

ATEX and IECEx

Safety of equipment in
potentially explosive
environments



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White paper

Abstract

Electrical, non-electrical, electronic and mechanical equipment intended for use in potentially hazardous environments must be evaluated for its impact on overall safety. The ATEX Directive (2014/34/EU) and the IECEx Certified Product Scheme are two assessment routes for the safety of equipment in such environments. This white paper outlines the scope, requirements and applicability of the two frameworks.

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Introduction

CE-labelled electrical, non-electrical, electronic and mechanical equipment is safe when used as directed in a normal environment. However, certain modern industrial environments pose an increased risk of fire and explosion, due to the use of flammable gases, vapours or combustible dusts. These potentially hazardous environments, also known as “Ex areas” (short for explosive areas), are found in a range of industries, including oil and gas refineries and distribution facilities, chemical processing plants, grain and agricultural handling, processing and storage facilities, underground mines, and even hospital operating environments. Equipment used in these hazardous environments must therefore be expressly designed to minimise such risks, and manufacturers of electrical, non-

electrical, electronic, mechanical equipment and systems must ensure that their products meet the enhanced requirements of applicable regulations and standards.

In the European Union (EU), compliance with the essential requirements of EU Directive 2014/34/EU, also known as the ATEX Directive, is required for equipment used in potentially explosive environments. In other markets, the voluntary IECEx Equipment Certification Scheme can facilitate acceptance of such equipment. Although similar in scope and intent, the ATEX Directive and the IECEx Scheme encompass different requirements and utilise different assessment approaches, complicating the regulatory approval process for equipment manufacturers.

This white paper provides an overview of the ATEX Directive and the IECEx Scheme, and answers a number of questions about their objectives and requirements. The paper is intended for manufacturers and distributors of electrical, non-electrical, electronic and mechanical equipment used in potentially explosive atmospheres, as well as plant and facility owners and managers.

Certain modern industrial environments pose an increased risk of fire and explosion due to the use of flammable gases, vapours or combustible dusts.

Safety risks in a potentially hazardous environment

Increasingly, electrical and electronic equipment is being used in potentially hazardous environments to automate or control certain production processes. However, the use of such equipment in close proximity to flammable or combustible gases or materials increases the risk of fire or explosion, as the normal operation of electrical and electronic equipment often involves actions or reactions that are a potential ignition source.

Examples of actions and reactions that can serve as an ignition source:

- **Electric sparks** – A poor quality component or electrical connection can fail, inadvertently producing an electric spark that can ignite gases or nearby materials.
- **High operating temperature** – Depending upon the particular potentially explosive atmosphere content, hot surfaces on equipment could cause auto ignition. Process system heating effects by ‘work done’ i.e. pumping systems, must also be considered as these can elevate the ‘product’ above its flashpoint.
- **Electrostatic discharge** – Some normal equipment operations can generate static electricity, which can serve as an ignition source at certain levels.
- **Friction sparks** – Equipment operation may also involve repeated contact between materials, resulting in friction that can produce heated sparks.

The ATEX Directive

The ATEX Directive 2014/34/EU defines essential health and safety requirements for equipment and protective systems used in potentially explosive atmospheres, including protective systems, components and safety devices.

Like all EU “New Approach” Directives, the ATEX Directive generally relies on the application of relevant standards to assess technical compliance. Compliance with the technical requirements of EU harmonised standards provides a

presumption of conformity with the Directive’s essential requirements. In cases where relevant harmonised standards do not exist, manufacturers are required to apply other EU standards, or applicable national or international standards. In rare cases, where a particular product is not covered by any existing standard, a manufacturer is required to complete a thorough evaluation of the product to demonstrate compliance.

Under the provisions of the ATEX Directive, evidence of compliance

is generally demonstrated by the issuance of a manufacturer’s, or supplier’s, Declaration of Conformity, based on an independent technical assessment. Special requirements apply to electrical products intended for use in high risk areas. The task of demonstrating compliance with the ATEX Directive rests with the party responsible for introducing a product into the EU marketplace. The responsible party is typically the product manufacturer, but it may also be an importer or wholesaler.

The IECEx Certified Equipment Scheme

IECEx Certified Equipment Scheme is a voluntary compliance system designed to assess and certify multiple aspects of potentially hazardous environments. More than 30 countries currently participate, including the U.S., China, Japan, Korea, Australia and Brazil, as well as many EU countries.

Certification schemes included in the IECEx System

- IECEx Certified Equipment Scheme
- IECEx Certified Service Facilities Scheme
- IECEx Certificate of Personnel Competence Scheme
- IECEx Conformity Mark Licensing System

The primary goals of the IECEx Scheme are to reduce testing and certification cost, speed up market

access for new products and equipment, and increase international acceptance of product assessment results. The Scheme achieves these goals through the issuance of an International Certificate of Conformity based on:

1. Testing and assessment of equipment samples for compliance with applicable international standards.
2. Assessment and auditing of a manufacturer’s quality assurance system.
3. On-going surveillance audits to ensure continued compliance.

Under the IECEx Scheme, testing and assessment activities are carried out by IECEx-approved Testing Laboratories, with certifications issued by IECEx-approved Certification Bodies.

Under the Scheme, assessment is based exclusively on compliance with standards issued by Technical Committee (TC) 31 of the International Electrotechnical Commission (IEC).

The use of IEC standards and independent third-parties for testing, assessment and certification are essential elements in the widespread acceptance of IECEx-certified equipment. Indeed, in countries that do not participate in the IECEx System, or which still require separate national testing and certification, IECEx equipment tests and assessment reports are widely accepted by regulatory officials, which may eliminate the need for duplicate testing.

Technical requirements of the ATEX Directive and the IECEx Scheme

ATEX requirements

The ATEX Directive provides a detailed overview of the essential health and safety requirements applicable to equipment used in hazardous environments. Annex II of the Directive addresses design and construction requirements for equipment and protective systems, whereas the specific technical requirements for various types of equipment and operating environments are found in individual harmonised standards. Compliance with the technical requirements in these standards serves as the primary basis for ATEX certification. Depending on the equipment and its intended use, more than one harmonised standard may be applicable to the evaluation and certification of a product.

Currently, nearly 100 individual harmonised standards can be used to demonstrate compliance with the essential requirements of the Directive. Updated harmonised standards lists are published periodically in the Official Journal of the European Union. In the absence of a harmonised standard for a specific equipment or application, the technical requirements of national or international standards may be applied. For non-electrical and electrical products, Annex I of the ATEX Directive identifies three separate categories of equipment, with Category 1 and Category 2 applicable to equipment used in higher risk areas, and Category 3 applicable to equipment used in low risk areas. Manufacturers of electrical equipment

of Category 1 and Category 2 are required to have their products tested and certified by an EU Notified Body, and should also present evidence of maintaining a quality system certified by a Notified Body.

Category 2 non-electrical equipment does not require a Notified Body assessment, but does require the technical documentation to be stored by an ATEX Notified Body. The quality system for Category 2 non-electrical and all Category 3 equipment is the sole responsibility of the manufacturer.

IECEx requirements

Equipment certification under the IECEx Certified Equipment Scheme is based on an assessment of compliance with the technical requirements found in the IEC 60079 series of standards (electrical products), as well as ISO 80079 series of standards (non-electrical products) and other IEC standards developed by TC 31.

The IECEx Scheme classifies equipment according to the hazardous environment areas where specific equipment can be used. Equipment Protection Level (EPL) Ga/Da and Gb/Db correspond with ATEX categories 1 and 2 respectively, while Gc/Dc corresponds with the requirements of ATEX category 3.

The IECEx has introduced a special conformity mark for immediate evidence that products bearing it are covered by an IECEx certificate of conformity. Manufacturers that

hold IECEx certificates of conformity for products AND that have been independently assessed against the additional requirements of the IECEx conformity mark licensing system are entitled to apply the unique mark logo that includes a mark license number. The mark license is issued to a manufacturer by an accepted IECEx certification body (ExCB) that has entered into a mark license agreement with the IEC.

The IECEx conformity mark is intended to provide greater assurance, and ultimately enhanced confidence, for governments, safety regulators, customers, industry and end users operating in explosive atmospheres.

Where ATEX Directive and IECEx Scheme requirements apply

The ATEX Directive requirements are mandatory throughout the European Economic Area (EEA), which comprises EU member nations as well as Iceland, Norway, Switzerland and Liechtenstein. These countries represent a population of over half a billion people and generate a combined annual gross domestic product (GDP) of more than \$18 trillion (USD).

The voluntary IECEx Certified Equipment Scheme is a component

of the IECEx System, which currently includes more than 30 members worldwide. Under the System, regulatory authorities in member countries accept certifications issued by IECEx-recognised Certification Bodies, regardless of their location. This framework aims to reduce testing and certification time and costs, enabling manufacturers to market certified equipment in all IECEx member countries.

In addition, the IECEx System has been endorsed by the United Nations Economic Commission for Europe (UNECE). As a result, non-IECEx member countries can implement legal frameworks into their respective national legislation, simply by adopting the IECEx System and Schemes. The portability of the IECEx framework is likely to result in an expanded global acceptance of IECEx-compliant equipment tests and assessments and, in many cases, IECEx-certified equipment itself.

Assessment paths of the ATEX Directive and the IECEx Scheme

The conformity assessment process of EU's ATEX Directive provides a certification route for a broad range of electrical and non-electrical equipment. It also offers significant latitude in the technical assessment of non-conventional equipment through the use of a technical construction file (TCF). This can be especially important to manufacturers of customised equipment, or equipment specifically designed for unique applications. Equipment certified in connection with the voluntary IECEx Certified Equipment Scheme meets the regulatory requirements of major economic countries throughout the world, thereby expediting global market acceptance. However, the IECEx scheme only assesses electrical equipment

against the technical requirements of IEC standards issued by TC 31. This restriction can present an insurmountable hurdle for manufacturers of highly specialised electrical equipment, for which a relevant standard does not yet exist.

Other considerations include restrictions on the use and acceptance of previously generated ATEX test data. Under the IECEx Scheme, equipment must be tested and certified by IECEx-approved Testing Laboratories, and Certification Bodies, and evidence of prior testing conducted by an EU Notified Body does not waive this requirement. However, EU Notified Bodies located in IECEx member countries are required to accept test reports

generated by IECEx-approved Testing Laboratories in support of an ATEX certification submittal.

Given these considerations, the preferred conformity assessment path for many manufacturers involves first obtaining equipment certification under the IECEx Certified Equipment Scheme. The IECEx testing data can then be submitted to an EU Notified Body as part of the ATEX certification process. This path will still require that certain ATEX-specific requirements are met, such as those related to equipment marking and documentation. However, the effort involved is relatively small compared with other alternatives.

Conclusion

Electrical, non-electrical, electronic and mechanical equipment intended for use in potentially hazardous environments must contribute to the overall safety of that environment. Equipment certified for compliance with the essential requirements of the ATEX Directive (2014/34/EU) or the IECEx Certified Equipment Scheme provides assurances that the equipment does not introduce additional risks, or compromise other efforts to ensure safety. These conformity assessment options provide manufacturers with

flexibility in meeting product safety requirements, expanding market opportunities and addressing the needs of customers.

TÜV SÜD is a Notified Body (Notified Body number 0123) under the EU ATEX Directive, and a Certification Body under IECEx02 (IECEx Certified Equipment Scheme), IECEx04 (IECEx Conformity Mark Licensing System) and IECEx05 (IECEx Certificate of Personnel Competence Scheme). In addition, TÜV SÜD maintains state-of-the-art laboratories to test

for explosion protection, dust and contamination control, environmental simulation, electromagnetic compatibility, mechanical and electrical safety.

Represented in over 1,000 locations worldwide, TÜV SÜD holds accreditations in the EU, the Americas, the Middle East and Asia. By delivering world-class solutions to customers, TÜV SÜD adds tangible value to businesses, consumers and the environment.

GLOSSARY OF ACRONYMS

ATEX – atmosphere explosible
CBTL – certification body testing laboratory
EEA – european economic area
EU – european union
GDP – gross domestic product

IEC – international electrotechnical commission
NCB – national certification body
TC – technical committee
TCF – technical construction file
UNECE – united nations economic commission for europe

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