HazLoc Essential Guides:

Understanding Zoned Equipment

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Introduction

All equipment manufactured for use in explosive atmospheres, whether the explosive atmosphere is caused by gas, vapour, mist or combustible dust must be suitably marked to indicate in what hazardous area of the explosive atmosphere the equipment can be installed. Hazardous areas are split into three classes of zone, these are:

Gas/Vapours/Mist	Combustible Dusts
Zone 0	Zone 20
Zone 1	Zone 21
Zone 2	Zone 22

What is a Zone? (Extract from IEC 60079-14)

Zone 0
Place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently.

Zone 1
Place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.

Zone 2
Place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mists is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

Zone 20
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.

Zone 21
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur, occasionally, in normal operation.

Zone 22
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

The marking on the equipment identifies into what zone the equipment can be safely installed and used. Historically it has been acceptable to install equipment into specific zones based on the type of protection e.g. you had to understand the protection concept to know what zone the equipment being installed could be located in.

This table shows the current Protection Concepts versus Zones.

Protection Concept		Zones of use
Intrinsic Safety	Ex ia	0, 1 and 2
	Ex ib	1 and 2
	Ex ic	2
Flameproof	Ex d	1 and 2
Increased Safety	Ex e	1 and 2
Encapsulation	Ex ma	0, 1 and 2
	Ex mb	1 and 2
	Ex mc	2
Pressurization/Purge	Ex px	1 and 2
	Ex py	1 and 2
	Ex pz	2
Quartz	Ex q	1 and 2
Oil Immersion	Ex o	1 and 2
Type n	Ex n	2

With the introduction of the ATEX Directive the concept of marking your equipment with the category was introduced. This would indicate to the end user what zone the equipment could be used in.

Gas/Vapours/Mist		Combustible Dusts	
Cat 1	Zone 0	Cat 1	Zone 20
Cat 2	Zone 1	Cat 2	Zone 21
Cat 3	Zone 2	Cat 3	Zone 22

In addition the IECEx introduced the Equipment Protection Level (EPL) marking which has been adopted along with the ATEX marking.

The ATEX category making and the IECEx EPL marking should always be consistent.

This table shows the full cross reference of EPL versus Category versus Zone.
(Extract from IEC 60079-0)

IEC 60079-0		**Directive 91/9/EC**		**EN 60079-10-X**
EPL	Group	Equipment Group	Equipment Category	Zones
Ma	*I*	*I*	M1	NA
Mb			M2	
Ga	*II*	*II*	1G	0
Gb			2G	1
Gc			3G	2
Da	*III*		1D	20
Db			2D	21
Dc			3D	22

Explanation of a typical marking

CE	0359	Ex	II	2	G	Ex	d	IIC	T4	Gb
Complies with European Directives	Notified Body Number	Marking for Explosion Protection	Equipment Group	Equipment Category	Environment	Explosion Protection	Type of Protection	Group	Temperature Class (T1-T6) (and/or T135°C)	Equipment Protection Level

Examples of markings

A level switch has the markings;

II 2 G Ex ia IIC T4 Gb

Q: In what zone can this be fitted?

A: Historically the **ia** would indicate this is suitable for zone 0. However, with ATEX the category overrides the concept and indicates that this is to be installed into a Zone 1 by the marking of Category **2** this is reinforced by the EPL of **Gb**.

A luminaires has the markings;

II 2 G Ex emb IIC T4 Gb

Q: In what zone can this be fitted?

A: This example includes some new markings '**mb**' if you were not sure what the new markings meant, with the category **2** and the EPL **Gb** showing you can still assess that it's a zone 1 piece of equipment.

A flameproof enclosure containing a safety barrier has the markings;

II 2 (1)G Ex d [ia Ga] IIC T4 Gb

Q: In what zone can this be fitted?

A; The **2** tells us that it's a category 2 piece of equipment which can be installed into a Zone 1, the **(1)** indicates that the output is safe for Zone 0. Again this is reinforced by the EPL **Gb** for Zone 1 and **[Ga]** for output to Zone 0.

To ensure correct selection of equipment clause 5 of IEC 60079-14 should be referred to.

The following is an extract from the ATEX Guidance Notes which shows additional variations to markings. These demonstrate how complex markings can be.

Ex	I	M2	Mining products, Group I, Category M2.
Ex	II	1G	Non-Mining products, Group II, Category 1 for use in gas/vapour/mist – atmospheres.
Ex	II	1D	Non-Mining products, Group II, Category1 for use in dust – atmospheres.
Ex			Protective system, for use in gas/vapour/mist/dust – atmospheres.
Ex	II	(1)GD	Device according to Article 1(2) of directive 94/9/EC in the non-hazardous area with intrinsically safe circuits of category "Ex ia", which can be connected e.g. to category 1 equipment.
Ex	II	2GD	Category 2 equipment for use in potentially explosive atmospheres containing gases or dust.
Ex	II	(2)/2(1)/1G	An assembly, such as gas detection system with more than one detection head, that is partly category 1 and partly category 2 formed by a safety device and equipment. The safety device is intended for use outside the hazardous area and the equipment is intended for use inside the hazardous area.
Ex	II	2(1)G	Category 2 equipment containing a safety device for a category 1 equipment.
Ex	II	2(1)GD	Same equipment for gas or dust potentially explosive atmospheres.
Ex	II	(2)G(1)G	A safety device alone which ensures the safety against explosion for category 1 equipment and for another category 2 equipment.
Ex	II	3/3D	A blower exhausting out of zone 22 and to be installed in zone 22.

There will always be some exception to the rules. A comprehensive understanding can be obtained from the ATEX Directive and associated guidance documents.

Under the ATEX Directive those installing equipment should be fully competent to do so.

If you are involved with ATEX, IECEx or DSEAR, it is likely that the new training and competence requirements will affect you. The new edition of IEC60079-14 (edition 4) specifies in detail the requirements for people involved in the installation of equipment or plant designed for use in hazardous areas (explosive atmospheres). Installation is equally applicable to skid/assembly manufacturers who use certified ATEX or IECEx equipment to form an assembly, as it is to installers of apparatus on a plant. Designers and manufacturers of equipment also need to be sure they are making the right decisions when it comes to ensuring the equipment is designed to the requirements of the correct and current standards.

How Intertek can help

Intertek provide training. Intertek has UK's largest dedicated explosion safety training centre which offers practical and theoretical CompEx Certification and DSEAR competence training and training for equipment designers and manufacturers at all levels in all hazardous area fields.

Training courses available include:

- CompEx Certified Training Courses for Site Operatives
- ModulEx Modular training programme for designers and manufacturers of hazardous area equipment
- Bespoke Training for ATEX and DSEAR

Intertek is an ATEX Notified Body (for all equipment concepts and facilities), an IECEx Certification Body (CB), a US NRTL (Nationally Recognised Testing Laboratory) and is accredited by SCC (Standards Council of Canada).

Intertek has the widest coverage of all product types and EU Directives so you can be assured your compliance needs can be met in full.

Should you require assistance to conduct conformity assessment work, or need help to gain new market access, then please contact Intertek, who will gladly help to find a way past any barriers to market access.

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