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Zones		
Zones gases	dusts	Zone- A place in which an explosive atmosphere is...
0	20	continually present
1	21	likely to occur in normal operation occasionally
2	22	not likely to occur in normal operation and only for very short durations

ATEX Marking- 2014/34/EU (was 94/9/EC)				
Equipment Group	Category	Environment	Zone of use	
I	M1	Methane and Coal Dust	N/A	
I	M2		N/A	
II	1		0/20	
II	2	Gas, Vapour Mists and Dusts	1/21	
II	3		2/22	

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

Groups (IEC)			
Group	Environment	Location	Typical Substance
I		Coal Mining	Methane (Fire Damp)
IIA	Gases, Vapours and mists	Surface and other mines	Methane, Propane etc.
IIB			Ethylene
IIC			Hydrogen, Acetylene etc.
IIIA	Combustible Dust	Surface	Combustible flying's
IIIB			Non-conductive
IIIC			Conductive

Useful Standards for the electrical designer and/or installer	
Topic	IEC (CENELEC) Standard
Area Classification- Gases, Vapours and Mists	IEC (EN) 60079-10-1:2015
Area Classification - Combustible Dusts	IEC (EN) 60079-10-2:2015
Electrical Equipment Installation	IEC (EN) 60079-14:2013
Electrical Equipment Inspection and maintenance	IEC (EN) 60079-17:2013
Electrical Equipment Repair and Overhaul	IEC (EN) 60079-19:2011
Material Characteristics of Gases and Vapours	ISO/IEC 60079-20-1:2017
Material Characteristics of Combustible Dusts	ISO/IEC 60079-20-2:2016

International Protection IEC 60529:1992 + A2:2013

1st Figure Protection against Solids		
IP	Test	Comment
0	None	No protection
1		Protected against solid bodies greater than 50mm diameter. (e.g. accidental contact with the hand)
2		Protected against solid bodies greater than 12.5mm diameter. (e.g. finger)
3		Protected against solid bodies greater than 2.5mm diameter (e.g. tools, wires)
4		Protected against solid bodies greater than 1.0mm diameter (e.g. thin tools and fine wire)
5		Protected against dust (no harmful deposit) Dust Proof
6		Completely protected against dusts Dust Tight

2nd Figure Protection against Water		
IP	Test	Comment
0	None	No protection
1		Protected against vertically falling drops of water (condensation)
2		Protected against drops of water falling up to 15° from the vertical
3		Protected against water sprayed up to 60° from the vertical
4		Protected against splashing water from all directions
5		Protected against jets of water from all directions
6		Protected against powerful jets of water from all directions
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
9		Protected against high pressure and temperature water jets

IEC (International Electrotechnical Commission) Publication IEC 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.

Zones/ATEX Categories/EPL's

Zone	ATEX Categories (Levels of Protection) Group II (Typical)	Equipment Protection Levels
0	1G	Ga
1	2G	Gb
2	3G	Gc
20	1D	Da
21	2D	Db
22	3D	Dc

Typical Equipment Marking: IEC Marking

Ex	db	IIC	T*	Gb	Db	+	/
Explosive Atmosphere	Concept letter + EPL	IEC Equipment group Gas (IIA, IIB or IIC) or Combustible Dusts IIIA, IIIB or IIIC	Temperature Class *For dust equipment this is the surface temperature and would be in °C.	Environment		IEC 60079-26	
				Gas EPL	Dust EPL	Two concepts together allowed in a higher EPL location	Equipment in a boundary wall

Cable Gland, adapters and accessories, Selection Chart IEC 60079-14:2013 Table 10

Selection Chart IEC 60079-14:2013 Table 10			
Protection Technique	Glands, adapters and blanking elements		
Gases and Vapours (Group II)			
	Ex d	Ex e	Ex n
Ex d	✓		
Ex e		✓	
Ex i and nL	✓	✓	
Ex n except nL	✓	✓	✓
Ex p	✓	✓	✓ (Gc only)
Combustible Dust (Group III)			
	Ex t		
Ex t	✓		
Ex p	✓		
Ex i	✓		

NB: If only one intrinsically safe circuit is applied then there are no specified requirements for cable glands. IEC 60079-14:2013 table 10. To meet IP requirements it may be necessary to use an IP washer or thread sealant between the entry device and the enclosure.

Minimum IP Rating for equipment used in Group III Hazardous locations

Level of Protection	Group IIIC	Group IIIB	Group IIIA
ta	IP6X	IP6X	IP6X
tb	IP6X	IP6X	IP5X
tc	IP6X	IP5X	IP5X

IP seal washers may be used on parallel threads. If no IP seal washer is used then thread engagement shall be five full threads

Pressurized Enclosures used in Group II Hazardous locations. Determination of type of protection (no internal release)

EPL	ATEX Category	Enclosure contains equipment not meeting "Gc" requirements	Enclosure contains equipment meeting "Gc" requirements
Gb	2G	Type "pxb"	Type "pyb"
Gc	3G	Type "pxb" or "pxc"	Type "pyb" "no pressurization"

IEC 60079-2 require that equipment of type of protection "py" will only contain equipment of type of protection "d", "e", "t", "n", "nA", "nC", "o" or "q"

Protection Concepts - Gases, Vapours & Mists: Electrical

Type of Protection	Symbol	ATEX Category	EPL	IEC /CENELEC (EN) Standard	Basic concept of protection
Increased Safety Non-Sparking	e nA	2 & 3	Gb, Gc	60079-7 60079-15	No arcs, sparks or hot surfaces.
Flameproof Enclosed Break Quartz/Sand Filled	d nC q	1, 2 & 3	Ga, Gb, Gc	60079-1 60079-15 60079-5	Contain the explosion, prevents propagation.
Intrinsic Safety Energy Limitation Optical Radiation	i nL op	1, 2 & 3	Ga, Gb, Gc	60079-11 60079-15 60079-28	Limits the energy of the spark and the surface temperatures
Pressurized Restricted Breathing Encapsulation Oil immersion	p nR m o	2, 3	Gb, Gc	60079-2 60079-15 60079-18 60079-6	Exclusion: keeps the flammable gas out
Special	s	1, 2 & 3	Ga, Gb, Gc	60079-33	Risk Assessment

Protection Concepts-Gases, Vapours & Mists: Non-Electrical

Type of Protection	Symbol	ATEX Category	ISO Standards (Proposed)	Basic concept of protection
General Requirements			80079-36	
Constructional Safety	c	2	80079-37	Ignition sources cannot arise
Flow restriction Pressurization Liquid immersion	fr p k	3	80079-37	Keeps the flammable gas out
Flameproof	d	2		Contain the explosion, prevents propagation.
Control of ignition sources	b	2	80079-37	Ignition sources cannot become active

Protection Concepts Dusts: Electrical

Type of Protection	Symbol	ATEX Category	EPL	IEC/CENELEC (EN) Standard	Basic concept of protection
Protection by enclosure	t	1, 2, 3	Da, Db, Dc	60079-31	Keeps the combustible dust out and avoids hot surfaces
Intrinsic Safety	i			60079-11	Limits the energy of the spark and the surface temperatures
Encapsulation	m			60079-18	Keeps the combustible dust out and avoids hot surfaces
Pressurization	P	2, 3	Db, Dc	60079-2	

Typical Equipment Marking: ATEX (Europe) Marking

CE	2585	Ex	II	2	G	D
Complies with European Directives	Notified Body Number (Exveritas)	EC Mark	Equipment group	Equipment Category	Environment	
					Gas	Dust

Pressurized Enclosures used in Group II Hazardous locations. Summary of protection requirements (no internal release)

EPL	ATEX Category	Enclosure contains equipment not meeting "Gc" requirements	Enclosure contains equipment meeting "Gc" requirements without pressurization
Gb	2G	Alarm and switch-off	Alarm ¹
Gc	3G	Alarm	no pressurization required

Pressurized Enclosures used in Group III Hazardous locations. Summary of protection requirements (no internal release)

EPL	ATEX Category	Ignition capable equipment	Non-ignition capable equipment
Db	2D	Alarm and switch-off	Alarm
Dc	3D	Alarm	no pressurization required

Data for Flammable Gases and Vapours (ISO/IEC 80079-20-1:2017) For the list of materials download the FREE Flamcal app (iOS, Android and PC), visit www.exveritas.com

Listed below are the flammability values for a number of common gases and vapours used in industry. There are more than 300 gases and vapours. Refer to ISO/IEC 80079-20-1:2017 for further details.

CAS No	Substance	Density relative to air (Air =1)	Flash point	Melting Point	Boiling Point	Flammable Limits Volume %		Ignition Temperature °C	Maximum Experimental Safe Gap (MESG) mm	Temperature Class	Group	Minimum Ignition Current Ratio
			°C	°C	°C	LEL	UEL					
74-86-2	Acetylene	0.90	gas			2.3	100	305	0.37	T2	IIC	0.28
106-97-8	Butane	2.05	gas	-138	-1	1.4	9.3	372	0.98	T2	IIA	0.94
75-15-0	Carbon Disulphide	2.64	-30	-112	46	0.6	60.0	90	0.34	T6	IIC	0.39
142-96-1	Dibutyl Ether	4.48	25	-95	141	8.5	48	175	0.86	T4	IIB	0.88
64-17-5	Ethanol	1.59	12	-114	78	3.1	19.0/27.7	400	0.89	T2	IIB	0.88
141-78-6	Ethyl Acetate	3.04	-	-83	77	2.0	12.8	470	0.99	T1	IIA	
74-85-1	Ethylene	0.97	gas	-169	-104	2.3	36.0	440	0.65	T2	IIB	0.53
50-00-0	Formaldehyde	1.03	60	-92	-6	7.0	73.0	424	0.57	T2	IIB	
142-82-5	Heptane	3.46	-7	-91	98	0.85	6.7	204	0.91	T3	IIA	0.88
1333-74-0	Hydrogen	0.07	gas	-259	-253	4.0	77.0	560	0.29	T1	IIC	0.25
8008-20-6	Kerosene		38 to 72°			0.70	5.0	210		T3	IIA	
74-82-8	Methane (Firedamp)	0.55	gas			4.4	17.0	595	1.14	T1	I	
74-82-8	Methane		gas	-182	-162	4.4	17.0	600	1.12	T3	IIA	1.00
111-65-9	Octane	3.93	13	-57	126	0.80	6.5	206	0.94	T3	IIA	
8006-61-9	Petrol(Gasoline)	3.0	-46			1.4	7.6	280		T3		
74-98-6	Propane	1.56	gas	-188	-42	1.7	10.9	450	0.92	T2	IIA	0.82
106-88-3	Toluene	3.2	4	-95	111	1.10	7.8	530	1.06	T1	IIA	
8006-64-2	Turpentine		35	-50 to -60°	154 to 170°	0.80		253		T3	IIA	
95-47-6	Xylene	3.66	30			1.0	7.6	470	1.09	T1	IIA	

Marking Explained

Example Marking Gas				Example Marking Dust			
Group (Surface)	Gas	Protection Concept(s)	Explosion Protection Level (EPL)	Group (Surface)	Dust Protection Concept(s)	Explosion Protection Level (EPL)	
CE	Ex	II 2 G	Ex db IIB T4 Gb TAMB -20°C to +55°C	CE	Ex	II 2 D	Ex tb IIIB T120°C Db
Notified Body Number for Quality Surveillance	ATEX Category	Gas Sub-Group	Temperature Classification	Notified Body Number for Quality Surveillance	Dust	ATEX Category	Temperature
			Ambient Temperature Range		Dust Sub-Group		

For the latest information, the appropriate IEC and European standards on explosive atmospheres should be referenced. If further information is required on any aspects of explosive atmospheres and/or equipment used in these areas. Please contact The Exveritas Group