

WHITE PAPER

A Guide to ATEX/HAZLOC/IECEX Certifications and Battery Pack Design Requirements

Introduction

There are many different types of electrically-operated devices. They function in many different types of environments - in a home, a car, a hospital or a place of business. Some electric applications are used in potentially dangerous atmospheres, like coal mines, or petrochemical plants or even corn silos. The nature of these applications is that they contain (or may contain) an explosive atmosphere.

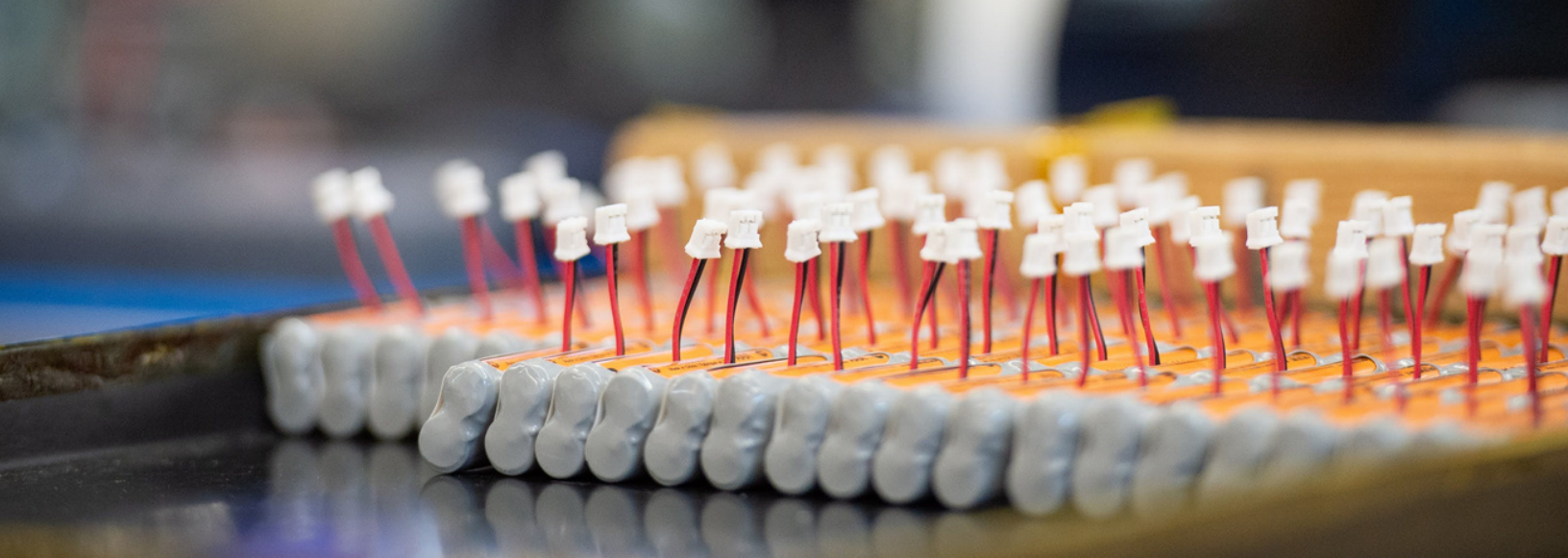
Explosive gases like methane in coal mines (referred to as firedamp in mining) combined with unsafe tools have been documented as causing some of the worst mining disasters in history. Explosions at chemical plants involving volatile gasses have also occurred. Fires and explosions involving materials not commonly associated with hazardous combustion have also occurred, such as with corn dust, grain dust, flour dust or even cotton candy.

For this reason, a particular type of safety-certified electrical equipment has evolved - equipment that has been designed and evaluated as being suitable for use in dangerous atmospheres.

Depending on the geographic location of the area under consideration, the equipment is evaluated differently.

Systems of Classification

In the US and Canada, these types of locations have traditionally been termed hazardous locations or HAZLOC, and devices designed to be used in these environments are known as HAZLOC-rated devices. In European countries, the regulations covering these devices are termed ATEX. In other parts of the world, a different system of classification is used called IECEx. Note that Canada and the US are moving towards the IECEx system of classification. The HAZLOC system is now only applicable to already-existing systems.



New installations and products should use the IECEx system of classification.

In Canada and the US, the laws that govern HAZLOC are governed by the CEC (Canada Electrical Code) and the NEC (National Electric Code). The codes are so similar to each other that they are practically the same. These codes are covered by clauses in either CEC Section 18 or NEC 500/505.

Meeting End-Product Standards

Common to these systems is that they are end-product standards. What this means is that the product is evaluated to the explosive atmospheres' regulations in and of itself, regardless of the component certifications. So, if battery packs are HAZLOC/IECEX/ATEX-certified, they cannot simply be plugged into another HAZLOC/IECEX/ATEX product and have the combination be HAZLOC/IECEX/ATEX-certified.

If the battery pack has been evaluated in the powered application, it can be considered HAZLOC/IECEX/ATEX-certified. This means that components of these devices cannot be switched, changed or altered without costly and lengthy certification projects. The cell or battery pack certified on a HAZLOC/IECEX/ATEX project is the only one permitted unless the entire project is retested with a different battery pack. The HAZLOC based system is a class and division-based system, whereas the IECEx and ATEX system is Zone-based.

In all cases, mining applications are considered the most hazardous. The certification requirements for mining applications are the most difficult. They are usually considered a special case.

Common System Features

For HAZLOC, the classes are I (Gases may be present), II (Dust may be present), or III (Fibers or filings may be present).

The division which follows is how often that hazard is present:

- 1 = The hazard is always present.
- 2 = The hazard may exist under abnormal conditions

There are further groups and temperatures which specify which gases the application is rated for and the maximum external temperature the application may present.

For ATEX/IECEx the system is Zone-based:

If only hazardous gasses are present, the areas Zone will be represented by a single number.

- Zone - 0 = Gas is always present
- Zone - 1 = Gas is likely to be present
- Zone - 2 = Gas is unlikely to be present

If a hazardous dust is also present or is the only hazard present, the areas Zone will be prefaced by a "2" for dusts.

- Zone - 20 = Dust is always present
- Zone - 21 = Dust is likely to be present
- Zone - 22 = Dust is unlikely to be present

Equipment groups, protection levels, temperatures and gases definitions can also appear on the labels.

Another common feature of all these systems is the 60079-xx series of standards. In the rest of the world, these are the IEC-60079 series. In the US, these are known as the UL-60079 series. There are many different standards in this series. The xx number increases non-sequentially to 35 for the IEC standards, 31 for the UL standards. The 60079-0 standard gives the general requirements.

Where a specific application standard exists, it takes precedence over other requirements unless there is a specific deferral. These standards are harmonized to each other on a regular basis, but the timing of the harmonization can lead to confusion rather than clarity. These standards are not necessarily test-based - in many cases, they are design-based, and much engineering evaluation and documentation must occur.

Using Specialized Test Labs

Only specialized test labs have the knowledge to evaluate these kinds of products. Hence they should be consulted as early as possible in the design cycle. It is a good idea to be familiar with the test lab. These types of applications come with ongoing certification and auditing requirements, so it is generally a good idea to pick one test lab and stick with it.

Costs, services and follow-up costs can vary widely from lab to lab so shopping around is a good idea. Some test labs may not be forthcoming with follow-up costs, so be sure to check what these are.

Listing Requirements

All products certified under these schemes will bear certification marks. Typically, this will be from a well-known certification company like CSA, UL, Intertek or SGS. An IECEx-certified application will also bear the Ex mark. An ATEX-certified pack will bear the hexagonal EX mark.

There will also be other markings on the application, which, depending on the nature of the certification, identify the types of explosive atmospheres in which these applications can be used. The label markings of these applications, as well as their meaning, have a similar appearance.

For IECEx-certified applications, the product certification can be found on the IECEx website: <https://www.iecex-certs.com/#/home>. For all others, the certification can only be found on the test lab's website.

For portable battery packs the most typical methods of ensuring that the pack can enable an application to be approved to these standards are as follows:

1. Ingress protection - IP5x or 6x. This can prevent dust from entering the battery pack, ensuring that it is safe in atmospheres where explosive dust is present.
2. Encapsulation - Ex m. Prevents electrical equipment from causing an explosion by isolating the electrical components from contact with the explosive atmosphere.
3. Intrinsic safety - Ex ia, ib or ic. The "ia" classification is the most intrinsically safe - "ic" is the lowest. This is based on the idea of limiting energy to safe levels below that which is required to ignite an explosive atmosphere of a specific type.
4. Non-incendive/Non-Sparking- Ex n. This is related to intrinsic safety. Generally a lowering of the application's power capability to ensure that an ignition event cannot occur.

Flame-proof and explosion-proof enclosures are also encountered, however, these tend to be geared toward fixed installations rather than portable ones.

Conclusion

There are a range of operating environments and conditions that need to be considered with any battery requirements. In the case of equipment designed for dangerous environments, we need to be aware of different geographical requirements and standards.



About Excell Battery

For over 35 years, Excell Battery has been a leading OEM supplier for medical equipment, utilities, industrial and handheld instrumentation, oil & gas, LEVs (light electric vehicles), and other advanced applications and extreme environments.

We provide full-lifecycle custom battery design from engineering development and standards certification, to volume production and recycling. We deliver a broad range of battery solutions that integrate our smart battery technology and custom mechanical design capability, with cells from our top global partners.

