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Balancing Safety and Innovation: a Critical Examination of IEC TS 60079 – 48 Guidelines for Portable Electronics in Explosive Zones

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The use of portable or personal electronic equipment (PEP) in hazardous areas, such as those where explosive atmospheres may occur, poses a challenge to safety and compliance. Such equipment may include smartphones, tablets, laptops, cameras, and wearable devices. While some PEPs may be certified for use in hazardous areas, others may not have a certificate or may not meet the required Equipment Protection Level (EPL) for the specific zone. In such cases, the owner or operator of the PEP needs to follow some guidelines to ensure the safe and appropriate use of the equipment.
The International Electrotechnical Commission (IEC) has published a Technical Specification, IEC TS 60079-48 (Explosive Atmosphere – Part 48, 2023), to guide the use of PEP without a certificate for use in hazardous areas requiring EPL Gb, Gc, Db, or Dc. This document covers the general requirements, administrative controls, and drop tests for PEP, as well as some examples of equipment that could be assigned a PEP.
This paper provides an overview and analysis of the new Technical Specification IEC TS 60079-48, published in December 2023, which outlines recommended practices for the use of portable electronic devices in potentially explosive atmospheres, especially in Zones 2 and 22 (ATEX Directive 2014/34/EU). The document emphasizes the importance of using ATEX-certified devices but acknowledges situations where non-certified devices may be permissible, subject to a rigorous risk assessment.
The paper also highlights challenges in proving that certain devices, even if non-certified, cannot become ignition sources through technical and organizational measures. It critiques the conservative approach of the specification in classifying electrical devices compared to other ignition sources.
The new Technical Specification offers a standardized basis for risk assessments, aligning with existing regulations. However, the stringent rules for electrical devices pose challenges, and the paper suggests collaborative assessments among operators for frequently used PEP devices. The aim of this work, as mentioned in the text, is to guide operators in evaluating specific devices and developing internal organizational measures.

1. Introduction

In industrial sectors operating in potentially explosive atmospheres, the widespread adoption of electronic devices has become increasingly prevalent in recent years. This trend brings forth a paradigm shift in operational methodologies, offering improved efficiency, connectivity, and data processing capabilities. However, integrating these devices into environments with explosion risks presents unique challenges that require careful consideration and adherence to stringent safety protocols.
Published in December 2023, the Technical Specification IEC TS 60079-48 represents a significant milestone in addressing the use of portable electronic devices within potentially explosive atmospheres. This document outlines a recommended approach tailored to mitigate risks associated with the use of uncertified devices in such hazardous environments. As industries aim to ensure operational continuity while prioritizing safety, understanding, and implementing the methodologies outlined in IEC TS 60079-48 are crucial.
Central to this discourse are Zones 2 and 22, where portable devices frequently encounter operational scenarios. These zones defined according to established regulations and standards such as Directive

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1999/92/EC, SUVA leaflet 2153, and EN 60079-10-1 and -2, require meticulous identification and mitigation of ignition sources. Among the potential ignition sources listed in EN 1127-1, electrical devices are prominent, emphasizing the critical importance of ensuring their compliance with regulatory requirements. Traditionally, safety protocols have relied on manufacturer-certified devices explicitly designed for operation within specified zones. Devices conforming to the stipulations of ATEX Directive 2014/34/EU and associated ordinances are presumed to offer adequate protection against ignition risks, provided that prescribed usage and maintenance guidelines are followed diligently. However, the landscape is evolving, with an increasing demand for non-certified portable devices, ranging from laser scanners to calibratable timers, prompting a reevaluation of existing safety frameworks. Furthermore, the proliferation of everyday electronic devices carried by operational personnel, including mobile phones, tablets, watches, hearing aids, and keyless cards, further complicates the safety landscape. The absence of ATEX certification for these ubiquitous devices raises pertinent questions regarding the applicability of existing safety concepts and underscores the need for innovative solutions to effectively mitigate associated risks. In practice, while adherence to safety guidelines remains steadfast in new installations, reconciling the presence of legacy devices poses a multifaceted challenge. Concepts such as those outlined in TR EC BCI 155, Chapter 0.2.2, offer a starting point for addressing these complexities. Nonetheless, the evolving nature of technology necessitates ongoing dialogue and collaboration among stakeholders to formulate robust frameworks capable of accommodating emerging safety concerns. In light of these considerations, this paper aims to provide a comprehensive examination of the regulatory landscape governing the use of electronic devices in potentially explosive atmospheres. Through an analysis of the methodology delineated in IEC TS 60079-48 and an exploration of practical challenges and solutions, it seeks to furnish insights vital for ensuring the safety and integrity of industrial operations amidst the proliferation of electronic devices. Expanding on the regulatory framework, it is essential to delve into the significance of the ATEX Directive 2014/34/EU. This directive, established by the European Union, outlines essential requirements for ensuring the safety and health protection of workers potentially exposed to explosive atmospheres. It sets forth guidelines for the design, manufacturing, and marketing of equipment and protective systems intended for use in such hazardous environments.

The ATEX Directive categorizes equipment and protective systems into groups and categories, with Group II referring to equipment for use in places with explosive gas atmospheres and Group III for equipment for use in places with explosive dust atmospheres. Categories further define the level of protection provided, ranging from Category 1 (highest level) to Category 3 (lowest level). Compliance with the directive entails rigorous testing and certification processes conducted by notified bodies authorized by EU member states.

Devices certified under the ATEX Directive undergo a thorough assessment to ensure they meet the essential health and safety requirements specified. This certification signifies that the equipment is suitable for use in potentially explosive atmospheres and provides a level of assurance regarding its reliability and performance in hazardous conditions. However, the directive primarily addresses equipment specifically designed and intended for use in such environments, leaving a gap for non-certified portable electronic devices increasingly present in industrial settings. The proliferation of non-certified portable electronic devices poses challenges to existing safety frameworks established under the ATEX Directive. While certified equipment is designed and tested to mitigate ignition risks, uncertified devices lack this assurance, potentially introducing vulnerabilities in safety protocols. Addressing this challenge requires a comprehensive reassessment of safety strategies and the development of innovative solutions to manage the risks associated with non-certified devices effectively.

Furthermore, the evolving nature of technology necessitates continuous adaptation of safety regulations and standards to keep pace with advancements in electronic devices and industrial practices. Stakeholders must engage in ongoing dialogue and collaboration to identify emerging risks and develop proactive measures to address them. This proactive approach is vital for safeguarding the well-being of workers, protecting assets, and ensuring the continuity of industrial operations in potentially explosive atmospheres. In summary, the ATEX Directive serves as a cornerstone of the regulatory framework governing the use of electronic devices in potentially explosive atmospheres, providing essential guidelines for equipment certification and safety assurance. However, the increasing prevalence of non-certified portable devices presents challenges that require innovative solutions and ongoing collaboration among stakeholders. By understanding the regulatory landscape and embracing proactive safety measures, industries can navigate the complexities of explosive atmospheres while harnessing the benefits of electronic devices for enhanced efficiency and productivity.

2. Requirements Regarding the use of non-certified Devices

Requirements regarding the use of non-certified devices necessitate a nuanced understanding of regulatory frameworks and risk assessment protocols. While the preference for ATEX-certified electrical devices within designated zones is well-established, it is imperative to recognize that the outright prohibition of non-certified devices is not universally mandated. Annex B of the ATEX Directive 2014/34/EU and Chapters 5 and 6 of SUVA leaflet 2153 delineate specific conditions under which the utilization of non-certified devices may be considered permissible, contingent upon a comprehensive risk assessment as articulated in the explosion protection document. Central to this evaluation is the concept of risk assessment, serving as a linchpin in determining the suitability of non-certified devices for operation within potentially explosive atmospheres. By systematically identifying and evaluating potential hazards, including the presence of ignition sources and the likelihood of their activation, organizations can ascertain the level of risk associated with the use of non-certified devices. This iterative process allows for informed decision-making, balancing operational needs with safety imperatives. According to SUVA leaflet 2153, which provides invaluable guidance on the utilization of electronic devices in hazardous environments, non-certified devices may be temporarily deployed in Zone 2 under certain conditions. Crucially, such devices must be adequately safeguarded against breakage to minimize the risk of ignition sources being exposed. This pragmatic approach underscores the importance of proactive risk mitigation measures, facilitating operational flexibility while ensuring compliance with safety standards. In addition to the above, the procedure for certifying these non-certified devices is also of significant importance. The certification process involves a thorough examination of the device’s design, construction, and intended operation. This includes an evaluation of the device’s electrical and mechanical components, its potential to generate heat or sparks, and its ability to withstand the environmental conditions of the designated zone. The device must also undergo rigorous testing to ensure it can operate safely without causing an explosion. Upon successful completion of these steps, the device can be certified for use in potentially explosive atmospheres. Subsequent sections of this paper will delve into the intricacies of assessing and mitigating risks associated with the deployment of non-certified portable electronic devices.

2.1 Electrically Driven Wristwatches

The utilization of electrically driven wristwatches within potentially explosive environments underscores the importance of balancing functionality with safety imperatives. These timekeeping devices, characterized by their compact size and simplistic construction, offer a pragmatic solution for operational personnel requiring timekeeping functionality in hazardous settings. Notably, wristwatches devoid of additional specialized functions, such as calculators or complex sensors, pose minimal risk of engendering an explosive atmosphere, rendering them suitable for deployment within Zones 2 and 22. However, it's crucial to note that their compact design and integrated batteries pose potential ignition sources. Despite stringent safety measures, lithium-ion batteries, if mishandled or damaged, can pose fire risks. Therefore, users should exercise caution and adhere to manufacturer guidelines regarding charging and maintenance.

According to data from the International Data Corporation (IDC), wristwatch shipments reached over 111 million units globally in 2023, with a significant portion attributed to electrically driven models. This widespread adoption underscores the ubiquity of wristwatches as everyday accessories, further emphasizing the importance of assessing their suitability for use in Atex zones. With the increasing prevalence of smartwatches and smartbands, it is imperative to evaluate their compatibility with hazardous environments. These devices, equipped with various sensors and communication capabilities, offer enhanced functionalities but also introduce additional risks. Therefore, it is essential to conduct thorough risk assessments and implement appropriate safety measures to mitigate potential hazards associated with their usage in explosive atmospheres.

2.2 Hearing Aids

The deployment of hearing aids in potentially explosive atmospheres necessitates careful consideration of their design and operational characteristics. Hearing aids, whether worn behind or in the ear, play a pivotal role in facilitating communication and enhancing situational awareness for individuals with hearing impairments. However, in industrial settings subject to stringent safety regulations, the compatibility of these devices with explosion-prone environments warrants scrutiny.

According to guidelines established by the German Electrotechnical Commission (Committee 235), hearing aids lacking rechargeable lithium-ion cells can generally be employed in Zone 2 and Zone 22 without compromising safety. However, the inclusion of supplementary devices, such as remote controls, necessitates specialized assessment before deployment in hazardous zones to mitigate potential ignition risks.

Statistics from the World Health Organization (WHO) indicate that approximately 466 million individuals worldwide suffer from disabling hearing loss, underscoring the significance of hearing aids as indispensable assistive devices (WHO, 2024). As such, ensuring the compatibility of these devices with safety regulations governing potentially explosive atmospheres is paramount to facilitating inclusive and safe working environments.

Moreover, it's crucial to recognize that individuals reliant on hearing aids may face significant challenges in environments where these devices cannot be safely used. For those with profound hearing loss, the removal of hearing aids in hazardous areas effectively renders them unable to effectively communicate or perceive auditory cues, leading to potential safety hazards and social isolation. Therefore, while safety regulations are essential, equal consideration must be given to the practical needs and challenges faced by individuals with hearing impairments in workplace environments.

2.3 Smartphones and Tablets

Smartphones and tablets represent quintessential examples of portable electronic devices ubiquitous in modern industrial settings. These multifunctional gadgets, equipped with advanced computing capabilities and communication features, have revolutionized workflow efficiency and connectivity. However, the integration of smartphones and tablets into zoned production areas presents unique challenges due to their inherent electrical components and susceptibility to damage.

Given the availability of explosion-protected designs in the market, the utilization of non-certified smartphones and tablets in zoned facilities should generally be avoided, as emphasized by the Berufsgenossenschaft Rohstoffe und chemische Industrie (BGRCI) in 2017. However, recognizing the practical constraints faced by organizations, robust measures against breakage upon impact must be implemented to minimize the risk of ignition sources being exposed, as stipulated in SUVA leaflet 2153.

Recent market research conducted by Statista indicates that global smartphone shipments surpassed 1 billion units in 2023, highlighting the pervasive presence of these devices across diverse industries (Statista, 2023). Consequently, addressing the safety implications of integrating smartphones and tablets into hazardous environments is imperative for safeguarding personnel and preserving operational continuity. Moreover, it's important to consider the reliance of modern industrial operations on these devices for critical communication and data management tasks. In many cases, smartphones and tablets serve as primary tools for accessing safety protocols, monitoring equipment status, and coordinating emergency response efforts. Therefore, any disruption caused by the inadequacy or unsafe usage of these devices can have far-reaching consequences beyond immediate safety concerns, impacting productivity, regulatory compliance, and overall business resilience. Thus, organizations must not only prioritize the physical safety aspects but also ensure the uninterrupted functionality and resilience of these technological tools in hazardous environments.

3. The Technical Specification IEC TS 60079-48

The Technical Specification IEC TS 60079-48, heralded upon its release in December 2023, represents a seminal milestone in the realm of occupational safety, specifically addressing the nuanced challenges associated with the utilization of portable or personal electronic devices (PEP) in environments fraught with potentially explosive atmospheres. Far from being a mere procedural document, it serves as a beacon of guidance, delineating a path towards enhanced safety protocols and regulatory compliance.

At its core, the Technical Specification embodies a resolute stance against the casual adoption of non-certified devices, unequivocally emphasizing the imperative of prioritizing certified alternatives whenever feasible. This stance emanates from a foundational commitment to safeguarding lives and assets by mitigating ignition risks to the fullest extent possible. By highlighting the significance of considering not only the device type but also its functionality, the document underscores the multifaceted nature of risk mitigation within hazardous environments. It recognizes that while certified devices offer a baseline assurance of safety, auxiliary considerations such as IT security and software compatibility must not be overlooked.

The delineation of four distinct categories of PEP devices within the Technical Specification epitomizes its meticulous approach to risk management. PEP 1, tailored for bodily wear, epitomizes a cautious yet pragmatic approach towards devices intended for direct contact with the user's person. Meanwhile, PEP 1b and PEP 1c cater to the nuanced requirements of zones mandating distinct Equipment Protection Levels (EPL), underscoring the document's granularity in addressing diverse usage scenarios. PEP 2c, designed for wearable operation without posing ignition risks under normal conditions, epitomizes the vanguard of technological innovation within the purview of hazardous environments.

Within Zones 2 and 22, where the stakes are particularly high, the Technical Specification imposes a plethora of stringent criteria to govern the utilization of PEP devices. From stringent regulations barring electrical or mechanical sparking to meticulously calibrated specifications governing surface temperature and energy transmission limits, every facet of device operation is subjected to rigorous scrutiny. The rigorous drop test protocols, which subject the appliance to four consecutive drops from a height of 2 meters onto a concrete surface, underscore the uncompromising standards upheld by the Technical Specification.

Moreover, the Technical Specification transcends mere technical specifications, advocating for the holistic implementation of a robust framework encompassing both technical and organizational measures. This entails instituting safeguards against device disassembly, implementing protocols to mitigate the risk of dropping and breakage, and ensuring meticulous adherence to approved usage protocols. The evaluation of these requirements is not undertaken lightly but is predicated on a robust framework guided by the manufacturer's declaration or specifications, buttressed by internal regulatory oversight. Central to the efficacy of this framework is the provision of comprehensive training and the involvement of personnel possessing a nuanced understanding of the exigencies of explosive zones. Their expertise is instrumental in navigating the intricate maze of PEP evaluations and guideline development, ensuring that safety imperatives are never compromised in the pursuit of operational expediency. In essence, the Technical Specification embodies a paradigm shift towards a culture of proactive risk management, heralding a new era of safety and resilience in hazardous environments.

4. Assessment

The assessment of the compatibility of devices with hazardous environments, as outlined in Annex B to ATEX Directive 2014/34/EU and further expounded upon in Chapters 5 and 6 of SUVA leaflet 2153, is a complex and multifaceted process. This process is of great importance in ensuring the safety and functionality of devices within hazardous environments. It requires a deep understanding of the devices in question, their potential failure modes, and the specific hazards present in the environment. The crux of this assessment process hinges on the operator's ability to substantiate that the devices utilized are incapable of acting as ignition sources, irrespective of their device category. This substantiation is a critical component of ensuring safety in hazardous environments. However, this task is far from straightforward. It necessitates a meticulous and comprehensive analysis encompassing not only easily avoidable ignition events, such as dropping or battery replacement but also unforeseeable occurrences like short circuits within the device. These unforeseen events can pose significant challenges to operators, requiring a deep understanding of the device's operation and potential failure modes. It is noteworthy that the probability of events that could potentially transform a device into an ignition source is frequently underestimated or even disregarded in conventional risk assessments. This underestimation is underscored by pertinent practices documented in sources like BGRCI (2017) and BGRCI (2021). The Technical Specification IEC TS 60079-48 adopts a similar stance concerning PEP2c devices. In this specification, breakage resulting from dropping is construed as part of normal operation. Consequently, the document implicitly assumes that the likelihood of a portable device coincidentally dropping at the precise moment of an unintentional substance leakage (in zones 2 and 22) is unacceptably high. This assumption reflects a conservative classification approach towards electrical appliances, relative to other types of ignition sources. This conservative approach manifests in various regulatory instances. For instance, while regulations such as TRGS 727 do not mandate personal earthing in zones 2 and 22, the charging of unearthed persons is considered an intrinsic aspect of normal operation. Similarly, the permissible carriage of hand tools or mobile metal containers within Zone 2, irrespective of their alloy composition, underscores the rarity of circumstances where impact sparks coincide with substance release incidents. This cautious approach regarding PEPs underscores the paramount importance attributed to mitigating ignition risks within hazardous environments. However, it also engenders a broader discourse regarding the calibration of risk assessment methodologies to accurately reflect the nuanced interplay of variables inherent in real-world scenarios. This discourse is crucial for the ongoing development and refinement of safety protocols. By critically examining and iteratively refining these methodologies, stakeholders can aspire towards a more comprehensive and nuanced understanding of risk dynamics. This understanding can, in turn, contribute to the fortification of safety protocols and the bolstering of resilience in hazardous environments. Through this process, we can strive towards a future where hazardous environments are managed with the utmost care and precision, ensuring the safety and well-being of all involved, while still being reasonably practicable.

In conclusion, the assessment of device compatibility within hazardous environments is a complex process that requires a comprehensive understanding of both the devices and the environment. By adopting a cautious approach and continuously refining risk assessment methodologies, we can ensure the safety of these environments and contribute to the ongoing development of effective safety protocols. This process is a testament to the importance of continuous learning and adaptation in the face of complex and evolving challenges.

5. Conclusions

In conclusion, the advent of the new Technical Specification represents a significant turning point for operators navigating the intricate landscape of risk assessments in hazardous environments. This specification provides a standardized approach, mandated by the stringent criteria laid out in ATEX Directive 2014/34/EU. It serves as a beacon, guiding operators through the complexities of ensuring safety within explosive atmospheres. However, it is crucial to acknowledge the formidable challenges that this undertaking entails. Complying with the rigorous regulations governing electrical devices, as delineated in the foregoing discussions, is no small feat. It demands a substantial investment of effort and expertise, underscoring the importance of a strategic approach. This is not a task to be taken lightly, but rather one that requires careful planning, meticulous execution, and continuous monitoring. In this context, collaborative initiatives among operators assume a high significance. By pooling resources, sharing insights, and collectively assessing the deployment of frequently utilized PEP devices, operators can effectively harness synergies. This collective effort can help surmount the complexities inherent in ensuring safety within explosive atmospheres. It is through this collaboration that operators can rise to the challenge, turning potential obstacles into opportunities for improvement. Furthermore, the potential involvement of regulatory authorities in such collaborative endeavors can imbue the process with added rigor and credibility. Their participation can provide a much-needed external perspective, ensuring that all aspects of the process are thoroughly examined and that no stone is left unturned. This collaborative ethos not only facilitates the dissemination of best practices but also fosters a culture of continuous improvement and proactive risk management. Thus, while the path ahead may be arduous, the collective resolve to embrace collaborative strategies promises to fortify safety protocols, enhance operational resilience, and ultimately safeguard lives and assets in hazardous environments. It is a journey filled with challenges, but also one filled with opportunities for learning and innovation.

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