need to meet all applicable performance requirements.

The standard defines bottom openings as any openings within the zone as shown in Figure 42, including intersections with side openings, as noted in 6.4.8.3.4. In lieu of the flammability tests in S.3, the standard allows several options for compliance with the requirements as explained in 6.4.8.3.4 a) through d).

As stated in 6.4.8.3.4 a), openings that do not exceed 3 mm in any dimension or 1 mm in width, regardless of length, are considered compliant. As stated in b), openings may go up to 6 mm in any dimension, or 2 mm in width if located under components that are rated minimum V-1, HF-1, or components that pass the needle flame test in IEC 60695-11-5. Alternatively, as explained in c), the standard also allows a metal mesh that does not exceed 2 mm by 2 mm of at least 0.45 mm diameter wire to be provided.

One last option, which only applies to metal enclosures, is explained in 6.4.8.3.4 d) and detailed in Table 34. Openings shall be dimensioned and spaced per that table based on the thickness of the enclosure and the shape of the opening (circular or otherwise). The standard does not specify any limits on the number of bottom openings if they are adequately spaced per the table.

Please also note that there are additional requirements for openings in Annex P that are not fire-related and can impact the size of openings.

However, in IEC 62368-1, Ed. 3, extensive revisions were made to fire enclosure requirements that affect enclosure openings. First, in 6.4.8.3.1, “Fire enclosure and fire barrier openings,” see the new Figure 40 — Determination of top, bottom and side openings. Extensive revisions were also made to 6.4.8.3.5, “Side openings and side opening properties,” which can result in areas of the side enclosure having no restriction for fire considerations. For top openings subjected to performance testing, also note modifications to “Application of needle flame” in Annex S.2 and “Flammability test for fire enclosure and fire barrier integrity,” including the new Figure S.1. In 6.4.8.3.4, “Bottom openings and bottom opening properties,” for openings below the PIS, the principles and requirements are now much closer to IEC 60950-1, including the reintroduction of the five-degree downward projection principle. Finally, also in 6.4.8.3.4, the original options c) and d) have been removed since this type of construction is considered to meet the criteria of the second part of option b).

3. For DC-powered products with internal PS2 circuits and containing only resistive PIS, does this construction require a fire enclosure?

All references are to IEC 62368-1:2018.)

In the case of the "reduce the likelihood of ignition" method, including the application of Subclause 6.4.3, a fire enclosure is normally not required. However, if requirements for separation from PIS are not met per the first dash of 6.4.3.1, a suitably rated fire barrier would be required. Therefore, this method may not be the best method for the type of application you describe. (The first dash paragraph of 6.4.3.1 states, "- an arcing PIS or a resistive PIS shall be separated as specified in 6.4.7 with the accessible outer surface of the equipment considered to be covered with a combustible material.")

In the case of the "control fire spread" method, for a product only having PS2 circuits complying with 6.4.5, a PS2 circuit does not require a fire enclosure, regardless of whether PIS is also available. However, note the component requirements in 6.4.5.2, in which one option is adequate separation from a PIS, although it is not the only option.

Please also note that if the DC-powered product also has a secondary lithium battery, M.4.3, "Fire enclosure," of Annex M is also required. A fire enclosure, V-1 or better, is required for the cell or combination of cells unless the cell is PS1. The product enclosure can also serve as the fire enclosure required by M.4.3. Currently, IEC TC108 is collaborating on a formal interpretation for M.4.3 in which PIS considerations and separation from combustible parts need not be considered inside batteries. Therefore, in such batteries, even for PIS in very close proximity to the enclosure, a V-0 material would not be required, even when it normally would be in 6.4.8.4.

4. What are the requirements for internal and external wiring according to IEC 62368-1, Ed. 3, and UL 62368-1, Ed. 3?

More specifically, you asked: I am seeking product certification to IEC 62368 and have come up against the wire flammability issue. I note the existing answer regarding equivalence with VW-1, but what about superior standards such as CL2? Is there a means by which CL2 being superior — i.e., the NEC® allows substitution — to VW-1 allows me to demonstrate compliance with UL 62368, the Standard for Audio/Video, Information and Communication Technology Equipment?

In response, as you inferred, the note under Subclause 6.5, "Internal and external wiring" in IEC 62368-1, Ed. 3, as well as UL 62368-1 accepts VW-1 wires rated to UL 2556, the Standard for Wire and Cable Test Methods, to demonstrate compliance with 6.5.1 as an alternative method.

In addition, for external wiring, according to the U.S./CAN deviations under 4.1.17DV.1, "External interconnecting cable and wiring," such wiring is to be investigated to the requirements of 6.5 and either 4.1.17DV.1.2 or 4.1.17DV.1.3, depending on the cable length.

External interconnecting cable and wiring 3.05 m or less may be investigated as part of the equipment (system) to the requirements of this standard, depending on the PS circuits involved:

- External interconnecting cable and wiring connected to PS2 or PS3 circuits — the flammability requirement of 6.5 applies
- There are no flammability requirements for external interconnecting cable and wiring in PS1 circuits.

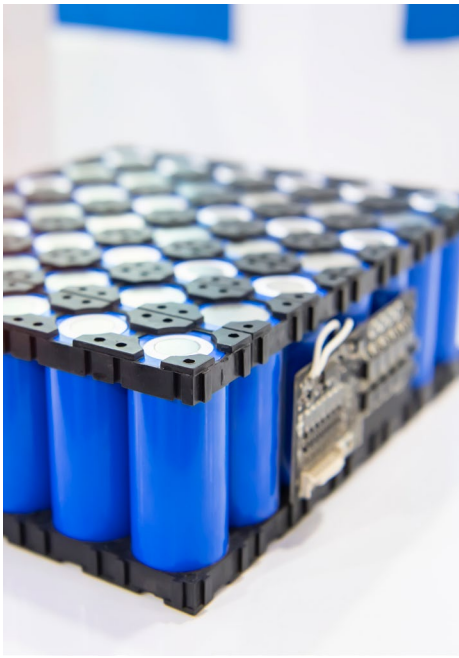
Other external interconnecting cables and wiring exceeding 3.05 m in length are required to comply with 4.1.17DV.1.3, including the references to the Canadian Electrical Code, Part I, CSA C22.1; and the National Electrical Code® (NEC®), NFPA 70®, under Annex DVA (Annex Q), where CL2 Listed cables are allowed to be used in Class 2 and LPS circuits.

Such CL2 cables are UL Listed as Power Limited Circuit Cable (QPTZ), information for which can be found in UL Product iQ® — iq.ULprospector.com/en/profile?e=210650.

Please note: CL2 cables are subjected to a vertical-tray flame test in UL 1685, the Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables, which is a more onerous test than VW-1. Therefore, if a manufacturer wanted to also substitute Listed CL2 cables for internal wiring or external cabling not exceeding 3.05m in length, that would be considered acceptable, too, as long as the circuit was Class 2 or LPS. However, most manufacturers choose not to do so due to cost considerations.

The complete answer to this topic is complex, and there appears to be a specific, detailed construction that needs review/analysis. Therefore, we encourage you to contact UL Solutions for an in-depth consultation, either via your local account executive or via 62368-UL-solutions.com/contact-UL.html.

5. Annex M.2 of IEC 62368-1:2014 requires batteries and cells to comply with the relevant IEC standard, such as IEC 62133: 2013. If a battery and/or cell complies with IEC 62133-1:2017 or IEC 62133-2:2017, does it also need to comply with IEC 62133:2013?



Some years ago, IEC TC21/SC21A decided to split IEC 62133 into two standards while also incorporating a number of improvements. In 2017, IEC 62133:2013 was replaced by IEC 62133-1:2017 for alkaline or other non-acid batteries and IEC 62133-2:2017 for lithium batteries. However, although IEC 62133-1 and IEC 62133-2 are the current standards for such chemistries, there is also the need for a transition period.

Please note that you reference IEC 62368-1:2014, Ed. 2, but IEC 62368-1:2018, Ed. 3, is also available now. IEC 62133, IEC 62133-1 and IEC 62133-2 are all listed in Annex M.2 of IEC 62368-1:2018 to allow for the transition.

If an AV/ICT product with a battery covered by the IEC 62133-x series is submitted for UL certification to IEC 62368-1:2014, a valid certification to IEC 62133-1 or IEC 62133-2 would be accepted for batteries and cells without also being compliant with the legacy IEC 62133:2013.

6. Can the marking on a wire be used as evidence of compliance with VW-1 rating requirements?

More specifically, you asked: When demonstrating compliance with IEC 62368 wire flammability by way of the VW-1 equivalence concession, if a manufacturer has a file listing for AWM Style No. 20276 (which conforms to UL 758, the Standard for Appliance Wiring Material, which itself states a number of flammability tests that can be applied), where is the evidence of which flammability test was used? Is it sufficient to rely on the product marking? If a cable is marked "[File Number] [UL logo] AWM Style 20276 80C 30V VW-1," is that sufficient to state that it meets VW-1 on the basis that UL Solutions controls such markings, or is there a further document or certificate that should be provided to show which flammability test was performed?

In response, we confirm that a VW-1 rating is acceptable based on a National Difference for USA/Canada (in Annex DVF (6.5.1)) with its reference to UL 2556. A reference to UL 2556 VW-1 is also in Subclause 6.5.1 of IEC 62368-1, Ed. 3, which provides this option for wider use under IEC 62368-1, although the acceptance is at the discretion o a National Certification Body(NCB).

For wires recognized by UL Solutions under the AVLV2 category, the markings, including identification, ratings and the UL Mark, provided on a spool (tag, reel or smallest unit container) are considered the evidence of formal compliance and UL Component Recognition. Please see the AVLV2 Guide Information in the Product iQ database for more details — https://iq.ULprospector.com/en/profile?e=206308. The marking provided on the wire itself is for reference only and, alone, generally is not considered direct evidence of UL Component Recognition during end-product UL Solutions Follow-Up Services.

Please note that there may be a benefit for your wiring and wiring harness suppliers to get covered under one of our traceability programs, like the UL Wiring Harness Program — UL.com/services/wiring-harness-traceability-program. Then you could trace the certification and ratings of your components to the original certification markings associated with the spool, etc. More than 3,000 wiring harness suppliers are currently certified under the wiring harness program, so some of your suppliers may already be covered — iq.ULprospector.com/en/profile?e=212703.

For any additional support needed, we encourage you to contact UL Solutions, either via your local account executive or via 62368-UL-solutions.com/contact-UL.html.

7. When are POE and USB ports required to be marked with the output voltage and the output current according to CSA/UL 62368-1 F.3.3.9DV.1? For POE, can we mark “POE” or “POE+,” etc., to replace voltage and current?

More specifically, you asked: UL 62368-1 F.3.3.9: Output terminals provided for the supply of other equipment except mains supply shall be marked with the nominal output voltage and frequency and, in addition, the maximum output current or power, unless the terminals are marked with the type references of the equipment that is permitted to be connected. According to our understanding of the sentence “unless the terminals are marked with the type references of the equipment,” for POE, we would add “POE,” “POE+” or “POE++” near the POE port. For USB, we would add a USB 2.0 symbol or USB 3.0 symbol near the USB port. Can you help check whether the strategy meets the requirements of UL 62368-1 and the NEC?

In response, let’s first clarify that National Difference F3.3.9DV is only intended to apply to equipment with terminals that need to be hard-wired to supply power to other equipment. This marking has been in CSA UL 62368-1 since its first edition, and was not intended to apply to USB, PoE or similar standardized ports with standardized connectors. However, other, newer requirements in CSA UL 62368-1 now apply to some of these ports.

More specifically, based on new requirements in Section 725.121 of the 2017 NEC, there is a new marking that applies to output ports that supply power (Class 2 or LPS) to other equipment through long lengths of cables (building wiring). Please look closely at 725.121(A)(4) and 725.121(C), which require certain outputs supplying building wire, such as PoE, to have maximum voltage and current markings or labels so cable installers (electricians) can correctly size the cabling — in particular, bundled cables — in accordance with new NEC Section 725.144, “Transition of power and data.” CSA/UL 62368-1, Ed. 3, now covers this NEC requirement in Regulatory Annex DVA (Q), “Power sources for Class 2 circuits.” Note that there is an exception to this marking/labeling for power sources providing 0.3 amperes nominal current or less based on a tentative interim agreement (TIA) issued by the NFPA after the 2017 NEC was published.

Therefore, in your example (POE output port), it will now need to comply with the above national difference in Annex DVA. However, marking the PoE port as “POE” or “POE+,” etc., does not meet the requirement since it does not allow for the equipment to comply with the installation requirements in NEC Article 725. In other words, the cable installer (electrician) and/or the code authority will be looking for the maximum voltage and current to be marked or labeled so they can determine compliance of the installed cabling with the new Section 725.144. Note that for the 2020 NEC, there is some further refinement of the requirements in 725.121. We recommend that you review them in the NEC.

Please also note that Annex DVA (Q) only applies to output circuits/ports connected to building wiring. Generally, USB is intended to be used for relatively short interconnects between equipment, not for connection to building wiring. Therefore, generally, USB ports are not covered by NEC Article 725.121 and Annex DVA (Q). As a result, for USB, the output voltage and output current are not required to be marked as they are for PoE.

8. Can single-fault condition testing between pins of a control IC and power switching MOSFET in a single package be omitted if there is inherent isolation between both complying with basic insulation requirements?

More specifically, you asked: Some AC/DC switching power supply circuits in IT/AV products are constructed using unrecognized off-line switcher IC components that incorporate the control IC and power switching MOSFET into a single IC package. Typically, the chip is designed to provide isolation between the drain/source pins of the MOSFET and the control pins. Is it always necessary to complete single-fault testing between the control pins and drain/source pins of the MOSFET per B.4.1, or can omitting faults between the drain/source pins of the MOSFET and the control pins of the IC be justified if the isolation between the drain/source pins and control pins (including PCB traces) meets creepage/clearance or electric strength requirements for basic insulation in accordance with B.4.4.1 and B.4.4.2?

In response, it is our understanding that the switcher IC and MOSFET you describe function independently, but are isolated in the same IC package by the equivalent to Basic Insulation.

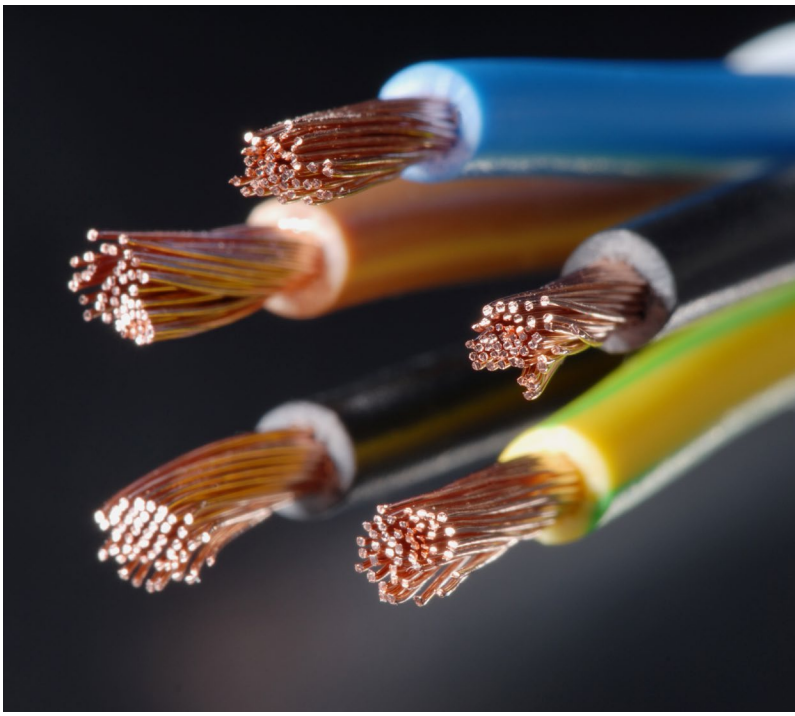
Based on this understanding, in most cases, the short circuit between the pins of the switcher IC and MOSFET may not be required per clause B.4.4 of IEC 62368-1:2014 and IEC 62368-1:2018 since the isolation possesses a certain quality (clearance, creepage distance and electric strength) comparable to a basic safeguard.

However, IEC 62368-1 is a hazard-based standard, and the application of Annex B needs to be considered in the context of the clauses (covering different energy sources/hazards) that reference it. Annex B is not applied independently.

Faulting the Basic Insulation should not be required in the context of Clause 5, "Electrically caused injury," since functional insulation is only required as a minimum for such an IC package.

However, in Clause 6, "Electrically caused fire," if the "reduction of the likelihood of ignition" method is chosen, then, in accordance with Subclause 6.4.3 of IEC 62368-1:2014 or IEC 62368-1:2018, relevant single-fault condition testing is required across a single safeguard in the context of risk of fire. In accordance with the definition of a single-fault condition (3.3.7.9) and B.4.1, "Simulated single-fault conditions – General," a basic safeguard failure should be considered if it affects the safety of the equipment. Therefore, we believe a single-fault condition across the single safeguard is appropriate in this situation.

Your question points to an area of IEC 62368-1 that may need further refinement, and we encourage you to engage IEC TC108 through your national committee if you believe the standard needs further clarity on this topic. Also, as this forum is a general forum and is not intended to analyze and provide guidance on specific designs, we suggest that you contact the UL Solutions office you work with if you have a specific design or construction that you wish to discuss.



9. What are the differences in application of the electric strength test in power supplies and end products?

More specifically, you asked: A PSU certified to IEC 60950-1 passes the HIPOT test at 2121 V DC between primary and earth. When it is used in an end product to be certified to IEC 62368-1, does it need to withstand the end product HIPOT test that could be more than 2121 V DC, e.g., 2500 V DC?

Generally, no, as a type test. Per Subclause 4.1.1 of IEC 62368-1, components complying with IEC 60950-1 are acceptable without further evaluation other than to consider the appropriate use of the component in the end product.

Therefore, while there is the need to determine the necessity of an electric strength (HIPOT) test as a type test per 5.4.9.1 on the product if the end product contains any solid insulation designated basic, supplementary or reinforced insulation, solid insulation in the PSU complying with the relevant requirements of IEC 60950-1 is not required to be reassessed via type test and brought into compliance with IEC 62368-1.

Please note that the electric strength test per 5.4.9.1 of 62368-1 is the type test for solid insulation. Therefore, the test requirements do not generally apply to insulation through the air, i.e., gaps complying with clearance and creepage distance requirements. There is no general HIPOT test at 2121 V DC between PRI and earth that is performed as a type test in 62368-1, although there typically is a production line (routine) test (at reduced ES test values) required per (EN) IEC 62911, Audio, Video and Information Technology Equipment – Routine Electrical Safety Testing in Production, and as a certification requirement of individual certifiers, including UL Solutions. These production line tests typically check for gross manufacturing defects, including miswiring errors, rather than rechecking all specific insulation properties originally qualified via type tests.

The IEC TC108 interpretation panel question of 108/698/INF provides guidance for component acceptance per 4.1.1 with some examples in various situations. Although this particular question was not addressed exactly, it will be helpful for further understanding of the application of 4.1.1, and the document is available through the IECEE website — decisions.iecee.org/iecee/SearchCMC.nsf/de_h.xsp?v=iectc.

10. Does UL Solutions plan to publish a UL 62368-3 Standard based on IEC 62368-3:2017?

For those unaware, the first edition of IEC 62368-3, Audio/Video, Information and Communication Technology Equipment – Part 3: Safety Aspects for DC Power Transfer Through Communication Cables and Ports, was published in 2017. It addresses two key topics.

Clause 5 covers power transfer using ES1 and ES2 level voltages. USB and PoE circuits are examples of the technologies covered in Clause 5.

Clause 5 covers power transfer using remote (power) feeding telecommunications (RFT) circuits. Clause 6 essentially covers the same circuits/technologies as originally covered in the legacy standard IEC 60950-21, Information Technology Equipment – Safety – Part 21: Remote Power Feeding.

When the CAN/US Technical Harmonization Committee (THC) reviewed both IEC 62368-1:2018 and IEC 62368-3:2017 for potential adoption in Canada and the U.S., a decision was made to develop and propose a CAN/US version of the latest IEC 62368-1 standard, which was subsequently published on Dec. 13, 2019, as CSA UL 62368-1:2019, Ed. 3. However, during this review, the THC also decided not to pursue a CAN/US version of IEC 62368-3.

The decision not to pursue a CAN/US version of IEC 62368-3 was made because the THC believed that IEC 62368-3 requires some refinement before it would be an appropriate standard for adoption as a mandatory binational standard for Canada and the U.S. This refinement was thought necessary both for Clause 5 and Clause 6. Therefore, rather than adopt IEC 62368-3, the THC proposed — and eventually got accepted — the following national difference in Clause 1 of CSA UL 62368-1, Ed. 3:

“1DV.2.3: Additional requirements for equipment with DC power transfer through communication cables and ports are given in IEC 62368-3. IEC 62368-3 Clause 5 for DC power transfer at ES1 or ES2 voltage levels is considered informative. IEC 62368-3 Clause 6 for remote power feeding telecommunication (RFT) circuits is considered normative (see ITU K.50). Alternatively, equipment with RFT circuits is given in either UL 2391, the Standard for Equipment with Remote Feeding Telecommunication Circuits Intended for Backwards Compatibility in Legacy Telecommunication Equipment, or CSA/UL 60950-21, the Standard for Information Technology Equipment – Safety – Part 21: Remote Power Feeding. RFT-C circuits are not permitted unless the RFT-C circuit complies with RFT-V limits (≤ 200V per conductor to earth).”

Therefore, in Canada and the U.S., USB, PoE and similar circuits will not be required to be investigated to Clause 5 in addition to the 62368-1 standard. However, RFT circuits will continue to need additional evaluation beyond 62368-1 per the options allowed for in National Difference 1DV.2.3.

11. Is additional Annex M evaluation still required if a Li-Ion battery pack certified to IEC 62133:2012 and UL 2054 is used in a host product? Will a battery pack certified by IEC 62368-1 be accepted in a host product investigated to IEC 60950-1?

More specifically, you asked: An ITE product has been certified according to the latest version of IEC/EN/UL/CSA 60950-1, the Standard for Information Technology Equipment – Safety – Part 1: General Requirements. It includes a rechargeable Li-ion battery pack certified according to IEC 62133, Ed. 2, and it also has a certificate for UL 2054, the Standard for Household and Commercial Batteries. Now the product will be tested according to IEC 62368-1, Ed. 3, and the question is: Will the battery require testing alone and/or with the host product? Is it required that the battery pack and host be evaluated according to Annex M of IEC 62368-1? What if the battery pack has been certified according to IEC 62133, Ed. 2, and IEC 62368-1, Annex M, when the host product was certified to IEC 60950? Does an update from IEC 60950 to IEC 62368 require Annex M testing again?

In response, based on Annex M.2.1 of IEC 62368-1:2018, a lithium battery pack that complies with IEC 62133 fulfills one of the general battery standard requirements required by Annex M. (IEC 62281 or IEC 62485-2 may also be needed based on the mobility of the host product). However, M.2 is only one aspect of Annex M, and applicable M.3 to M.6 and M.10 are also essential to evaluate the operation of the battery in the host product/system. Although UL 2054 is permitted as an alternative to IEC 62133 (per Annex DVF of UL 62368-1:2019), the use of a UL 2054-compliant lithium battery pack in transportable equipment does not eliminate the need to also determine compliance with M.3 to M.6 and M.10 in the host product/system.

For host products/systems subjected to IEC 60950-1, per 1.5.1, components and subassemblies that comply with IEC 62368-1 are acceptable as part of equipment covered by IEC 60950-1 without further evaluation of the component other than to consider the appropriate use of the component or subassembly in the end-product/system, which is done per 4.3.8, which includes testing of the system under single fault during charging and discharging, etc. However, no further tests from IEC 60950-1 are needed on the host/system once a lithium battery pack and the host/system construction have already been certified according to IEC 62133:2012 and applicable parts of IEC 62368-1:2019, Annex M. (Note for stationary equipment: A national difference in 4.3.8 of UL 60950-1 requires more evaluation for battery packs used in stationary equipment that rely on solid-state circuits and software controls. UL 1973, the Standard for Batteries for Use in Stationary and Motive Auxiliary Power Applications, is one of the appropriate standards.)

If a host product has already been certified to IEC 60950-1 but uses a battery pack that was certified to IEC 62133:2012 and Annex M of IEC 62368-1:2014/IEC 62368-1:2019, again, the use of the battery pack must be considered accordingly in the host/system when the host product is upgraded to IEC 62368-1:2019. Some parts of Annex M may be required since Annex M covers some system considerations that are not part of IEC 60950-1, such as M.4.4, drop test of equipment containing a secondary lithium battery. However, we suggest that you contact UL Solutions to discuss this type of complex topic in greater detail since all the specific details of the existing components/constructions/certifications require close review.

12. What are the key differences between the Ed. 2 of IEC 62368-1 and Ed. 3?

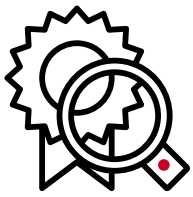
Related to key changes in Edition No. 3 from Edition No. 2, the Foreword to Edition No. 3 includes the following information:

"This edition includes the following significant technical changes with respect to the previous edition:

- addition of requirements for outdoor equipment
- new requirements for optical radiation
- addition of requirements for insulating liquids
- addition of requirements for work cells
- addition of requirements for wireless power transmitters
- addition of requirements for fully insulated winding wire (FIW)
- alternative method for determination of top, bottom and side openings for fire enclosures
- alternative requirements for sound pressure."

UL Solutions has also produced a certification impact analysis on this new edition. This latest analysis is intended to identify and analyze the impact of notable differences between the latest edition of IEC 62368-1:2018, Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, and its immediate predecessor, IEC 62368-1:2014, Ed. 2.

This analysis will permit people already familiar with Ed. 2 of IEC 62368-1 to become familiar with the likely impact of the latest edition on the safety of AV and ICT equipment. Other select observations are included that may be of interest to the reader. This analysis will be updated periodically as additional information on the application of the new standard becomes known.



13. Regarding Subclause 6.2.2 of IEC 62368-1:2018, Ed. 3, what are the failure criteria of PS1 under abnormal and single-fault conditions on load and power source circuits?

Subclause 6.2.2.1 specifies that the electrical power source classification shall be determined by measuring the maximum power under each of the following conditions:

6.2.2.2 – Worst-case fault
6.2.2.3 – Worst-case power source fault

Therefore, the above two measurements determine the PS class (PS1, PS2, PS3).

Worst-case (load) fault (6.2.2.2) represents any fault in the load circuit to draw maximum power from the power source. In particular, the fault is simulated by an additional load as LVR, shown in Figure 34. The LVR is adjusted to draw maximum power from the power source during operation under normal operating conditions. Note that a single fault of components associated with the load is not actually conducted for worst-case (load) faults.

However, in a worst-case power source fault (6.2.2.3), single-fault testing of components is conducted in the power source circuit with the load under normal operation.

The criteria of PS1 as specified in 6.2.2.4 — "power source measured according to 6.2.2 does not exceed 15 W measured after three seconds" — applies to the measurement results from both worst-case fault and worst-case power source fault.

Although the energy source of ES, MS, TS or RS in this standard is classified under normal, abnormal and single-fault conditions, PS classification is made by a different method. It is classified according to the maximum measured power under worst-case fault (6.2.2.2) and worst-case power source fault (6.2.2.3).

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CMIT23CS853409-04.23