Premier Farnell

EU Directive 94/9/EC – Equipment and Protective Systems intended for use in potentially explosive atmospheres (ATEX)

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Design with the best

1 Introduction

European Union (EU) Directive ATEX95 94/9/EC commonly called "ATEX" covers electrical and non-electrical equipment that is used in potentially explosive atmospheres. Explosive atmospheres may be present where flammable solvents or combustible dusts such as flour are used. Flammable solvents may be used for cleaning or as an additive to a process. Equipment that is used in these environments must be designed to avoid causing an explosion or fire,
i.e. avoid sparks and other ignition sources and they cannot be put onto the EU market until approved by a Notified Body who will issue a Certificate of Conformity.

There is another related directive called the ATEX 137 Workplace Directive 99/92/EC (DSEAR – Dangerous Substances & Explosive Atmospheres Regulations - in UK). This is concerned with the safety of the workplace and requires the user to carry out a risk assessment and mark hazardous areas according to risk. "Zones" are defined which are based on the risk levels and these relate to the Categories defined by the ATEX equipment directive.
Both of these ATEX directives are currently in force in the EU.

ATEX is an EU Directive and equipment sold in other parts of the world may need to meet different local legislative requirements. In North America, documentation is submitted to an appropriate approvals body and testing is also carried out. In the rest of the world, most countries use IEC Standards as national standards.

2 Scope

Any equipment that is used where there is a risk that the atmosphere will contain flammable or explosive mixtures of air and gases, mists, dusts, vapours, etc., even if this is unlikely to occur. New and used equipment and some types of components, such as relays, that are placed on the EU market and put into service has to comply.
This includes equipment made for own use.

ATEX 95: Manufacturer
ATEX 137: User

2.1 Exclusions

ATEX specifically excludes certain categories of equipment which are:

Medical devices used in medical environments (these would be covered by the Medical Device Directives).

Domestic and non-commercial equipment where potentially explosive atmospheres are rare

Personal protective equipment, Marine shipping and offshore equipment, transport such as cars and trains (but not if these are used in explosive atmospheres) and equipment designed solely for military purposes. Equipment used where the risk is due only to the presence of explosive or chemically unstable substances is also excluded. Simple mechanical products such as clockwork timepieces and self-closing doors are also excluded but forks for fork-lift trucks would be included.

2.2 Equipment categories

Equipment within the scope of ATEX is divided into two groups. Group I is for equipment used in underground mines and surface installations. Group II covers other equipment and this is divided into three categories.

Category 1. Equipment that requires the highest level of protection as it will be used for long periods in potentially explosive atmospheres, and must be able to provide protection even if one means of protection fails or if two faults occur. or if two faults occur.

Category 2. Equipment needs a high level of protection for use where potentially explosive atmospheres are likely to occur.

Category 3. Equipment in this category will have a normal level of protection and is intended for use where potentially explosive atmospheres are infrequent or exist for short periods only.

The frequency that potentially explosive atmospheres may be encountered is the basis of the zones defined by the ATEX 137 Workplace Directive. There are six zone classifications, three where the risk is from gases and three where the risk is from dusts. Zone 0 (gases) is the highest level of risk and so only Category 1 equipment is likely to be acceptable. Zone 1 is where potentially explosive atmospheres (due to gases) are likely and Zone 2 is where they are unlikely or may be present for a short time and so Category 3 equipment could be used. Zones 20, 21 and 22 are the equivalent dust risk zones

3 Requirements

Equipment that needs to comply with ATEX must be designed in such a way as to meet the general requirements of the directive. The main principles are to prevent explosions, avoid all sources of ignition and if an explosion were to occur, to halt it as soon as possible.

There are many design requirements and a few are summarised here:

- Designs must be analysed to determine where possible faults may occur that cause ignition
- Equipment must withstand conditions within the environment in which it will be used.
- All equipment must include instructions and the directive specifies what these must include.
- Materials must be selected to avoid triggering an explosion. For example, plastics should not be used if these are likely to fracture as a result of contact with solvents.
- The design and construction should avoid triggering explosions with attention, for example, to enclosures to prevent leaks (keep explosive mixtures out or to contain explosive mixtures) and to avoid dust build up.
- Avoid potential ignition sources such as static discharge, stray leakage currents or overheating.

There are also requirements that are specific to the two Groups and three sub-Categories as well as additional requirements for safety related devices, for example they must be fail-safe. There are also requirements relating to systems such as hazards caused by power failure.

All equipment within the scope of ATEX must be marked and the directive specifies which markings are required and include the name and address of manufacturer, CE mark, year of construction, a specific marking of explosion protection and a symbol to represent the equipment Group and Category. Equipment in Group II is also marked G to signify gases and D for dusts.

4 How to comply

Manufacturers will need to submit an application for examination to an approved Notified Body. There are several procedures that can be used, a product "type" can be approved or an individual unit can be tested and approved by a Notified Body. For "type approval", the Notified body will review submitted information, examine and test the equipment and provide a certificate of conformity if the equipment meets all of the requirements. Manufacturers will also need to inform the Notified Body if any modifications are made and further testing may be required before approval can be given. However ATEX does not apply to repaired equipment as long as the original function is maintained.

The types of technical documentation that will be required includes:

- Design drawings, layout diagrams, circuit diagrams, etc.
- Description and explanations of drawings
- A list of standards which apply
- Test reports and any other information such as design calculations.
- Manufacturers should carry out risk assessments and many possible methods are available for this. The EC guidance suggests two methods; i) by a systematic review of all component parts and the likely effect of possible defects to these and ii) by the use of brain-storming. EC guidance also suggests that more than one technique should be used to avoid overlooking risks.

Premier Farnell

COBHAM

Written in conjunction with ERA Technology Ltd trading as Cobham Technical Services (www.era.co.uk/rfa)

Baseefa

For the World

Putting IECEx and ATEX together

For Europe

Aim: One single certificate for any hazardous area product recognised and accepted throughout the world.

Already accepted in many countries. Alternatively a single test report (ExTR) can be sent to any member certification body (ExCB) to issue locally accepted certification.

Currently only electrical equipment to IEC Standards.

ExCB issues an ExTR (covering the product type) and a quality assessment report (QAR) (covering the related production facility)

Certificates of conformity created directly on the IECEx website, fully visible for the whole world to read and check status.

ExCB maintains the status of certificate based on the outcome of further QARs, a minimum of 2 audit visits in a 3 year period.

IECEx Product Certification

Technically identical standards for electrical equipment since 2005.
With the exception of intrinsic safety, where a revised IEC/EN 60079-11 and a new IEC/EN 61241-11 are due in 2006.

For single standards, a single set of tests and assessments can support both IECEx and ATEX.

An ATEX EC-Type Examination Certificate can be based on an IECEx ExTR but ATEX documentation does not necessarily support an IECEx certificate.

The technical requirements of a manufacturer's QA system are effectively the same, both are based on EN13980 and an IECEx QAR can support the issue of an ATEX QAN.

ATEX Conformity Assessment

A common approach to lifting barriers to trade within the European Economic Area (EEA).

The Directive becomes law on implementation in each member country and compliance is mandatory within the EEA.

Applicable to non-electrical equipment and protective systems as well as electrical equipment.

Certification from a Notified Body is Mandatory for cat. 1 and M1 equipment, protective systems and cat. 2 and M2 electrical equipment. Otherwise self-declaration of compliance is permitted.

An EC-Type Examination Certificate and Quality Assessment Notification (QAN) are issued by a Notified Body.

The manufacturer - alone - is responsible for the Declaration of Conformity which must accompany every product which bears the European CE Marking.

Electrical Protection Concepts

Standard IEC/EN		Code		Protection Concept	Zone	
Gas	Dust	Gas	Dust		Gas	Dust
60079-0	61241-0			General Requirements		
60079-1		Ex d		Flameproof	1	
	61241-1		Ex tD	Enclosure		20/21/22
60079-2	61241-2	Ex p	Ex pD	Pressurised	1	21/22
60079-5		Ex q		Powder Filled	1	
60079-6		Ex o		Oil Filled	1	
60079-7		Ex e		Increased Safety	1	
6007941(*)	61241-11(*)	Ex ia Ex ib	Ex iaD Ex ibD	Intrinsic Safety	0 1	20 21
60079-15		Ex nA Ex nL Ex nR Ex nC Ex nP		Non-sparking Energy limited Restricted breathing Enclosed break Pressurisation	2	
60079-18	61241-18	Ex ma Ex mb	Ex maD Ex mbD	Encapsulation	0 1	20 21

(*) expected 2006

Ingress Protection (IP)

Hazardous area equipment typically requires a minimum IP rating of IP54 but may be assessed and tested to the higher ratings below:

DUST
IP 5x - Dust protected
IP 6x - Dust tight
WATER
Protected against:
IP x4 - splashing water
IP x5 - water jets
IP x6 - powered water jets
IP x7 - temporary immersion
IP x8 - continuous immersion

See IEC/EN 60529 for full definition of IP ratings

Mechanical Protection Concepts

Standards	Code	Concept	Zone
EN13463-1		general requirements	
EN13463-2	fr	flow restriction	2 22
EN13463-3	d	flameproof	1 21
EN13463-5	c	constructional safety	1 21
EN13463-6	b	control of ignition sources	1 21
EN13463-7	p	pressurisation	1 21
EN13463-8	k	liquid immersion	1 21

Mechanical certification is based on a risk assessment approach.

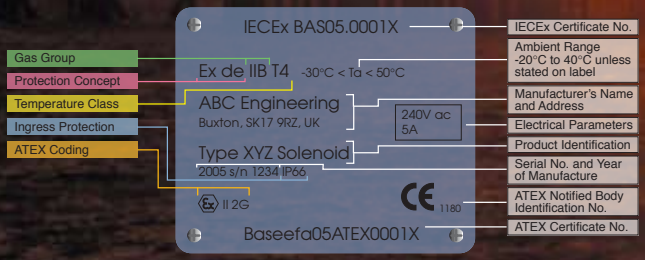
Category 3 equipment must be safe for use in normal operation.
Category 2 equipment must be safe for use in normal operation and expected malfunction
Category 1 equipment must be safe for use in normal operation, expected and rare malfunction.

Potential ignition sources identified in the risk assessment are made safe by applying one or more of the concepts. The number of '*' in the table below indicate the number of protection concepts which need to be applied.

	cat 3	cat 2	cat 1
normal operation	*	*	**
expected malfunction		*	**
rare malfunction			*

Temperature Class

T Class	Maximum Surface Temperature
T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C



Gas Groups

Gas Group	Representative Test Gas
I	Methane (mining only)
IIA	Propane
IIB	Ethylene
IIC	Hydrogen

Gases are classified according to the ignitability of gas-air mixture.
Refer to IEC/EN 60079-20 for classification of common gases and vapours.

ATEX User Directive - DSEAR Implementation

What does DSEAR require?

Employers must:

- find out what dangerous substances are in their workplace and what the fire and explosion risks are
- put control measures in place to either remove those risks or, where this is not possible, control them;
- put controls in place to reduce the effects of any incidents involving dangerous substances;
- prepare plans and procedures to deal with accidents, incidents and emergencies involving dangerous substances;
- make sure employees are properly informed about and trained to control or deal with the risks from the dangerous substances;
- identify and classify areas of the workplace where explosive atmospheres may occur and avoid ignition sources (from unprotected equipment, for example) in those areas

The following are just some of the standards that can assist in the implementation of DSEAR

EN 1127-1	Explosion prevention and protection
IEC/EN 60079-10	Classification of hazardous areas
IEC/EN 60079-14	Electrical installations hazardous areas
IEC/EN 60079-20	Data for flammable gases and vapours

IEC 61508 - Safety Systems

IEC/EN 61508 is the international standard for electrical, electronic and programmable electronic safety related systems. It sets out the requirements for ensuring that systems are designed, implemented, operated and maintained to provide the required safety integrity level (SIL). Four SILs are defined according to the risks involved in the system application, with SIL4 being used to protect against the highest risks.

The standard is in seven parts:

IEC 61508-1, General requirements
IEC 61508-2, Requirements for E/E/PE safety-related systems
IEC 61508-3, Software requirements
IEC 61508-4, Definitions and abbreviations
IEC 61508-5, Examples and methods for the determination of safety integrity levels
IEC 61508-6, Guidelines on the application of IEC 61508-2 and IEC 61508-3
IEC 61508-7, Overview of techniques and measures

ATEX Coding

EU Explosive atmosphere symbol

II 2 GD

Equipment group

Equipment category

I - mining

M1 - energised
M2 - de-energised (*)

II - non-mining

	Gas	Dust
1 - very high protection	0	20
2 - high protection	1	21
3 - normal protection	2	22

(*) = in presence of explosive atmosphere

Baseefa Services

ATEX certification
IECEx certification
IEC 61508 certification
Quality system approval
Training
Technical advice
Technical file storage
Testing
Assistance with DSEAR (ATEX User Directive) Implementation

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Issue 1, September 2005

ATEX Identification

ecom

Scope of use:

Operating devices which are certified in accordance with directive 94/9/EG (ATEX 95 - previously ATEX 100a) are labelled with additional information which describes the place of installation or use. The device group appears first, then the device category and finally the atmosphere reference: (G)as and/or (D)ust.

The following categorisation applies to device group II:

Category 1 – very high level of safety
Safety is provided via 2-fold protection measures - even for rarely occurring equipment faults or 2 independent equipment faults.

Use in zone 0, 1, 2 / 20, 21, 22, atmosphere G / D

Category 2 – higher level of safety
adequate safety for frequent equipment faults / 1 fault

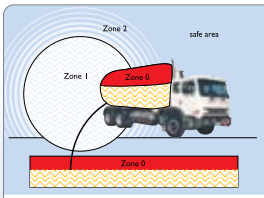
Use in zone 1, 2 / 21, 22, atmosphere G / D

Category 3 – normal level of safety
adequate protection during fault-free operation

Use in zone 2 / 22, atmosphere G / D

Labels for the avoidance of explosions - required in accordance with Directive 94/9 EC

(General regulations for the design and testing of electrical operating equipment for use in Ex-proof areas)



Division into zones

Safety plays a particularly important role wherever flammable substances are manufactured, processed, transported or stored - especially in the chemical and petrochemical industries, in crude oil and natural gas transportation and in the mining industry. In order to guarantee high levels of safety in these areas, legislators in most countries have drawn up corresponding requirements in the form of legislation, directives and standards. One aspect of globalisation has been the great progress which has been made in terms of standardising the directives for explosion protection. The European Union plays a leading role here: Directive 94/9/EC creates the basis for complete harmonisation, as since July 1, 2003 all new equipment destined for the European market must be approved according to this directive.

Definition of the zone classification:

Zone 0 / 20: Hazard: constant, prolonged or frequent	Device category 1
Zone 1 / 21: Hazard: occasional	Device category 2
Zone 2 / 22: Hazard: rare and temporary	Device category 3

Explosion group

This designation section contains among other things the device group. **Group I** comprises operating devices for firedamp mining with prevailing coal dust and methane atmospheres.
Group II applies to all areas above ground, such as chemical or petrochemical plants, mills (dusts) etc. The "intrinsically safe", "flameproof enclosure" and "powder filling" types of ignition protection are further divided into explosion groups **IIA** to **IIC** due to the different igniting power of the various gases.

CENELEC Identifier	Typical Gas	Ignition Power µJ
I	Methane	280
IIA	Propane	>180
IIB	Ethylene	60 ... 180
IIC	Hydrogen	<60

Temperature classes

Due to their different ignition temperatures, gases are classified in temperature classes. Similarly, the electrical operating devices in **Group II** are classified according to the maximum surface temperature **which can be reached by the ex-atmosphere.**

Max. permissible housing or component temperature of the operating devices

T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C

II 2G

Additional identification in accordance with directive 94/9/EC **(ATEX 95)**

Identification in accordance with EN 60079-0

E Ex ia IIC T4

Certified according to European Ex-standards | Explosion protection | Type of ignition protection

Type of ignition protection	Explosion protection Fundamentals and methodology	General requirements	Special requirements for operating materials in Group II, Category 1 in a gaseous atmosphere	Intrinsic safety	Encapsulation	Increased safety	Oil immersion	Overpressure encapsulation	Powder filling	Pressure-proof housing	Ignition protection type „n" *	General requirements	Protection based on the housing (dust atmosphere)
Symbol			Zone 0								Zone 2		
Identification				EEx i	EEx m	EEx e	EEx o	EEx p	EEx q	EEx d	EEx n		New: EEx tD Old: Txx°C IPxx
Basic principle	Special information for zone 0: Surface temperatures must not exceed 80% of the ignition temperature of the gas, even under rarely occurring operational faults. (Also contains further information about temperature safety distances for "dust Ex-areas".)	General regulations for the design, and testing of electrical operating equipment for use in Ex-proof areas.	EEx ia or EEx ma or suitable combination of two independent types of ignition protection Safety - even if two independent faults occur or - on failure of an apparatus-based protection measure by means of a second independent protection measure	Prohibited high temperatures, sparks and electric arcs are prevented by limiting the energy in the circuit. Detailed information: a = use in zone 1, 2, (0) - only under consideration of further standards* b = use in zone 1, 2* (*depending on the device category)	Ignition of the atmosphere is prevented by bedding the ignition source in a sealing compound. Detailed information: ma = use in zone 1, 2, (0) - only under consideration of further standards* mb = use in zone 1, 2* (*depending on the device category)	Only applies to operating devices or their components which, under normal circumstances, do not generate sparks or electric arcs, do not develop dangerously high temperatures and do not exceed a rated voltage of 11 kV.	Operating devices or components thereof are enclosed in oil and hence isolated from the Ex-atmosphere.	The ignition source is enclosed by a pressurised ignition protection gas through which the surrounding atmosphere cannot penetrate.	The ignition source is enclosed with fine-grained sand - the Ex-atmosphere surrounding the housing cannot be ignited by for example an electric arc.	If an ignition takes place in the interior of the capsule then the housing will withstand the pressure - the explosion is not transmitted to the outside.	Slightly simplified application of the other types of ignition protection. Devices in this category guarantee the required level of protection during normal operation. nA non-sparking electrical operating devices nC sparking operating devices fitted with protected contacts nR vapourtume proof housing nL operating devices and circuits with restricted energy nZ operating devices with n-overpressure encapsulation	General requirements for the design, construction, structure, testing and identification of operating devices for use in "dust Ex-areas".	Use of a dust-protected or dust-proof housing with a limited max. surface temperature *IP 5x only for non-conducting dusts
Use (zone)			0, 1 and 2	0, 1 or 2	0, 1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	2		20, 21 (IP 6x) 22 (IP 6x, IP 5x possible*)
Standard old	EN 1127-1	EN 50014	EN 50284	EN 50020	EN 50028	EN 50019	EN 50015	EN 50016	EN 50017	EN 50018	EN 50021		EN 50281-1-1
Standard new		EN 60079-0		EN 60079-11	EN 60079-18	EN 60079-7	EN 60079-6	EN 60079-2	EN 60079-5	EN 60079-1	EN 60079-15	EN 61241-0	EN 61241-1
	General	Gas atmosphere										Dust atmosphere	

Test body certification

PTB 04 ATEX X

- Test body
- Year
- According to directive 94/9/EC
- Sequentional number of the test body
- Additional conditions

Additional conditions	Identification
Operating device can be used without special restrictions (it is sufficient to follow the operating instructions / safety precautions).	-
Observe the special conditions for safe use.	X
Ex-component	U

CE 0102 **IP 65**

Housing protection

Meaning of the brackets

Can be used without restrictions for zone 0, special instructions must be observed.

II 2(1) G ...

Ta: -20°C ... +50°C

Ambient temperature Ta

It must be ensured that the specified ambient temperature range is not exceeded, as otherwise the specified temperature class can no longer be guaranteed.

Test bodies in Europe (selection)

Test body	Body	Identification
PTB	Germany	0102
ZELM	Germany	0820
EXAM	Germany	0158
TÜV Product Service GmbH	Germany	0123
IBExU	Germany	0637
KEMA	Netherlands	0344
UL INTERNATIONAL DEMKO A/S	Denmark	0539
NEMKO	Norway	0470
Baseefa	United Kingdom	1180

Foreign body protection

0	No protection
1	Objects > 50 mm
2	Objects > 12,5 mm
3	Objects > 2,5 mm
4	Objects > 1,0 mm
5	Dust Protected
6	Dust Tight

Water protection

0	No protection
1	Vertically Dripping Water
2	75° to 90° Angled Dripping Water
3	Sprayed Water
4	Splashed Water
5	Water Jets
6	High Power Water Jets/Heavy Seas
7	Effects of Immersion
8	Indefinite Immersion

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Wolf Safety Lamp Company

ATEX Explained

Ex Equipment

This guide is provided to aid in the selection of Wolf lighting products for use in potentially explosive atmospheres. Information given is based on practice within the EU, as specified in the requirements of the 94/9/EC ATEX (Equipment) Directive and the 99/92/EC ATEX (Workplace) Directive.

ATEX MARKING

CE 1180 · Ex · II · 2 · GD

- CE mark denotes manufacturers' declaration of product compliance to all relevant EU Directives
- Number of Notified Body responsible for EC monitoring of production quality
- Specific mark for Explosion Protection
- Equipment Group
- Equipment Category
- Defines suitability of use of Group II equipment in gas and/or dust atmospheres

CERTIFICATION CODE

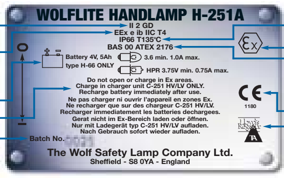
gases, vapours and mists to EN 50014

E Ex · e ib · IIC · T4

- Explosion Protected equipment 'E' prefix denotes compliance with CENELEC Standards in the EN50014 series
- Protection Concepts
- Gas Group
- Temperature Classification

Note: 'EEx' and Protection Concepts are not marked if a 'Technical File' from first principles is applied.

Ex EQUIPMENT LABEL



- ATEX MARKING
- CERTIFICATION CODE — gases, vapours & mists
- Replacement parts specification
- Safety measures to be applied in service
- Serial/batch number incorporating year of construction
- MARKING FOR DUST IGNITION PROTECTION
- Explosion protection mark (ATEX marking)
- EC-TYPE EXAMINATION CERTIFICATE NUMBER
- CE mark (ATEX marking)
- Supplementary approval Lloyds Register of Shipping marine approval

EC-TYPE EXAMINATION CERTIFICATE NUMBER

BAS · 00 · ATEX · 2176

- Notified body responsible for EC-Type Examination (Test House)
- Year Certificate Issued
- ATEX Certificate
- Serial Number

X Suffix denotes special conditions of certification
U Suffix denotes Ex component approval

MARKING FOR DUST IGNITION PROTECTION

to EN 50281-1-1

IP66 · T135°C

- Ingress Protection Code
- Maximum External Surface Temperature

EC NOTIFIED BODIES

Notified Bodies have been appointed by the governments of individual EC countries as responsible to carry out part or all of the functions specified in the ATEX Equipment Directive, such as EC type examination of equipment and quality assurance assessment of equipment production.

Baseefa (2001) Ltd are responsible for the quality assurance assessment of equipment manufactured by the Wolf Safety Lamp Company, this is identified by their notified body number (1180) appearing below the CE mark on Wolf products.

EQUIPMENT GROUP & EQUIPMENT CATEGORY

	Equipment Group	Equipment Category	Protection Level	Hazard Gas	Hazard Dust	Use
Mining	I	M1	Very high protection	–	–	Operable in Ex atmosphere
		M2	High protection	–	–	De-energised in Ex atmosphere
Industrial	II	1	Very high protection	G		Zones 0,1,2,
					D	Zones 20,21,22
		2	High protection	G		Zones 1,2
					D	Zones 21,22
		3	Normal protection	G		Zones 2
					D	Zones 22

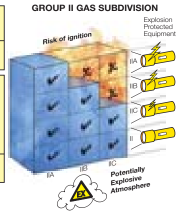
Equipment Group and Category identify the areas in which equipment may be safely used

GAS GROUP

	Group	Typical Hazard	Maximum Safe Sparking Energy Intrinsic Safety Ex ia/ib	Maximum Safe Gap Flameproof Ex d	Applicable Concepts
Mining	I	Methane	more	wide	all concepts
Industrial	IIA	Propane	energy required to ignite gas	flameproof gap size	Ex d, Ex ia/ib
	IIB	Ethylene			
	IIC	Hydrogen/Acetylene	less	narrow	
	II	All Gases			Ex e, Ex m, Ex p, Ex o, Ex q, Ex n

Equipment sub-grouping segregates gases according to ease of ignitability by sparks or flames. These apply to flameproof Ex d and intrinsically safe Ex ia/ib equipment only.

GROUP II GAS SUBDIVISION



PROTECTION CONCEPTS FOR ELECTRICAL APPARATUS

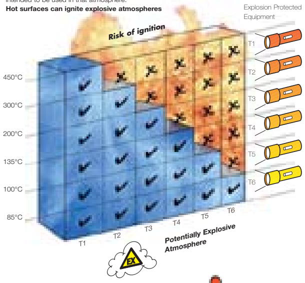
Concept	Symbol	Icon	Description	Category	EN Standard
General req.	–		General requirements	–	EN 60079-0
Oil immersion	Ex o		explosive gas excluded by immersing ignition source in oil	2	EN 50015* (EN 60079-6)
Pressurised	Ex p		explosive gas excluded by surrounding ignition source with pressurised inert gas	2	EN 60079-2
Powder filled	Ex q		explosive gas excluded by immersing ignition source in sand	2	EN 50017* (EN 60079-5)
Flameproof	Ex d		ignition within the apparatus enclosure is contained and will not ignite surrounding explosive atmosphere	2	EN 60079-1
Increased safety	Ex e		design excludes the possibility of incendive arcs, sparks or hot surfaces	2	EN 60079-7
Intrinsic safety	Ex ia		energy in circuit and temperature on components reduced to a safe level	1	EN 50020* (EN 60079-11)
	Ex ib			2	
Encapsulation	Ex m		flammable gas excluded by encapsulating the ignition source in resin	2	EN 60079-18
Non-incendive	Ex n		will not ignite explosive gas in normal operation, faults unlikely to occur	3	EN 60079-15

Protection concept identifies the means by which explosion protection is achieved.
* Shortly to be replaced by standard in brackets.

TEMPERATURE CLASS

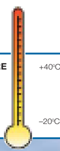
Temperature class relates to the hot surface ignition temperature of a particular explosive atmosphere. It must not be exceeded by the temperature classification of the equipment intended to be used in that atmosphere.

Hot surfaces can ignite explosive atmospheres



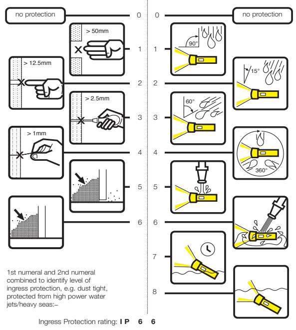
AMBIENT TEMPERATURE

Equipment approved to the CENELEC standard have T. class based on use in an ambient of -20°C to +40°C unless otherwise stated (ie. T amb. = 35°C)



INGRESS PROTECTION (IP) CODE to EN 60529

Ex equipment selection for use in gases, vapours, mists or dusts must take into consideration the environmental conditions of the area in which it is to be used. Apparatus resistance to ingress of both solid bodies and water is identified by use of an "IP rating".



1st numeral and 2nd numeral combined to identify level of ingress protection, e.g. dust tight, protected from high power water jets/heavy seas:–

Ingress Protection rating: **I P 6 6**

APPARATUS GROUPS AND TEMPERATURE CLASSES FOR COMMON EXPLOSIVE GASES AND VAPOURS

Gas/Vapour Temperature	Gas Group	Temperature Class
Acetic acid	IIA	T1
Acetone	IIA	T1
Acetylene	IIC	T2
Ammonia	IIA	T1
Benzene	IIA	T1
Butane	IIA	T2
Cumene	IIA	T2
Cychlohexane	IIA	T3
Ethanol (ethyl alcohol)	IIA	T2
Ethylene	IIB	T2
Hydrogen	IIC	T1
Methane (industrial)	IIA	T1
Methanol	IIA	T1
Petroleum	IIA	T1
Propane	IIA	T1
Toulene	IIA	T1
Turpentine	IIA	T3
Xylene	IIA	T1

A more comprehensive list of gases and vapours is provided in IEC 60079-20

IGNITION TEMPERATURES FOR COMMON COMBUSTIBLE DUSTS

Dust Cloud	Ignition Temperature
Aluminium	590°C
Coal dust (Lignite)	380°C
Flour	490°C
Grain dust	510°C
Methyl cellulose	420°C
Phenolic resin	530°C
Polythene	420°C
PVC	700°C
Soot	810°C
Starch	460°C
Sugar	490°C

A more comprehensive list of dusts is provided in BS 7535. A database of 'Combustion and Explosion Characteristics of Dusts' is available at www.hvbg.de/e/bia/fac/expl/

'CE' MARKING AND THE 94/9/EC ATEX DIRECTIVE ON EQUIPMENT AND PROTECTIVE SYSTEMS INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES.

MANDATORY WITHIN THE EU

'CE' marking has been introduced as part of the European Union's new approach to technical harmonisation as a means of identifying products that comply with all relevant EC Directives.

Subject to certain safeguards, products bearing the 'CE' mark are permitted to be sold throughout the EU without interference from national regulatory authorities. The Directives have been put in place in order to remove artificial trade barriers within the European Union previously caused by individual countries' national standards, a secondary function is as a means of regulating safety.

The **Explosive Atmospheres 94/9/EC ATEX (Equipment) Directive** became mandatory on 1 July 2003.

On this date the existing Explosive Atmospheres and Gassy Mines Directives were repealed. Since then only equipment and systems 'CE' marked as compliant with the ATEX Equipment Directive (and all other relevant mandatory directives) may placed on the market within the EU.

The Directive applies to all equipment and systems for use in potentially explosive atmospheres within the EU. The scope of the Directive includes electrical and mechanical equipment for use in Group I (mining) or Group II (industrial) applications, both on and offshore and considers risks of ignition of potentially explosive gas, vapour, mist and dust atmospheres. In addition, devices intended for use outside potentially explosive atmospheres that contribute to the safe functioning of equipment and systems with regard to explosion risk are also included.

Compliance of products to the ATEX Equipment Directive, through conformity assessment, takes a modular approach, and is generally in two stages; design and production.

A common route to product design compliance is to apply to a Notified Body (Ex. Test House) for an EC Type Examination Certificate. To comply, the equipment or system must meet the Essential Health and Safety Requirements (EHSRs) listed in the Directive. Harmonised EU standards have been adopted by CENELEC and CEN, relating to the design, construction and testing of equipment; a product complying with these standards is deemed to meet the EHSRs to which the standards relate. Where apparatus follows a protection concept not covered by these standards, compliance to the 94/9/EC Directive is still possible by compiling a 'Technical File' from first principles, demonstrating compliance through test and assessment to the EHSRs relating to design and construction of equipment for use in explosive atmospheres.

The production quality stage of the conformity assessment procedures ensure continued product compliance in manufacturing. Typically a manufacturer should have a certified ISO 9000 quality management system and comply with one of the quality modules in the ATEX Equipment Directive, however this will vary depending on product equipment category; equipment used in higher risk areas will require more onerous conformity assessment procedures to be applied.

In addition to the 94/9/EC ATEX (Equipment) Directive, products for use in potentially explosive atmospheres may require to be compliant with other Directives including the 89/336/EEC Electro-Magnetic Compatibility (EMC) Directive, which became mandatory on 1/1/96. This Directive applies to virtually all electrical and electronic apparatus potentially able to generate interfering emissions or exhibit an undue sensitivity to interference sources.

Once compliance with the relevant Directives is complete and an EC Declaration of Conformity issued by the manufacturer, the 'CE' mark may be applied and the product placed on the market.

The ATEX Equipment Directive in full, and EC Commission guidance on the Directive, may be found on the following website: http://europa.eu.int/comm/enterprise/atex/index.htm

99/92/EC ATEX (WORKPLACE) DIRECTIVE ON MINIMUM REQUIREMENTS FOR IMPROVING THE SAFETY AND HEALTH PROTECTION OF WORKERS POTENTIALLY AT RISK FROM EXPLOSIVE ATMOSPHERES.

WORKPLACES IN OPERATION BEFORE JULY 2003 MUST COMPLY BY JULY 2006.

WORKPLACES COMING INTO USE AFTER JULY 2003 MUST COMPLY IMMEDIATELY.

The Directive covers both Group I and Group II activities, on shore and offshore within the EU, and aims to provide a better level of protection for the health and safety of workers in potentially explosive gas, vapour, mist and dust atmospheres.

It lists a set of obligations and safety measures for employers, requiring the adoption of a coherent risk assessment based strategy for the prevention of explosions. These obligations include:

- Generation of an explosion protection document, evaluating explosion risk, including: likelihood of the presence of the explosive atmosphere, the presence of ignition sources (including electrostatic discharge), identification of the substances and processes in use, definition of specific measures taken to safeguard the health and safety of workers.
- Classification of areas into zones and marking points of entry with safety signs.
- Appropriate training and supervision for workers.
- Use of written instructions and permits to work.
- Special requirements for work equipment:-
  - Equipment in service before 30 June 2003 may continue to be used after this date if it has been risk assessed and the explosion protection document indicates it can be safely used.
  - Equipment brought into service after 30 June 2003 must be CE marked as compliant with the 94/9/EC ATEX (Equipment) Directive.
- Due consideration of explosion protection measures, encompassing issues such as:
  - Control of releases.
  - Use of protective measures appropriate to the greatest potential risk.
  - Selection of appropriate equipment by referencing the explosion protection document.
  - Ensuring equipment is correctly maintained and operated.
  - Minimising the risk of explosion and the effect of explosion in the workplace.
  - Provision of suitable warning and escape facilities.

99/92/EC is a separate directive specifically covering workers in explosive atmospheres, working within the more general **89/391/EEC Directive** on the **introduction of measures to encourage improvements in the safety and health of workers at work.**

The ATEX Workplace Directive in full may be found on the following website: http://europa.eu.int/comm/enterprise/atex/index.htm

DSEAR – THE DANGEROUS SUBSTANCES AND EXPLOSIVE ATMOSPHERES REGULATIONS 2002.

In the UK the 99/92/EC ATEX workplace Directive will be implemented as The Dangerous Substances and Explosive Atmospheres Regulation 2002 (DSEAR). These regulations will also include the safety aspects of the 98/24/EC Chemical Agents Directive, resulting in flammable and dangerous substances being covered by a single set of regulations, thus reducing the volume of legislation covering this area.

A copy of the DSEAR regulations is available at: http://www.hmso.gov.uk/si/si2002/20022776.htm

A guide to DSEAR, published by the Health and Safety Executive can be downloaded at: http://www.hse.gov.uk/fireandexplosion/dsear/htm

CLASSIFICATION OF HAZARDOUS AREAS

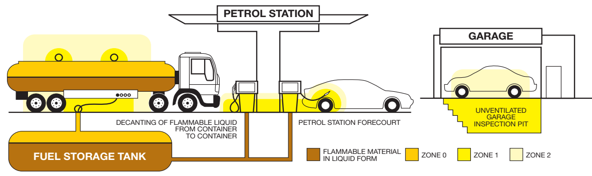
To EN 60079-10

Hazardous areas are classified into zones on the basis of the frequency and duration of the occurrence of an explosive atmosphere. Durations on table are typical.

Area Classification Gases	Area Classification Dusts	Zone Criteria
Zone 0	Zone 20	present continuously or for long periods (>1000hrs per annum)
Zone 1	Zone 21	likely to occur in normal operation occasionally (>10hrs, <1000hrs per annum)
Zone 2	Zone 22	unlikely to occur in normal operation, if it does will only be for short periods (<10hrs per annum)

EXAMPLE OF HAZARDOUS AREA ZONES

This diagram shows how hazardous area zones may occur in typical circumstances.



Ex Environment

KEY

- Explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist, or a cloud of combustible dust in air.
- Spark
- Ignition
- Flameproof flange gap on Ex d equipment
- < = less than
- > = more than

ASSOCIATED STANDARDS

Explosive Atmospheres. Explosion prevention & protection	
Basic concepts and methodology	EN 1127-1
Electrical equipment for use in potentially explosive gases, vapours and mists - associated non-concept standards	
Classification of hazardous areas	EN 60079-10
Electrical installations	EN 60079-14
Inspection and maintenance of electrical installations	EN 60079-17
Repair and overhaul of apparatus	IEC 60079-19
Data for flammable gases and vapours	IEC 60079-20
Electrical apparatus for use in the presence of combustible dusts	
Protection of enclosures "tD"	EN 61241-1
Classification of areas	EN 61241-10
Selection, installation and maintenance	EN 61241-14
Protection by encapsulation	EN 61241-18
Non-Electrical Equipment for use in potentially explosive gases, vapours, mists and dusts	
Basic method and requirements	EN 13463-1
Protection by constructional safety "c"	EN 13463-5
Protection by liquid immersion "k"	EN 13463-8

These standards relating to apparatus for dust and non electrical equipment are being supplemented by further standards for specific concepts of protection.

Standards available from: British Standards Institution, 369 Chiswick High Road, London W4 4AL www.bsi-global.com

For details of our full range of explosion protected lighting products visit our website listed below or contact Wolf to request data sheets.

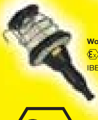
Wolf ATEX Turbolite
II 2 GD II T4 (Tamb=55°C) T135°C
SIRA02ATEX5099X

Wolflite Primary Cell Handlamp H-4DCA
II 2 GD EEx e ib IIC T4 IP66 T135°C
BAS00ATEX2203

Wolflite Rechargeable Handlamp H-251A
II 2 GD EEx e ib IIC T4 IP66 T135°C
BAS00ATEX2176

Wolf Rechargeable Torch R-30
II 2 GD EEx ib IIC T4 IP67 T135°C
Baseefa05ATEX0068

Wolf Hazard Lamp HL-95
II 1 G EEx ia IIC T4
BAS99ATEX1044



Wolf EX GLS Leadlamp
II 2 G EEx d e IIA T3
IBExU03ATEX1018X

Wolf ATEX Safety Torches
II 2 GD EEx e ib IIC T6 IP67 T65°C
II 2 GD EEx e ib IIC T4 (Tamb=40/55°C) IP67 T95°C (Tamb=55°C)
BAS02ATEX2220X

Wolf LiteTracker™ and Bikelite
II 1 G EEx ia IIC T4
BAS99ATEX1017

Wolf Ex-Penlite PL-01
II 2 G EEx e ia IIC T4
TÜV00ATEX1529

Wolf 'Zone 0' Headtorch HT-200
II 1 G EEx ia IIC T4/T3
Baseefa04ATEX0398

Wolf Flameproof Leadlamp
II 2 G EEx d e IIC T4/T3
DMT03ATEX279

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ISO 9001