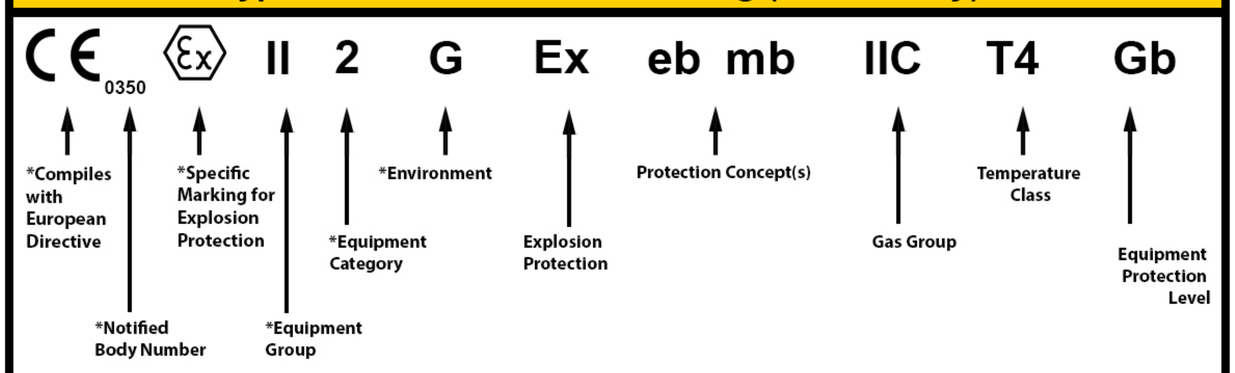
Guide to Explosive Atmospheres and Hazardous Locations

BME NITECH
www.bmenitech.co.uk
sales@bmenitech.co.uk
+44 (0)1224 825320

The information on this chart is for guidance only. For the latest information, the appropriate IEC and European standards on potentially explosive atmospheres should be referenced.

Typical ATEX and IECEx Marking (* ATEX only)



Equipment Group (ATEX and IECEx)

Equipment Group	Equipment Category	EPL	Atomsphere	Protection Level	Required Protection Performance & Operation
I (Mining)	M1	Ma	Methane & Dust	Very High	• Two Countable Faults, Remain Energised and Function
I (Mining)	M2	Mb	Methane & Dust	High	• Severe Normal Operation, De-Energise in EX Atmosphere
II (all other areas)	1	a	Gas, Vapour, Mist, Dust	Very High	• Two Countable Faults
II (all other areas)	2	b	Gas, Vapour, Mist, Dust	High	• One Countable Fault
II (all other areas)	3	o	Gas, Vapour, Mist, Dust	Medium	• Normal Operation

Groups (ATEX and IECEx)

Group	Environment	Location	Typical Substance
I	Gases, Vapours and Dust	Mining	Methane (Fire Damp)
IIA	Gases, Vapours and Mists	Surface and other locations	Methane, Propane, etc.
IIB			Ethylene
IIC			Hydrogen, Acetylene, etc.
IIIA	Combustible Dusts	Surface and other locations	Combustible flyings
IIIB			Non-conductive
IIIC			Conductive

Zoning Definitions

Gas	Dust	Definitions
0		A place in which an explosive atmosphere is continually present
	20	
1		A place in which an explosive atmosphere is likely to occur in normal operation occasionally
	21	
2		A place in which an explosive atmosphere is not likely to occur in normal operation, but if it does only occurs for short periods
	22	

Equipment Categories & Protection Levels

ATEX Category	Equipment Protection Levels	Typical Zone Suitability
1G	Ga	Equip. suitable for Zones 0,1,2
1D	Da	Equip. suitable for Zones 20,21,22
2G	Gb	Equip. suitable for Zones 1,2
2D	Db	Equip. suitable for Zones 21,22
3G	Gc	Equip. suitable for Zone 2
3D	Dc	Equip. suitable for Zone 22

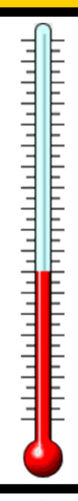
ATEX Categories v Zones of Use

Equipment Category ATEX 2014/34/EU	Zone of Use	
	Gas, Vapours & Mist	Dust
Cat 1	Zone 0, 1 & 2	Zone 20, 21 & 22
Cat 2	Zone 1 & 2	Zone 21 & 22
Cat 3	Zone 2	Zone 22
Note: Unless the explosion protection risk assessment states otherwise.		

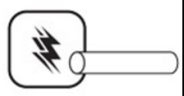
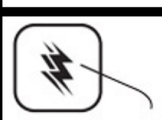
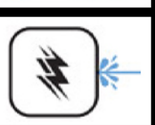
Protection Concepts (ATEX and IECEx)

Type of Protection	Symbol	Typical IEC EPL	Typical Zone(s)	IEC standard	Basic Concept of Protection
Electrical equipment for gases, vapours and mists (G)					
General Requirements				IEC 60079-0	
Flameproof	da db dc	Ga Gb Gc	0,1,2 1,2 2	IEC 60079-1	The ignition is contained, quenched and does not ignite the surrounding atmosphere.
Pressurised: Zone I to Non-Hazardous Zone I to Zone II Zone II to Non-Hazardous	px py pz	Gb Gb Gc	1,2 1,2 2	IEC 60079-2	Keep the flammable gas out.
Powder Filled	q	Gb	1,2	IEC 60079-5	Quench the ignition source.
Oil Immersion	ob oc	Gb Gc	1,2 2	IEC 60079-6	Keep the flammable gas out.
Increased Safety	eb ec	Gb Gc	1,2 2	IEC 60079-7	Removes the potential for arcs, sparks and hot surfaces.
Intrinsic Safety	ia ib ic	Ga Gb Gc	0,1,2 1,2 2	IEC 60079-11	Limitation of the energy and temperature of components and parts within the circuit.
Type 'n': Non-Sparking, nA Restricted Breathing, nR Enclosed Break, nC	nA nR nC	Gc Gc Gc	2 2 2	IEC 60079-15	Is not an ignition source during normal operation, where faults are unlikely to occur.
Encapsulation	ma mb mc	Ga Gb Gc	0,1,2 1,2 2	IEC 60079-18	Keep the flammable gas out.
Optical Radiation: Inherently Safe, is Mechanically Protected, pr Shutdown, sh	op is op pr op sh	Ga Gb Ga	0,1,2 1,2 0,1,2	IEC 60079-28	Ignition protection from optical radiation.
Special Protection	sa sb sc	Ga Gb Gc	0,1,2 1,2 2	IEC 60079-33	Ignition prevented by special means of protection.
Electrical equipment for combustible dusts (D)					
General Requirements				IEC 60079-0	
Intrinsic Safety	ia ib ic	Da Db Dc	20,21,22 21,22 22	IEC 60079-11	Limitation of the energy and surface temperature of components and parts.
Encapsulation	ma mb mc	Da Db Dc	20,21,22 21,22 22	IEC 60079-18	Encapsulation of potentially incendive parts.
Optical Radiation: Inherently Safe, is Mechanically Protected, pr Shutdown, sh	op is op pr op sh	Da Db Da	20,21,22 21,22 20,21,22	IEC 60079-28	Ignition protection from optical radiation.
Enclosure	ta tb tc	Da Db Dc	20,21,22 21,22 22	IEC 60079-31	Fully dust tight protection by exclusive of incendive atmospheres.
Special Protection	sa sb sc	Da Db Dc	20,21,22 21,22 22	IEC 60079-33	Ignition prevented by special means of protection.
Pressurised	pD	Db Dc	21,22 22	IEC 61241-4	Pressurisation of the enclosure.
Non-Electrical equipment					
				EN 13463-1	
General	h	Ga Da Gb Db Gc Dc	0,1,2 20,21,22	IEC 80079-36	Low potential energy
Flow Restricted Enclosure	fr			EN 13463-2	Relies on tight seals, closely matched joints and tough enclosures to restrict the breathing of the enclosure
Flameproof Enclosure	d			EN 13463-3	
Control of Ignition Sources	e		0,1,2 20,21,22	EN 13463-5	Control equipment fitted to detect malfunctions
	h	Ga Da Gb Db Gc Dc	0,1,2 20,21,22	IEC 80079-37	
Pressurisation	p		1,2 21,22	EN 60079-2 EN 61241-4	Enclosure is purged and pressurised to prevent ignition sources from arising
Liquid Immersion	k		0,1,2 20,21,22	EN 13463-8	Enclosure uses liquid to prevent contact with explosive atmosphere
	h	Ga Da Gb Db Gc Dc	0,1,2 20,21,22	IEC 80079-37	

Temperature Classification

Max. Surface Temperature	IEC - Group II	
450° C (842°F)	T1	
300° C (572°F)	T2	
200° C (392°F)	T3	
135° C (275°F)	T4	
100° C (212°F)	T5	
85° C (185°F)	T6	
Note: For Group I applications, electrical apparatus has fixed temperature limits i.e. 150°C and 450°C		

Ingress Protection IEC 60529

First Figure Protection against Solids			Second Figure Protection against Liquids		
IP	Test	Comment	IP	Test	Comment
0		No protection	0		No protection
1		Protected against solid bodies greater than 50mm diameter (e.g. accidental contact with the hand)	1		Protected against vertically falling drops of water (condensation)
2		Protected against solid bodies greater than 12.5mm diameter (e.g. finger)	2		Protected against drops of water falling up to 15° from the vertical
3		Protected against solid bodies greater than 2.5mm diameter (e.g. tools, wires)	3		Protected against water sprayed up to 60° from the vertical
4		Protected against solid bodies greater than 1.0mm diameter (e.g. thin tools and fine wire)	4		Protected against splashing water from all directions
5		Protected against dust (no harmful deposit) – Dust Proof	5		Projected against jets of water from all directions
6		Completely protected against dusts – Dust Tight	6		Projected against powerful jets of water from all directions
IEC (International Electrotechnical Commission) Publication 60529: Classification of Degrees of Protection Provided by Enclosures provides a system for specifying the enclosures of equipment on the basis of the degree of protection provided by the enclosure. IEC 60529 does not specify degrees of mechanical damage of equipment, risk of explosions, or conditions such as moisture (produced for example by condensation), corrosive vapours, fungus or vermin.			7		Protected against the effects of temporary immersion in water
			8		Protected against the continuous effects of immersion in water having regard to specific conditions