

IEC 62368-3 Backgrounder and update!

Safety of AV /ICT Equipment – DC Power Transfer through Communication Cables and Ports

Introduction

With the 2017 publication of IEC 62368-3:2017, Safety of AV/ICT Equipment – DC Power Transfer through Communication Cables and Ports, new requirements for DC power transfer through communication cables and ports are now available, both for adoption as a national standard, and for use by IEC technical committees looking to address such requirements. This paper, originally issued in 2018, and updated several times since, provides background on the development of IEC 62368-3, plus additional information on the latest developments.

Background

IEC TC108 is the international technical committee responsible for standardization in the field of safety for audio/video, information and communication technology (AV/ICT) equipment.

Latest:

- February 11, 2021 - As announced in **EK1 715-20**, the German Product Safety Committee EK1 has decided the application of EN IEC 62368-3: 2020 in conjunction with the EN 62368-1: 2014 + A11: 2017 or EN IEC 62368-1: 2020 + A11: 2020 is not mandatory (it is voluntary). However, at the manufacturer's request, the GS Mark also can be awarded if EN IEC 62368-3: 2020 is applied in addition to the EN 62368-1: 2014 + A11: 2017 or EN IEC 62368-1: 2020 + A11: 2020 standard.
- April 23, 2021 - As announced in **108/753/INF**, IEC TC108 has taken a position via Interpretation that compliance with IEC 62368-3 is not required for compliance with IEC 62368-1 as the only reference to IEC 62368-3 is in the scope of IEC 62368-1 and as a result is not normative.

IEC TC108 has been deeply involved in a multi-year project and transition developing replacement standards for the legacy standards for:

- *IEC 60065* has been the primary international standard for safety of AV equipment for many years.
- *IEC 60950-1* similarly has been the primary standard for safety of information technology equipment (ITE), including telecommunications equipment, now commonly referred to as communication technology (CT) equipment.

The standard that has replaced both IEC 60065 and IEC 60950-1 is *IEC 62368-1, Audio/video, information and communication technology equipment - Part 1: Safety requirements*, frequently referred to as the hazard-based standard. IEC 62368-1:2018 is now in its third (3rd) edition. By the end of 2020, two major regions of the world, Europe and Canada/U.S., have transitioned to an IEC 62368-1 -based standard.

For ITE, in addition to its Part 1 standard, IEC 60950-1, three additional Part 2 standards existed.

- *IEC 60950-21, Information technology equipment - Safety - Part 21: Remote power feeding*, covered remote power feeding telecommunication (RFT) equipment.
- *IEC 60950-22, Information technology equipment - Safety - Part 22: Equipment to be installed outdoors*, covered ITE intended to be installed outdoors.
- *IEC 60950-23, Information technology equipment - Safety - Part 23: Large data storage equipment*, covered large ITE with internal robotics systems, typically associated with movement of data storage media, which can be a risk of injury to persons without proper safeguarding.

Each of these Part 2 standards also required transition and association with IEC 62368-1.

Although IEC 60950-1 had been fully transitioned into IEC 62368-1, individual decisions also had to be made on how to transition each Part 2 standard, either via revision

and incorporation of content into the base IEC 62368-1 standard, or via a new Part 2 standard as part of the IEC 62368-x series.

The IEC TC108 effort included careful and detailed review of the Part 2 standards' principles and content, and thorough update of the requirements to be more in tune with hazard-based safety engineering principles inherent to IEC 62368-1.

For *IEC 60950-22*, IEC TC108 made a decision that its content could be incorporated into the base Part 1 standard relatively easily. While some of the unique considerations for outdoor equipment could be added into the existing sub-clauses (primarily clause 5 for electric shock), most of the unique requirements for outdoor equipment would fit nicely into a new annex (Annex Y).

For *IEC 60950-23*, IEC TC108 concluded that its requirements could be easily transitioned into the base Part 1 standard since the unique considerations associated with internal robotics could be broadened and incorporated into Clause 8 for mechanically caused injury.

However, the more challenging decision ended up being the *IEC 60950-21* standard and how to transition it, especially as a greater variety of DC power transfer through communication cables and ports is becoming more prevalent.

IEC 60950-21 and IEC 62368-3

Since the requirements in IEC 60950-21 applied only to a relatively narrow scope of communications equipment with remote power feeding telecommunication (RFT) circuits, and this equipment is manufactured by a very limited number of manufacturers, the actual decision on transitioning IEC 60950-21 to an IEC 62368-based standard was relatively straightforward.

For purposes of background, RFT technology uses ES3 level voltages and is an established approach to power remote equipment located at distances ranging from hundreds of metres to tens of kilometres away. The 'current feed' version, RFT-C, originally used in Europe, is used to power series-connected repeaters. The 'voltage feed' version; RFT-V, is more specific to North America and is used to power terminal equipment—it is known also as line—or span-powering. Only skilled persons are

normally allowed to have access to the conductors of the RFT (ES3) system. Access by an instructed person is restricted to special installations, and access by an ordinary person is not allowed. (For more information on Remote Power Feeding, consult informative Annex A of IEC 62368-3.)

The content of IEC 60950-21, with its six sub-clauses and one annex (approximately 35 pages total), was too large and complex to attempt to incorporate into the Part 1 standard. Therefore, IEC TC108 decided it should be incorporated into a Part 2 standard to be used when equipment with RFT circuits was investigated.

However, about the same time that IEC TC108 was considering how to best transition IEC 60950-21 into the IEC 62368 series, the technical committee received a request from the *IEC Advisory Committee on Safety (ACOS)* to consider developing group safety, or horizontal requirements for other forms of interface circuits beyond RFT that transfer DC voltage through communication cables and ports.

While RFT circuits typically are operating at ES3 voltage levels (> 60 V), other forms of interface circuits that have DC transfer at lower voltages, typically ES1 and ES2, are becoming more prevalent, both in AV/ICT equipment and other products, including appliances and lighting. **Universal Serial Bus (USB)** and **Power Over Ethernet (PoE)** particularly are becoming a concern as their maximum power levels approach 100 Watts (and in the case of USB have plans to exceed 100W). Such concerns center mainly around increasing voltage, current and power levels under abnormal and single fault conditions, and their effect on equipment, connectors and cabling associated with these protocols, even if they complied with existing ES2, PS2 and/or LPS limits in IEC 62368-1.

IEC TC108 agreed to develop appropriate requirements for such applications within a group (horizontal) safety function in accordance with *IEC Guide 104, The preparation of safety publications and the use of basic safety publications and group safety publications*. Subsequently, requirements were discussed, developed and proposed by the Hazard Based Standard Development Team (HBSDT) of IEC TC108.

As a result, the following steps were taken.

- IEC TC108 proposed that both the existing IEC 60950-21 requirements and the new requirements for DC power transfer at ES1 and ES2 would be included in a new Part 2 standard, *IEC 62368-3, Audio/video, information and communication technology equipment - Part 3: Safety aspects for DC power transfer through communication cables and ports*. (IEC 62368-3 is the next-in-series Part 2 document after, *IEC TR 62368-2, Audio/video, information and communication technology equipment - Part 2: Explanatory information related to IEC 62368-1*.)
- Clause 5 would contain the requirements for power transfer/interfaces at ES1 and ES2 voltages.
- Clause 6 would contain the requirements for power transfer using remote power feeding telecommunication (RFT) circuits, typically at ES3.

Below is the complete structure of *IEC 62368-3:2017*, published in December 2017:

Foreword

1 Scope

2 Normative references

3 Terms, definitions and abbreviated terms 4

General requirements

5 Power transfer using ES1 or ES2 voltages

5.1 General requirements

5.2 Electrical-caused injury, electrical sources and safeguards

5.3 Electrical-caused fire, power sources and safeguards

5.4 Safeguards to protect against a single fault condition in the PSE

6 Power transfer using RFT

6.1 General requirements 6.2

Connection to ICT networks

6.3 Electrically caused injury

6.4 Electrically caused fire

Annex A (informative) – Remote Power

Feeding Annex B (informative) – Rationale for

5.4

As with other Part 2 standards, IEC 62368-3 is intended to be used with the Part 1 standard, IEC 62368-1.

Per its Foreword,

“This International Standard is to be used in conjunction with IEC 62368-1:2014. It has the status of a group safety publication in accordance with IEC Guide 104. The subclauses of IEC 62368-1 apply as far as reasonable. Where safety aspects are similar to those of IEC 62368-1, the relevant clause or subclause of IEC 62368-1 is given for reference in a note in the relevant subclause. Where a requirement in IEC 62368-3 refers to a requirement or criterion of IEC 62368-1, a specific reference to IEC 62368-1 is made.”

Adoption of IEC 62368-3

Although IEC 62368-3 is an international standard, it is not put into practice until countries begin adopting it. Related to this, Canada and the United States have taken a different path than Europe. Let’s take a closer look at this situation related to current adoption of IEC 62368-3.

Canada and the U.S.

In Canada and the United States, a CAN/U.S. Technical Harmonization Committee (THC) develops proposals for adoption of IEC 62368-series standards, including National Differences (NDs) for these IEC-based standards. The CAN/U.S. THC for 62368 consists of Industry members from Canada and the U.S., in addition to technical representatives from CSA and UL Solutions.

Although the CAN/US THC supported developing a CAN/U.S. version of IEC 62368-1:2018, which was published as CSA C22.2 No. 62368-1:2019/UL 62368-1:2019, Edition No. 3, on December 13, 2019, for several reasons the CAN/US THC decided not to support pursuing a similar CAN/U.S. version of IEC 62368-3.

First, there are some technical issues with its first edition, both in its Clause 5 (lacks some refinement) and Clause 6 (additional work is needed to align it with the latest ITU K.50). See - **Current Challenges Associated with IEC 62368-3** – below for more details.

Also, subsequent to the publication of IEC 62368-3, IEC TC108 made a decision to begin a new project to split IEC 62368-3 into two separate standards outside of the 62368-

series since the standard has been designated a basic safety publication for electronic products with DC power transfer and does not only apply to AV/ICT equipment. See - **Future State of IEC 62368-3** - below for more details.

Therefore, the THC believed IEC 62368-3 needed some additional refinement before it should be mandated for use in Canada and the U.S. As a result, a new National Difference (1DV.2.3) was proposed and added to the Scope of CSA/UL 62368-1, Edition No. 3 providing options for compliance other than straight application of IEC 62368-3:

“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 are given in either UL 2391 or CSA/UL 60950-21. RFT-C circuits are not permitted unless the RFT-C circuit complies with RFT-V limits ($\leq 200V$ per conductor to earth).”

In summary, for Canada and the U.S.,

- Clause 5 of IEC 62368-3 essentially has been made informative, so it is not required to be applied to USB, PoE and similar protocols in AV/ICT equipment investigated for Canada and the U.S.
- Clause 6 remains normative for ICT equipment with remote power feeding technology (RFT); however, one of the following alternative compliance options also may be used - the existing UL 60950-21, *Remote Power Feeding*, or the existing UL 2391, *Outline of Investigation for Equipment with Remote Feeding Telecommunication Circuits Intended for Backwards Compatibility in Legacy Telecommunication Equipment*.

Therefore, if a manufacturer elects to use CSA/UL 62368-1 Edition No. 3, National Difference **1DV.2.3** also is required, as applicable based on types of circuit involved.

For Clause 5 of IEC 62368-3, it is expected most AV/ICT manufacturers with USB, PoE, etc. will request that Clause 5 not to be applied. Thus, for Clause 5, the 62368-3 Report / TRF supplement likely will indicate 'Not Applied' or similar. However, this provision only is applicable for Canada and the U.S.

For Clause 6 of IEC 62368-3, the clause in whole, or the allowed alternative options, will be applied to the very limited number of ICT products with RFT circuits. Thus, for Clause 6, the 62368-3 Report/TRF supplement will document compliance when it is applied.

Finally, for CAN/US, if a manufacturer elects to use the legacy CSA/UL 62368-1 Edition No. 2 through the Effective Date of 2023-01-06 associated with CSA/UL 62368-1, Edition No. 3, there will be no required consideration of IEC 62368-3, although AV/ICT equipment with RFT circuits will continue to be subjected to UL 60950-21.

Note too, the CAN/U.S. position now is backed by the IEC TC108 view of IEC 62368-3, as announced in **108/753/INF** on April 23, 2021, in which, IEC TC108 has taken a position that compliance with IEC 62368-3 is not required for compliance with IEC 62368-1 as the only reference to IEC 62368-3 is in the scope of IEC 62368-1 and as a result is not normative.

Europe

Taking a different path than Canada and the U.S., Europe decided to pursue an IEC 62368-3 -based standard, which resulted in the March 27, 2020 publication of *EN IEC 62368-3:2020*. There are no significant European Common Modifications and Special National Conditions associated with it, so the published content is essentially the same as IEC 62368-3:2017.

CENELEC established a December 20, 2020 Date of Withdrawal (DOW) associated with EN IEC 62368-3:2020, which was the date EN IEC 62368-3:2020 (specifically its Clause 6) superseded EN 60950-21 as EN 60950-21 was to be withdrawn on this date. Subsequently, CENELEC has withdrawn EN 60950-21 on this date.

However, a complicating factor is that both EN IEC 62368-1:2020 and EN IEC 62368-3:2020 are not formal European Harmonized Standards because they both have not been accepted by the European Commission (via review by the Harmonized Standards (HAS) Consultants) and published in the Official Journal (OJ) of the European Union.

Therefore, some manufacturers may elect **not** to use one or both of these standards as their method of establishing conformity with the essential provisions of the applicable European Directive (e.g., LVD).

Such being the case, manufacturers ultimately are in charge of making the decision whether they want to request an IECEE CB Report / Certificate that includes EN IEC 62368-3 for Europe.

In summary, if using harmonized standards as the primary method of establishing conformity with the essential provisions of the applicable European Directive (e.g., LVD), thus EN 62368-1:2014 is used,

- EN IEC 62368-3:2020 is not required to be used with EN 62368-1:2014 for AV/ ICT with USB, PoE, etc. covered by its Clause 5, although some manufacturers may elect to use it - there is no EU mandate (regulation) requiring use of Clause 5 of EN IEC 62368-3:2020 with EN 62368-1:2014 at this time.
- EN IEC 62368-3:2020 (although, technically, not a harmonized standard), is recommended to be used with EN 62368-1:2014 for AV/ICT with RFT Circuits covered by its Clause 6 since EN 60950-21 was withdrawn on December 20, 2021, the DOW of EN IEC 62368-3.

If EN IEC 62368-1:2020 is used, since it is not a harmonized standard, the manufacturer needs to document an EU market access strategy with appropriate details in its Risk Assessment and Technical File establishing conformity with the essential provisions of the applicable European Directive (e.g., LVD). This may include use of EN IEC 62368-3:2020 in whole or part. Of course, manufacturers also are responsible for any associated potential business risk of not selecting use of EN IEC 62368-3:2020 for Europe.

However, likely limiting this risk is the IEC TC108 view of IEC 62368-3, as announced in **108/753/INF** on April 23, 2021, in which, IEC TC108 has taken a position via Interpretation that compliance with IEC 62368-3 is not required for compliance with IEC 62368-1 as the only reference to IEC 62368-3 is in the scope of IEC 62368-1 and as a result is not normative.

Finally, for Europe the manufacturer also should consider any requirements that could be associated with specific country Marks (e.g., GS in Germany) - if the Mark scheme specifically requires the EN IEC 62368-3:2020 standard, this would affect the decision on use of EN IEC 62368-3:2020.

However, as announced in **EK1 715-20** on February 11, 2021, German Product Safety Committee EK1 has decided the application of EN IEC 62368-3: 2020 in conjunction with the EN 62368-1: 2014 + A11: 2017 or EN IEC 62368-1: 2020 + A11: 2020 is not mandatory (it is voluntary). However, at the manufacturer's request, the GS Mark also can be awarded if EN IEC 62368-3: 2020 is applied in addition to the EN 62368-1: 2014 + A11: 2017 or EN IEC 62368-1: 2020 + A11: 2020 standard.

Current Challenges Associated with IEC 62368-3

Currently some challenges remain with the application of IEC 62368-3, including its introduction into design, production and planned global certification practice. Some of the issues that remain to be worked out include the following:

- IEC 62368-3 is referenced in the Scope (Clause 1) of IEC 62368-1:2018 (Edition No. 3), although the IEC 62368-3 references are to Ed. No. 2 of IEC 62368-1 and not the recently published Ed. No. 3. (However, IEC TC108 has issued an **108/727/INF** document clarifying IEC 62368-3 can be used with either IEC 62368-1:2014 or IEC 62368-1:2018.)
- '*Proprietary*' connectors and protocols, at least some of them, are excluded from the scope of 62368-3 per its Clause 4. However, further clarification likely will be needed on what is a *proprietary and no'* connector and protocol, and how to determine *proprietary vs. non-proprietary*, especially for equipment not certified by 3rd parties to the industry standards defining the connectors and protocols, like USB 3.0 or IEEE 802.3
 - potentially anything not determined to be 100% compliant with these specs could be considered *proprietary and no'*. It is unclear on who will determine whether a connector or protocol is *proprietary and no'*.
- Some of the terms associated with voltage, current and power specifications used in IEC 62368-3's Clause 5 are not wholly consistent with *similar and no'* terms used in the industry specifications (e.g., USB 3.0 and IEEE 802.3) referenced in IEC 62368-3. In fact, some of these *ratings* and *limits* that need to be identified in the industry specs seem to be design specifications or test conditions/ specifications and not safety ratings or limits.

As a result, due to the potential wide applicability of 62368-3, especially its Clause 5, its foreseeable users of the standard may disagree with how 62368-3 relies on some of these specifications from industry standards. Similarly, without detailed cross-referencing in IEC 62368-3 on explicitly where the ratings and limits come from in the industry specifications (e.g., clause, section, etc.), along with why they are considered safety ratings and limits, it may be difficult for the potential users of 62368-3 to understand why the information was referenced in 62368-3 – in fact, there likely will be points-of-contention between manufacturers and certifiers on the validity of such limits, especially if it is not clear where they came from in the industry specs.

- There remains some uncertainty on the viability of application of IEC 62368-3's Clause 5 to the interfaces of *external power supplies* and *chargers* utilizing connectors associated with USB - sub-clause 5.3.2 seems particularly problematic.
- There remains some misalignment of Clause 6 requirement for RFT circuits with the latest *ITU-T K.50 (2018), Safe limits for operating voltages and currents of telecommunication systems powered over the network*. As a result, manufacturers of equipment with RFT circuits may need to consider two sets of requirements (62368-3 & ITU K.50) into future designs, which is problematic from a design perspective.

Future State of IEC 62368-3

IEC TC108 continues work on studying how to best refine the content of IEC 62368-3 to address the issues mentioned above.

As mentioned earlier, IEC TC108 also has decided to split IEC 62368-3 into two independent standards, removing it from the IEC 62368-x series due to its group safety status and intended application to products other than just AV/ICT equipment. This activity is taking place through two separate projects, which will result in two separate standards, one for the current Clause 5 content (IEC 63315) strike and one for the current Clause 6 content (IEC 63316). This work is expected to continue over the next couple of years.

In parallel, and since 62368-3 is a group safety publication, other IEC technical committees also are studying IEC 62368-3 to determine how to best incorporate its principles/requirements into their standards, either by extraction (with revision for their specific scope/application), or by reference.

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UL Solutions hopes this Backgrounder has been helpful to interested industry members and other stakeholders preparing for the industry transition from the legacy AV/ICT standards to the IEC 62368-series standards.

Please feel free to contact us if we can be of any service during this important transition period - <https://62368-ul-solutions.com/contact-ul.html> .