# Certification and standards

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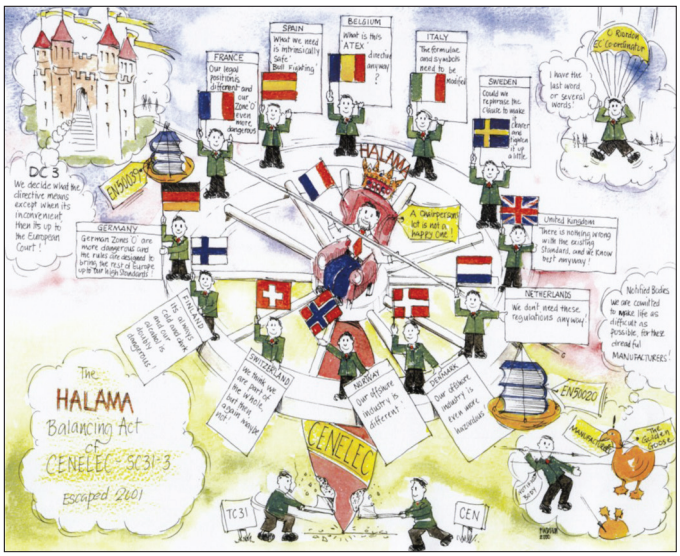
## 1 INTRODUCTION

This document is intended to provide guidance on the certification and standards used in the design and application of instrumentation used in hazardous areas. Inevitably this subject is one of constant but usually slow change and hence the date on which this document is written [June 2015] should be taken into account when considering any action based on this document.

All standards are created by individuals who have a specific interest in the subject. The time involved and the costs incurred by participants are considerable. This restricts the people involved to those with an enforcement, certification or commercial interest, which they tend to promote. Consequently the major representation on international committees is from certification bodies; manufacturers have adequate representation but end-users are not adequately represented. The resultant standards are reasonable and produce adequately safe equipment, which is surprising and a testament to the integrity of the individuals involved.




A 2001 Version of a CENELEC committee

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## 2 STANDARDS ORGANISATIONS

### 2.1 IEC

International standards for electrical equipment are created by the International Electrotechnical Committee IEC]. Those covering hazardous areas are created by a specific committee TC31 and its numerous sub-committees and form part of the IEC 60079 series. The process of creating and modifying standards is slow because of the lengthy but essential consultation process. An interval of five years between editions of the standards is quite common. Almost all national standards-making organisations are members of IEC and it is a truly international organisation.

The format of the IEC standard number is IEC 60079-xx: yyyy. The xx being the part number of the specific section and the yyyy the year of publication.

### 2.2 CENELEC

The European Committee for Electrotechnical Standardisation [CENELEC] are the European standards making body for electrical equipment. Currently IEC and CENELEC hazardous area standards are voted on simultaneously and bear the same number. The CENELEC committee on intrinsic safety exists but has not found it necessary to meet for several years. The standards are identical in technical content but the CENELEC standard contains further information to make it more useable with the ATEX directive. The apparatus standards are 'harmonised' as being an acceptable interpretation of the ATEX directive. It is important to recognise that the directive is a European Union [EU] document not a CENELEC standard and hence introduces some minor differences. There is usually a time difference of several months between the publication of the IEC standard and the publication of the EN and its final 'harmonisation' so that it can be used for ATEX certification. This delay could lead to there being different requirements for IEC Ex and ATEX certification for a short time. However no significant problems have occurred as a result of these differences as far as is known to the author,

The CENELEC standard number [European Norm] is the same as the corresponding IEC standard and has the form EN 60079-xx: yyyy. The date of publication may be one year later than the corresponding IEC standard.

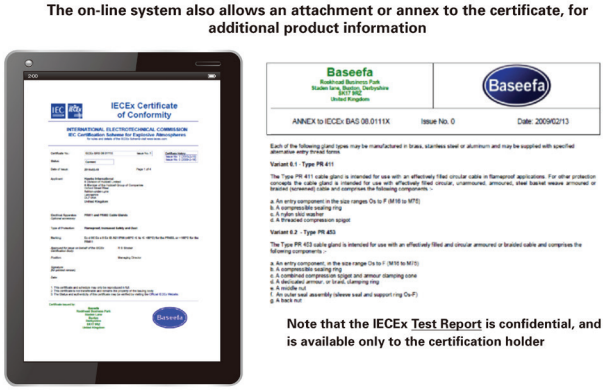
### 2.3 BSI

The British Standards Institution [BSI] is the United Kingdom participating member of both IEC and CENELEC. BSI publish an English language version of the CENELEC standard. The form of the standard number is BS EN 60079-xx: yyyy. The technical content of the IEC, CENELEC and BS standards are identical.

The CENELEC standard number [European Norm] is the same as the corresponding IEC standard and has the form EN 60079-xx: yyyy. The date of publication may be one year later than the corresponding IEC standard.

## 3 IEC EX

The IEC has an affiliated organisation which issues certificates of compliance with the IEC 60079 Series of standards. [There are a number of other related activities].
These certificates are based on detailed test reports created by approved testing organisations and are granted to manufacturers with approved quality control systems. The organisation is based in Australia; it has a strong secretariat responsible to a committee controlled by the approved certification bodies [CB]. A major advantage of IEC Ex certificates is that the latest version is available on the web




IECEx On-line certification System

and hence can be consulted at any time. IEC Ex certificates can only be issued by CBs. Anyone can use the IEC standards as a basis for 'certification' but this does not create an IEC Ex certificate.

The intended ideal is for IEC Ex certificates to be accepted universally. Some progress has been made in this direction, for example in Australia and Singapore, and there has been considerable support from the relevant United Nations organisation.
Numerous countries issue certificates based on the IEC test report but sometimes the acceptance is questioned in excruciating detail and other barriers to issuing the certificates erected. It can still be an irritating and expensive business. It is disappointing that IEC Ex certificates are not acceptable in Europe and the US There are some chinks in the US barrier, For example the U.S. Coastguard accepts some IEC Ex certification. In countries where the end-user decides what is acceptable then IEC Ex certificates are usually favoured. The usual practice of European manufacturers is to obtain an IEC Ex certificate and test report and use these to obtain an ATEX certificate. The only consolation is that the current situation is a considerable improvement on the late 1900s when everybody used different standards and their own specially defended single certification body.

It is difficult to be too definitive about where IEC Ex certificates are accepted because there does not appear to be an authorised list. Australia, New Zealand and Singapore are known to accept IEC Ex certificates. Brazil. China, Russia, Korea and India are known to issue local certificates based on the IEC test reports.

# 4 ATEX

## 4.1 Introduction

There are two ATmosphere EXplosive Directives [ATEX] in use at the present time. The directive which covers the marketing and manufacture of equipment for use in hazardous atmospheres is 94/9/EC generally referred to as the 'Apparatus Directive'. The other directive, 1999/92/EC is intended to ensure at least the minimum level of protection for workers in industries using hazardous materials. It is generally known as the 'user directive'.

## 4.2 User Directive 1999/92/EC

This 'worker protection' directive can be summarised as requiring a detailed, well documented risk analysis of the installation. Defining the acceptable risk is a very difficult task. The usual approach is to use equipment covered by appropriate Documents of Conformity, which is installed and maintained as required by the EN codes of practice [EN 60079-14, and -17] so as to achieve an acceptable solution. Theoretically a risk analysis can be used to circumvent the use of certified apparatus but this would require a very detailed comprehensive knowledge of all the relevant factors which is not usually available. Consequently this option is not often used but can sometimes be used to justify the continued use of old equipment or installations.

All European legislation has to be enacted in each country. Within the United Kingdom this Directive became law as part of the 'Dangerous Substances and Explosive Atmospheres Regulations' [DSEAR]. These regulations also include the requirements of the 'Chemical Agents Directive' [CAD], This arrangement can be slightly confusing but is a convenient arrangement since the requirements overlap.

Compliance with these regulations is the responsibility of the end-user. Some notified bodies do offer to carry out investigations and do inspections. These reports can be used to support the safety documentation but the responsibility still rests with the end-user.

## 4.3 Apparatus Directives 94/9/EC and 2014/34/EU

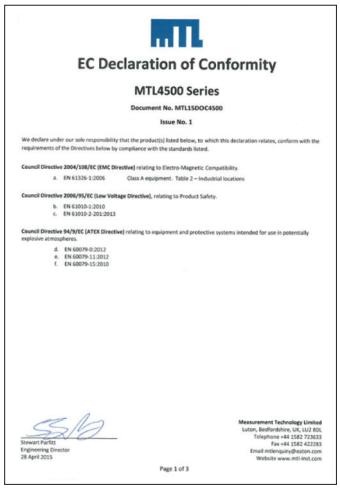
The directive which covers the design and marketing of equipment for use in hazardous areas is currently the 94/9/EC directive. It will be replaced on April 20th 2016 by the recently created directive 2014/34/EU. Fortunately as far as the supply and use of apparatus is concerned the continued use and supply of equipment which is already certified will be permitted. New equipment or equipment being significantly modified will be certified to the new directive from that date. It will be necessary to issue revised Documents of Conformity [D of C] for existing equipment from the changeover date. The new Directive does slightly tighten the requirements for

Notified Bodies and it will be interesting to see if there is a flood of new certificates on the day after the Notified Bodies have their ratification renewed.

The ATEX certificate is used as evidence of compliance with the requirement of minimising the risk of an explosion and authorises the use of the distinctive hexagon Ex mark ⟨Ex⟩.

Usually ATEX certificates are based on the CENELEC standards [EN 60079-x Series] but theoretically can be issued based on the 'essential safety requirements' of the Directive, without reference to the detailed requirements of any standard. However this approach is rarely used. There are requirements for the manufacturer to have adequate quality control systems [which are subject to surveillance] so as to ensure that the product produced complies with the certification. The directive only requires Category 1 and 2 equipment [usually interpreted as equipment for use in Zone 0 and 1] to be certified by a Notified Body. Category 3 [Zone 2] equipment can be 'certified' by the manufacturer but this is not always acceptable to the end-user and consequently most Notified Bodies do issue 'certificates' for Category 3 equipment. There is no shortage of Notified Bodies, for example the UK has eight which contrasts with one prior to ATEX.

The ATEX certificate is evidence of compliance with minimising the explosion risk but the legal requirement and the CE marking ⟨Ex⟩ requires compliance with all relevant directives. This is recorded on the Document of Conformity [DofC] which lists the relevant directives and the method of compliance. The directives which are usually quoted for instrumentation are the ATEX Directive, the low voltage directive [LVD] and the radio frequency interference directive {RFID}. The RF decoupling capacitors used to ensure compliance with the RFID are usually quite small but can affect the IS certification. Late changes in value can delay final IS certification. Other directives such as the machinery directive are applicable to some equipment. The D of C is the responsibility of the organisation placing the equipment on the market. Frequently hazardous area equipment may also be used for non-hazardous applications and the D of C should take into account this possibility.



EC Declaration of Conformity

MTL4500 Series

Document No. MTL15DOC4500

Issue No. 1

We declare under our sole responsibility that the product(s) listed below, to which this declaration relates, conform with the requirements of the Directives below by compliance with the standards listed.

**Council Directive 2004/108/EC (EMC Directive)** relating to Electro-Magnetic Compatibility.

a. EN 61326-1:2006 Class A equipment. Table 2 – Industrial locations

**Council Directive 2006/95/EC (Low Voltage Directive)**, relating to Product Safety.

b. EN 61010-1:2010

c. EN 61010-2-201:2013

**Council Directive 94/9/EC (ATEX Directive)** relating to equipment and protective systems intended for use in potentially explosive atmospheres.

d. EN 60079-0:2012

e. EN 60079-11:2012

f. EN 60079-15:2010

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28 April 2015

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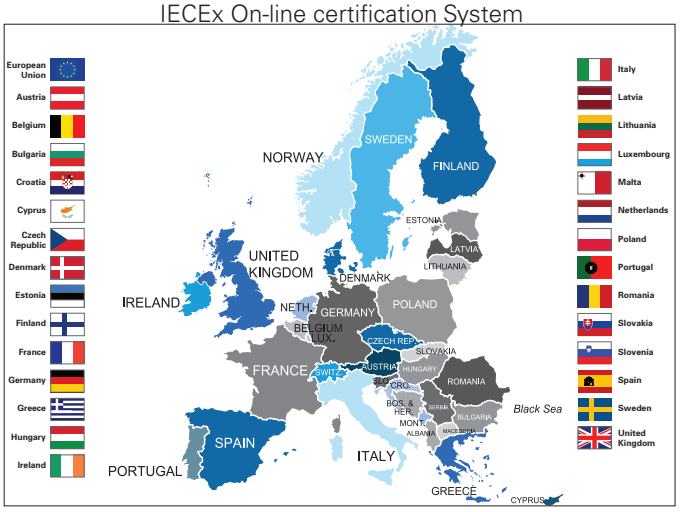
EC Declaration of conformity

*Note: All three directives usually quoted on the D of C have been updated and the common changeover date is 20th April 2016. The ATEX Directive 94/9/EC becomes 2014/34/EU, the EMC Directive2004/108/EC becomes 2014/30/EU and the LVD Directive 2006/95/EC becomes 2014/35/EU. The new directives do not require changes in the fundamental requirements hence re-certification will not be required, however the D of C will need to be modified.*

### 4.4 ATEX Countries of use

There are a large number of countries where it is a legal requirement to comply with the ATEX Directive. The 28 states of the European Union [EU] [no longer the European Community] together with the three states which are members of the European Free Trade Area [EFTA] [Iceland, Liechtenstein and Norway] form the core of the common market. There are a variety of customs agreements with Monaco, San Marino, Andorra and Turkey. Switzerland has 'an enhanced Mutual Recognition Agreement' with the EU. In addition a number of territories with ex-colonial attachments are also involved. These are French Guyana, Guadeloupe, Azores, Madeira, Canary Islands, Reunion, Saint-Barthelemy and Saint-Martin. The combination of these countries forms a large market.

IECEx On-line certification System




There are some marginally surprising exceptions to this combination and in these territories ATEX is not a legal requirement. These include the Cayman Islands, Falkland Islands, Antarctic Territories, Bermuda, Faroe Islands, Greenland and Gibraltar. All of these have European connections but are not included.

In these and some other countries end-users specify ATEX certified equipment as a guarantee of quality. This is common practice in the Middle East, some Asiatic countries and for some marine applications. Possibly the trend is to specify IEC Ex equipment in preference to ATEX but the additional commitments of the D of C still influence some end users. Offering both forms of certification is the option adopted by most European manufacturers.

## 5 VALIDITY OF CERTIFICATION

### 5.1 Standards

When a revised standard is issued, there is usually a period when the certification bodies can issue certificates to the previous version. Commercially there is always pressure for certificates to be issued to the latest version and consequently this relaxation is not frequently used.

The Foreword of an IEC standard contains a list of the changes from the previous version of the standard. The changes are classified into three levels of significance:

1) Minor and editorial changes
2) Extensions in scope
3) Major technical changes. The nature of these changes is also indicated in the Foreword.

If the major technical change is because of the recognition of a previously unknown significant explosion risk then corrective action to existing equipment might be considered necessary and the validity of existing certificates questioned. Fortunately no such technical change in the standards relating to instrumentation has occurred in the last fifty years. Consequently the continued use and placing on the market of equipment certified to earlier versions of the IEC/CENELEC standards is considered to be adequately safe.

### 5.2 IEC Ex certificates

IEC Ex certificates are a statement of compliance with a particular version of the IEC standard or standards at a specific time. There is no time limit. The standards used are the current versions with a changeover period when the standard is updated. In practice there is always commercial pressure to use the latest version of the standard and this changeover concession is rarely used. Minor changes to the design are permitted, without modifying the certification but major changes require recertification to the latest version of the standard. The interpretation of 'minor changes' varies between certification bodies and there is usually pressure to recertify to the latest standard.

The acceptability of an IEC Ex certificate [the latest version on the IEC Ex website] remains with the end-user. Presumably if some previously unrecognised significant hazard emerged the certificate would be withdrawn or some clear warning included in the documentation. Fortunately this problem has not occurred. Certificates based on older standards are still valid but may be regarded with some suspicion by some users. In practice older equipment is adequately safe and has the additional merit of safety, proven by time and use.

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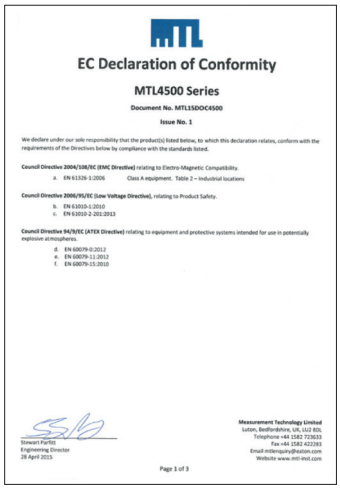

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### 6.4 ATEX certificates and Documents of Conformity

ATEX certification is based on the latest version of the harmonised version of the CENELEC standard with a transition period [1to 2 years] at the changeover.
[Harmonisation is the ratification of the standard as an adequate interpretation of the 'Essential Health and Safety Requirements' [EHSR] of the Directive by the European Commission]. Minor modifications are permitted in accordance with the original standard used but major changes require recertification to the current standard.

When creating the Document of Conformity [D of C] [which is necessary to comply with the CE marking and the placing of the equipment on the European market requirements], the manufacturer is permitted to quote the latest harmonised version of the standard. This is permitted provided that an analysis of the standards shows that there has been no significant change from the standard used in the original certification which detrimentally affects the EHSRs of the apparatus. This results in the D of C quoting a different version of the standard from that in the certificate. It is usual to add an explanatory note to the D of C.

If this procedure or an equivalent procedure is followed then the D of C confirms that apparatus certified to the older version of the CENELEC standard continues to satisfy the requirements of the ATEX apparatus directive.

## Appendix A - Relevant standards

This appendix lists the Explosive Atmosphere standards which are relevant to hazardous area instrumentation. There are other standards which are partially relevant but a comprehensive list would be very long. The IEC standard is quoted in this document. The EN version has the same number as the IEC version and has identical technical requirements but with Annexes which satisfy the ATEX apparatus requirements. The English language version of the CENELEC EN standard is published by BSI as a BS EN and is usually used by UK manufacturers for both IEC Ex and ATEX certification.

It is important to recognise that the standards are not primers on the subject and some expertise in the subject is assumed. Similarly the requirements are additional to those required to ensure adequate safety and performance of nonhazardous equipment.

It is an unfortunate fact that standards grow and proliferate. In 1960 the subject of intrinsic safety was covered by BS 1259 [18 A5 pages] and currently requires a combination of BS EN 60079-0,-11 and-25, which comprise 303 A4 pages. This represents the advance in technology or unwarranted tedious detail depending on your viewpoint. The truth is probably somewhere in between.

**IEC 60079-0 Explosive atmospheres –**
**Part 0: Equipment - General requirements**

Contains the requirements which are common to two or more methods of protection. For example requirements for the avoidance of electrostatic risk and impact test requirements are included. The individual apparatus standards state which sections are applicable to the specific method of protection, For example IEC 60079-11 the IS apparatus standard excludes several sections of 79-0.

**IEC 60079-1 Explosive atmospheres –**
**Part 1: Equipment protection by flameproof enclosures ''d''**

Contains requirements for 'da',db' & 'dc'. Implications being worked out.

**IEC 60079 -2 Explosive atmospheres –**
**Part 2: Equipment protection by pressurized enclosure ''p''**

Quite complex document covering different levels of protection for different circumstances.

**IEC 60079-7 Explosive atmospheres –**
**Part 7: Equipment protection by increased safety ''e''**

Contains 'ec' requirements which will replace 'nA'.

**IEC 60079-10-1 Explosive atmospheres –**
**Part 10-1 Classification of areas – Explosive gas atmospheres**

Contains guidance on this difficult subject with some examples. Some other organisations such as the Institute of Petroleum produce documents which give useful guidance on particular situations.

**IEC 60079-10-2 Explosive atmospheres –**
**Part 10-2 Classification of areas – Combustible dust atmospheres**

Dust equivalent of above.

**IEC 60079-11 Explosive atmospheres –**
**Part 11 Equipment protection by intrinsic safety 'I'**

Contains reference curves and tables as well as apparatus requirements. Contains the initial concept 'ic' requirements, which replaces 'nL'.

**IEC 60079-14 Explosive atmospheres –**
**Part 14: Electrical installations design, selection and erection.**

This standard attempts to be comprehensive so that users do not have to consult other standards. It is intended to supplement the usual good engineering practice and not replace it. There is strong interaction with IEC 60079-25, the IS system standard.

**IEC 60079 – 15 Explosive atmospheres –**
**Part 15: Equipment protection by type of protection 'n' electrical apparatus.**

Base document. 'nL' has become 'ic' and 'nA' is migrating to 'ec', hence reference has to be made to the last appropriate edition of the standard for information on 'nL' or 'nA' equipment.

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