One World One "Ex" Language?

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Nowadays, the task of selecting an electrical system destined for use in a hazardous location can lead to a time consuming navigation through a myriad of approval certificates with different acronyms, product labelling details and an investigation into what the markings on the label(s) actually represent. This article will provide an overview of the various national and regional regulations governing hazardous area certified products, take a brief look at the standards against which they are assessed and examine if there is any scope for creating a **"common language"** for users of hazardous area equipment that may facilitate a future in which class leading hazardous area equipment, regardless of origin, is acceptable to the relevant regulatory body of the country in which the hazardous area operator is located.

(Examples of all product approval markings referred to in this article can be viewed at the end of this article).

Hazardous Location Product Certification Requirements In The United States.

In the U.S. the Occupational Safety & Health Administration (OSHA) is responsible for ensuring safe working conditions for employees in the workplace through demonstrable compliance with its Code of Federal Regulations (CFR) which are U.S. law. Under 29 CFR 1910.307, OSHA regulates worker safety in hazardous locations through a requirement that companies procure and install equipment that will demonstrate compliance the National Electrical Code, NFPA 70, via a list of safety standards deemed "appropriate" by OSHA. The primary safety standards recognised by OSHA, at minimum, demonstrate compliance with Articles 500, 505 and 506 of the National Electrical Code. These articles describe the classification of hazardous locations, what methods of electrical protection (protection techniques) are acceptable in these locations and how equipment operating in such locations shall be marked.

Article 500 describes the Class and Division system of hazardous location classification, the relevant protection techniques and product markings required. Article 505, added in 1996, relating to gas and vapour atmospheres and Article 506, added in 2005, relating to dust and fibre atmospheres, describe the Class and Zoning system.

Under regulation 1910.3079(g)(1), OSHA permits industry to work to the Class and Zoning system described in NEC 505. NEC 505.9(C) outlines the marking required on the equipment. Although OSHA guidelines do not address Class and Zoning systems for dust and fibre atmospheres, under NEC 506.20, equipment listed for Class II, Div. 1 and Div. 2 locations can be installed in the respective Zone 20, 21 and 22 areas provided the temperature classification of the equipment meets the requirements for the relevant dust group. Under 506.9(C)(1), Class II listed equipment with Division 1 and Division 2 approvals can be marked with additional Zone identification and dust group temperature classification markings. NEC 506.9(C)(2) describes the Class and Zone method of marking equipment that will be operated in dust and fibre atmospheres.

Under OSHA regulations, electrical equipment destined for installation and use in hazardous locations must be certified by a Nationally Recognised Testing Laboratory (NRTL). NRTLs test and certify equipment to standards, produced by recognised standards developing organisations, which OSHA deems "appropriate". Examples of standards producing organisations include ASTM, ANSI, ISA, IEEE, Underwriter Laboratories and Factory Mutual. OSHA recognises and monitors organisations that apply for NRTL status in accordance with the requirements of 29 CFR 1910.7. OSHA will also recognise NRTLs based outside of the U.S., one example being CSA of Canada.

When OSHA recognises an organisation as having NRTL status they are issued a formal notification by the head of OSHA, who is the Assistant Secretary of Labor for Occupational Safety and Health. This notification sets forth the specific scope and other terms of the recognition. This recognition is reviewed every five years and will be revoked if the NRTL does not comply with the requirements of 29 CFR Part 1910.

It is the responsibility of NRTL to the submit the safety standards it intends to certify product against, test, certify and list the product to the relevant standards, monitor the use of the listed product in the market place and notify manufacturers if changes to standards are likely to impact on the certification of their listed product.

OSHA compliance officers carry out site inspections to ensure electrical equipment used in hazardous locations display the unique certification mark of an NRTL and have the authority to issue fines if the equipment is not installed in accordance with the equipment's approvals or does not display the mark of a recognised NRTL.

Hazardous Area Product Certification Requirements In Europe.

In the European Union, the "ATEX 95" Directive, 94/9/EC, is a legally binding requirement on manufacturers and users of equipment intended for use in potentially explosive atmospheres. The scope and intent of the Directive is to enable the free

movement of ATEX certified equipment throughout the European Economic Area, which is made up of all European Union and European Free Trade Association member countries. It was adopted on 23rd March 1994 and entered into force on 1st March 1996. It replaced all EU member state's similar national regulations on the 1st July 2003.

The ATEX 95 Directive lays down the Essential Health and Safety Requirements (EHSRs) that specify the levels of explosion protection required for equipment destined for operation in potentially explosive atmospheres (hazardous areas). The primary source of technical adherence for the assessment and certification of products designed for use in explosive atmospheres is harmonised "EN" standards that provide "technical expression" of the requirements of the EHSRs. The full list of harmonised standards is contained in the Official Journal of the European Commission, the executive body of the EU.

In order to place an ATEX certified product on the market, the manufacturer must sign a Declaration of Conformity with the appropriate Directive(s). Declarations of Conformity with other Directives, particularly electrical equipment, may apply before a CE mark can be placed on the equipment (e.g. electromagnetic compatibility under EMC 2004/108/EC). In addition, for products that are certified for installation in hazardous areas, "Ex" marking on the equipment is required.

To support the Declaration of Conformity for ATEX, the manufacturer will have their product assessed and tested by a "Notified Body" who will issue an EC Type Examination certificate that states the product meets the requirements of the ATEX Directive's EHSRs. The Notified Body tests the product in accordance with the European Commission's list of harmonised "EN" standards that reflect the "latest state of the art" with respect to the protection methods that comply with the EHSRs of the Directive. The Notified Body must also asses the manufacturer's quality assurance system relevant to the manufacturing of the certified product, ensuring product quality is assured under the requirements of the Directive.

Under the Directive, notified bodies are required to meet as part of the "Group of Notified Bodies" to ensure the technical requirements of the EHSRs are fulfilled via the latest standards and to ensure the standards are applied in a coherent manner throughout member states. CENELEC normally requests the International Electrotechnical Commission (IEC) to produce standards that will meet the requirements of the EU's Directives. The most applicable standards relevant to hazardous area product certification is the IEC 60079 series of standards published by the International Electrotechnical Commission which, since 2006, have been adopted by the European Union, via CENELEC, as harmonised "EN" standards that support the EHSRs required by the ATEX Directive. The "zoning" concept used under ATEX has been adopted from the IEC system of hazardous area classification.

Internationally Recognised Hazardous Area Product Certification.

The International Electrotechnical Commission (IEC) itself runs its own certification system for hazardous area equipment and it is called the IECEx scheme of hazardous area equipment certification. This scheme has the stated goal of becoming the global benchmark for hazardous area certified equipment so that any product carrying the IECEx mark will be acceptable to all national bodies regulating industries engaged in hazardous area activities. Under the IECEx "Ex" product certification scheme, manufacturers submit their product to a recognised IEC certification body, an ExCB, who controls the certification process for the product. Samples of the product are tested in accordance with the relevant IEC standards by a testing laboratory, an ExTL, under the coordination of the ExCB. The product must conform to the most applicable standards related to hazardous equipment, most notably the IEC 60079 series of standards. The ExCB is also responsible for auditing the manufacturer's production facility in accordance with the ISO 9001 standard. The manufacturer is only issued with a Certificate of Conformity if the test report (ExTR) and the quality assessment report (QAR) provide evidence of compliance with the relevant standards. The ExCB is then responsible for annual audits of the manufacturer with respect to the product that has been granted the Certificate of Conformity (CoC). The CoC and test report are held and controlled by the IEC and the most current version of the CoC, along with its revision history, is visible on the IECEx website.

Under IECEx rules an ExCB can only certify products against the IEC standards for which it has been assessed via the "scope of acceptance", a process carried out by an Assessment Team made up of existing IECEx members. The ExCB and ExTL must demonstrate the capability (e.g. technical competence, laboratory equipment) to assess and test products to the standards covered by the scope of acceptance. Annual surveillance of ExCBs and ExTLs is required under IECEx rules and all ExCBs and ExTLs are re-assessed every five years.

The IECEx is made up of national technical committees that each contributes to the creation and continuous updating of standards. Updates to standards are frequent and are designed to reflect the latest state of the art with respect to protection concepts and test methods for equipment to be operated in hazardous areas. To illustrate, the latest standard for intrinsic safety, edition 6 of IEC 60079-11, published in 2011, was previously published in 2006. One example of the 2011 update was the addition of new test requirements for opto-isolators.

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Convergence Of Hazardous Area Product Certification Systems.

If there is any likely route to the convergence of an internationally recognised hazardous area product certification "kite-mark" this is likely to be via the IECEx scheme. To enable harmonisation on a global scale the IEC requires the identification of "national differences" between national standards and regulations and IEC standards. Additionally, a transitional period must be defined in order to normalise such differences so that the IECEx standards have a broad consensus of agreement and are acceptable to all participating countries. National differences may be reflected in requirements like fire and electrical shock testing for the U.S. and any Directives applicable to electrical products for the EU and EFTA. However, it is not the goal of the IECEx scheme to replace or remove these additional requirements as the scheme is focussed solely on explosion protection certification.

The U.S. representative on the IECEx Scheme is the United States National Committee (USNC) which is administered by the ANSI. Under NEC Articles 505 and 506, hazardous areas are divided into Zones and the majority of ANSI, ISA or UL standards referenced in NEC Articles 505 and 506 are derivative forms of the IEC series of 60079 standards. Under ANSI guidelines, an IEC standard is either adopted in its identical form or modified to add to, or reduce, the requirements of the standard. The standard will normally be adopted or modified by one of the standards developing organisations like the ISA or UL and obtain national standard status via the ANSI. In relation to explosion protection, the majority of differences applied to IEC standards are designed to ensure compliance with the NEC. Such differences could relate from wiring methods through to the addition of sections such as information on protection concepts like zener diodes.

Although the technical and legal harmonisation process may take anywhere between 10 and 15 years, from a U.S. perspective, the real challenge to adoption may happen "on the ground". One example is where the Authority Having Jurisdiction (AHJ) will need the technical capability to sign off on equipment marked and certified to the Class and Zoning requirements of the NEC. In reality, if the product has the mark of an NRTL, with IEC "Ex" Certified Body status, and the appropriate level of knowledge and communication is present between OSHA compliance officers and other AHJs, then the case for sole acceptance of IECEx marked products may strengthen in the medium to long term.

A recent development has seen the United Nations, through the work of UNECE, adopt the IECEx model of certification as the basis for establishing a regulatory framework for hazardous areas at a national level so that any U.N member country can use the IECEx model as the basis for national legislation. This will be especially beneficial for countries that require access to class leading hazardous area products but do not have legislation or regulations that mirror those of the U.S. or Europe, which can make the selection of equipment an onerous, or even impossible, task. Member countries with developed legislative frameworks may choose to align themselves with this development so that all countries recognise the same certificates.

Summary

As global trade in hazardous area products is set to increase, it would appear sensible that all countries operate on the same playing field when it comes to certifying hazardous area products and classifying the areas and in which they operate. While some countries, like Australia, have made the decision to require IECEx CoCs for hazardous area equipment and countries like Canada have changed their national code, the CEC, to reflect the Class and Zoning system, in reality it may be some time before regions like the U.S. and Europe adapt their regulatory and legislative systems to a single unified system of hazardous area product certification. It will also take some time for the Class and Zoning method described in NEC Articles 505 and 506 to be adopted by hazardous area operators in the U.S.

Although full convergence may be some time away, or may never happen, from a hazardous area operator's perspective, product certified under the IECEx scheme's range of IEC 60079 standards and national standards based on the IEC 60079 series (i.e. IEC standards adopted of modified for NEC 505 & 506 or "EN" harmonised EU standards for ATEX), at minimum, will represent the latest state of the art in respect of explosion protection technology.

For companies operating the Class and Division system, products with dual Class - Division and Class - Zone approvals represent the most advanced examples of explosion protection systems in industry today.

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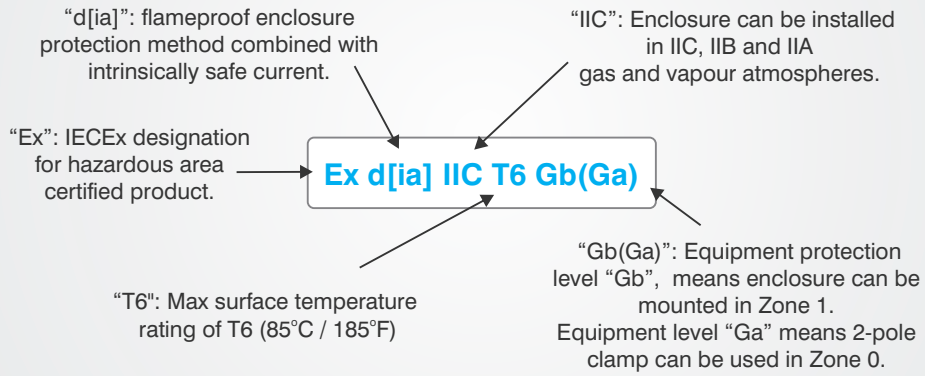
Examples Of Product Certification Markings.

The following are examples of product approval markings relevant to IECEx, NEC 500, 505 & 506 and ATEX for the Earth-Rite RTR road tanker ground monitoring system. Please note that the Canadian Electrical Code (CEC) also operates the Class and Zoning system in accordance with Section 18 of the CEC. The Class and Division method appears in Annex J of the CEC.

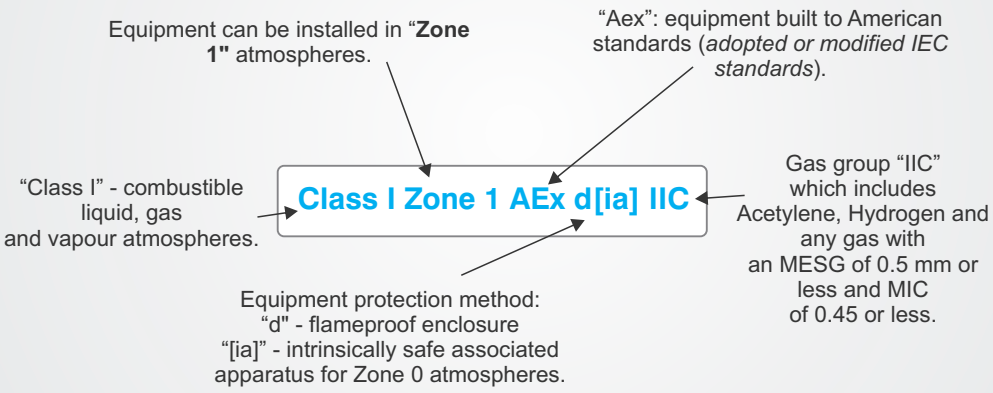
Highlights

- Standards are the cornerstone of hazardous area product certification.
- The adoption of international standards, such as those of the IEC, at a national level may facilitate the convergence of hazardous area classification and equipment approvals globally.
- Products that display the IECEx mark, along with required Class and Division or ATEX markings, represent the latest state of the art in respect of explosion protection technology.

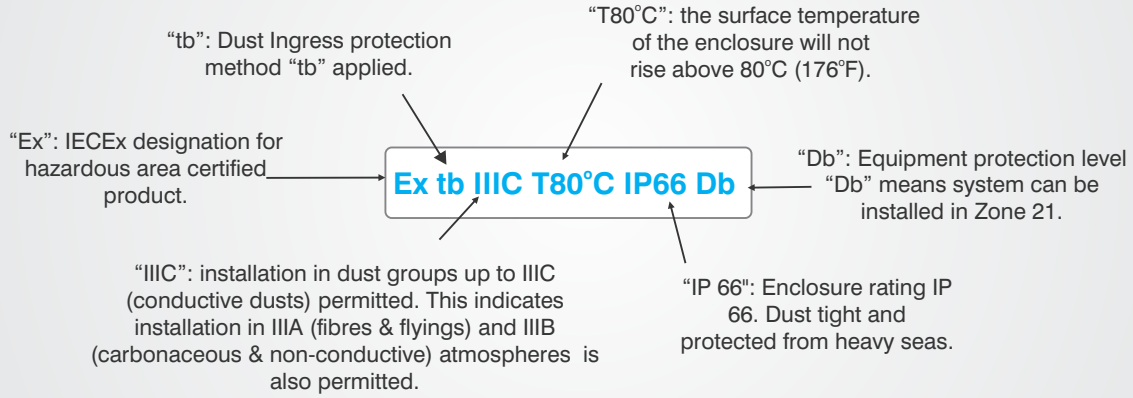
IECEx Certification Marking (Gas & Vapour)



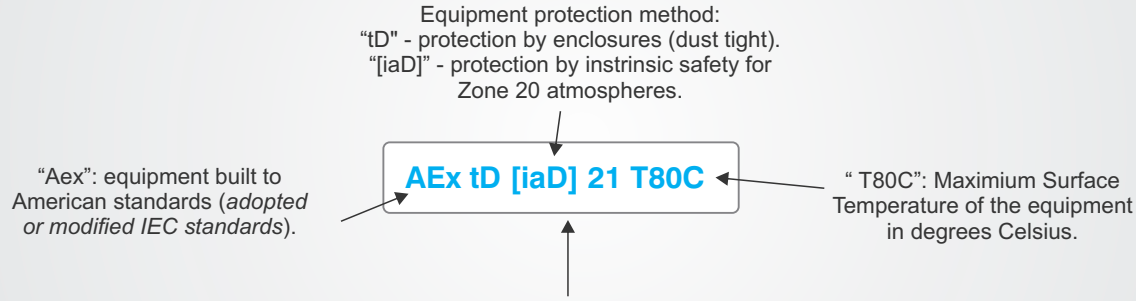
North American Approval Marking to NEC 505 (Gas & Vapor)



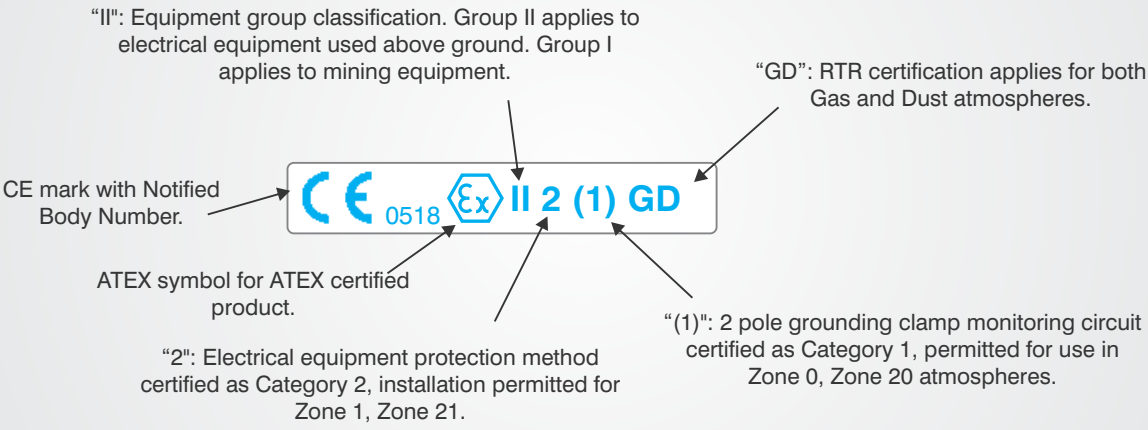
IECEx Certification Marking (Dust, Fibres, Flyings)



North American Approvals to NEC 506 (Dust, Fibres, Flyings)



ATEX Certification Marking



United States Approval Markings to NEC 500

"Class I": Combustible liquid, gas and vapour atmosphere

"Div.1": Division 1 defined as a location where combustible atmospheres can exist under normal operation, during maintenance, due to leaks or when equipment is faulty.

Class I, Div. 1, Groups A, B, C, D.

"Groups A, B, C, D": Indicates which gas groups the grounding system can be installed in. Gases, vapours, liquids are grouped according to their Minimum Experimental Safety Gap and Minimum Ignition Current ratio characteristics.
Higher Groups (e.g. A and B) require high levels of flameproof protection and low energy current.

"Class II": Combustible Dust atmospheres.

"Div.1": Division 1 defined as a location where ignitable dusts are normally suspended in air at a potentially combustible value under normal operating conditions.

Class II, Div. 1, Groups E, F, G.

"Groups E, F, G": Group E represents conductive metal dusts (e.g. aluminium). Group F represents carbonaceous dusts (e.g. coal dust). Group G represents other dust types not included in E and F, including the likes of grain, starch, flour, plastics and chemicals (pharmaceutical).

Class III, Div. 1 ← Hazardous locations where easily ignitable fibres and flyings are present around machinery but are not likely to be suspended in the atmosphere. Examples include saw dust from cutting operations and textile mills

Free Grounding & Bonding Handbook

Further information on hazardous area classification and zoning, their comparisons and differences, explosion protection techniques, and other factors related to hazardous locations can be viewed in the Grounding and Bonding Handbook.

More Information: If you require information on grounding techniques for static dissipative containers including drums and IBCs please contact Newson Gale at:

ATHEX Industrial Suppliers - www.athex.eu - info@athex.eu - Tel: +32 (0)3 653 21 82