Protas

www.protas.com.tr

Zones

Zone		Zone- A place in which an explosive atmosphere is...
gases	dusts	
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	Gas, Vapour Mists and Dusts	0/20
II	2		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

Equipment Ambient Temperature: Explosion protected (Ex) equipment shall only be used in the following temperature range unless otherwise stated on the equipment. -20°C to + 40°C

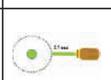
Groups (IEC)

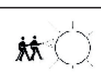
Group	Environment	Location	Typical Substance
I	Gas/Dust	Coal Mining	Methane (Fire Damp)
IIA	Gases, Vapours and mists	Surface and other mines	Methane, Propane etc.
IIB			Ethylene
IIC			Hydrogen, Acetylene etc.
IIIA	Combustible Dust	Surface	Combustible flying's
IIIB			Non-conductive
IIIC			Conductive

Useful Standards for the electrical designer and/or installer

Topic	IEC (CENELEC) Standard
Area Classification- Gases, Vapours and Mists	IEC (EN) 60079-10-1
Area Classification - Combustible Dusts	IEC (EN) 60079-10-2
Electrical Equipment Installation	IEC (EN) 60079-14
Electrical Equipment Inspection and maintenance	IEC (EN) 60079-17
Electrical Equipment Repair and Overhaul	IEC (EN) 60079-19
Material Characteristics of Gases and Vapours	ISO/IEC 80079-20-1
Material Characteristics of Combustible Dusts	ISO/IEC 80079-20-2

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

GroupII:Electrical Protection Concepts (Gas) excluding Mining

Concept Method	Symbol & EPL	EPL	ATEX	Zone	Concept Method	Symbol & EPL	EPL	ATEX	Zone
Flameproof	da	Ga	1	0, 1 and 2	Pressurized	pxb	Gb	2	1 and 2
	db	Gb	2	1 and 2		pyb	Gb	2	1 and 2
	dc	Gc	3	2		pzc	Gc	3	2
Increased Safety	eb	Gb	2	1 and 2	Liquid Immersion	ob	Gb	2	1 and 2
	ec	Gc	3	2		oc	Gc	3	2
Intrinsic Safety	ia	Ga	1	0, 1 and 2	Special	sa	Ga	1	0, 1 and 2
	ib	Gb	2	1 and 2		sb	Gb	2	1 and 2
	ic	Gc	3	2		sc	Gc	3	2
Encapsulation	ma	Ga	1	0, 1 and 2	Powder	qb	Gb	2	1 and 2
	mb	Gb	2	1 and 2		qc	Gc	3	2
	mc	Gc	3	2	Restricted Breathing	nR	Gc	3	2
Optical Radiation	op is	Ga	1	0, 1 and 2					
	op sh	Ga	2	0, 1 and 2	Non-incendive	nC	Gc	3	2
	op pr	Gb	2	1 and 2					

Non - Electrical Protection Concepts (Gases)

Concept Method	Concept Letter	Symbol	EPL	Zone	ATEX
Constructional Safety	c	h	Ga, Gb and Gc as may be appropriate	0, 1 and 2 as may be appropriate	1, 2 and 3 as may be appropriate
Control of ignition sources	b		Ga, Gb and Gc as may be appropriate		1, 2 and 3 as may be appropriate
Liquid immersion	k		Ga, Gb and Gc as may be appropriate		1, 2 and 3 as may be appropriate

Protection Concepts Dusts: Electrical

Type of Protection	Symbol	ATEX Category	EPL	IEC/CENELEC (EN) Standard	Basic concept of protecti
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	

Relationship Gas / Vapouor Dust & Equipment Group

Location gas/vapour or dust subgroup	Permitted equipment group
IIA	II, IIA ,IIB or IIC
IIB	II , IIB or IIC
IIC	II or IIC
IIIA	IIIA, IIIB or IIIC
IIIB	IIIB or IIIC
IIIC	IIIC

Ex d Flange equipment Obstruction Distance

Location Gas Group	Permitted Distance mm
IIA	10
IIB	30
IIC	40

Equipment Selections by ATEX Category

		Hazardous Area Classification (Zones)		
		0/20	1/21	2/22
Equipment Category	1	✓	✓	✓
	2	✗	✓	✓
	3	✗	✗	✓

Equipment Selection by Group

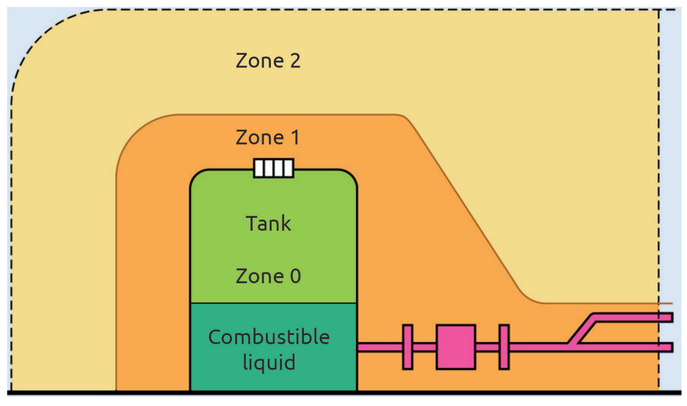
		Gas Area (Location)		
		IIC	IIB	IIA
Equipment Group	IIC	✓	✓	✓
	IIB	✗	✓	✓
	IIA	✗	✗	✓
		Dust Area (Location)		
		IIIC	IIIB	IIIA
	IIIC	✓	✓	✓
	IIIB	✗	✓	✓
	IIIA	✗	✗	✓

Equipment Selection by Temperature Class

		Area					
		T6	T5	T4	T3	T2	T1
Equipment Class	T6	✓	✓	✓	✓	✓	✓
	T5	✗	✓	✓	✓	✓	✓
	T4	✗	✗	✓	✓	✓	✓
	T3	✗	✗	✗	✓	✓	✓
	T2	✗	✗	✗	✗	✓	✓
	T1	✗	✗	✗	✗	✗	✓

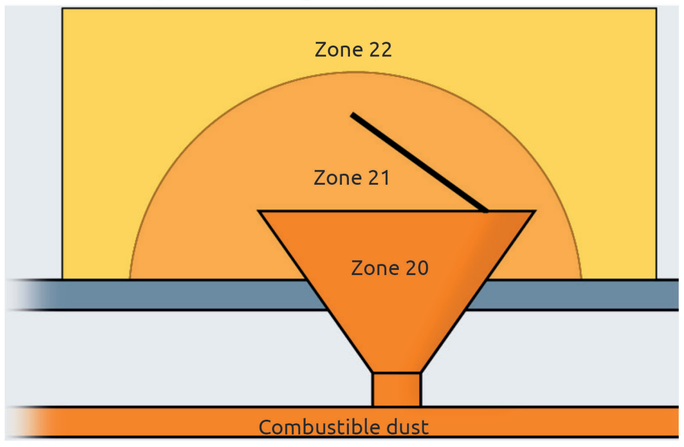
Example of classifi cation of explosive gas atmospheres into zones

Ex gas atmosphere according to IEC/EN 60079-10-1



Example of classifi cation of explosive dust atmospheres into zones

Ex dust atmosphere according to IEC/EN 60079-10-2

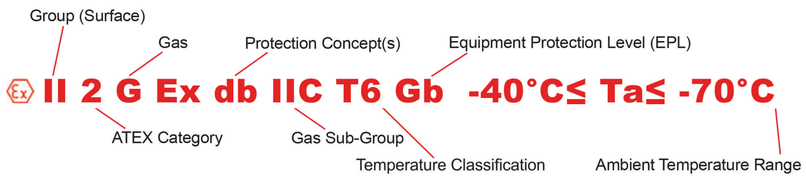


Typical Equipment Marking'

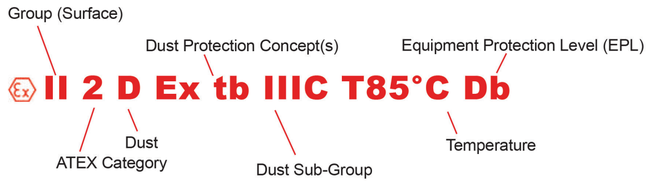
	EU	UK	IECEx	LATAM	Northern America	EAC
Marking	Ex II 2GD	Ex II 2GD	Ex II 2GD	Ex II 2GD		
Standarts Applied Marking	Ex db IIC T6 Gb Ex tb IIIC T85°C Db -40°C ≤ Ta ≤ +70°C	Ex db IIC T6 Gb Ex tb IIIC T85°C Db -40°C ≤ Ta ≤ +70°C	Ex db IIC T6 Gb Ex tb IIIC T85°C Db -40°C ≤ Ta ≤ +70°C	Ex db IIC T6 Gb Ex tb IIIC T85°C Db (-40 °C ≤ Tamb ≤ +70 °C)	Class I, Division 1, Group A, B, C & D Class I, Zone 1, AEx db IIC T6 Gb, Ex db IIC T6 Gb, Zone 21, AEx tb IIIC T85°C Db, Ex tb IIIC T85°C Db	Ex db IIC T6 Gb X Ex tb IIIC T85°C Db X
Conformity Scheme	CE	UKCA	IECEx	INMETRO	UL/CSA	TR CU
Certificate Number	UL 21 ATEX 2656X	UL22UKEX2376X	IECEx ULD 21.0033X	UL-BR 22.0598X	E521536	ЕАЭС RU C-TR.АД07.V.05977/23
Notified Body	ExVeritas - 2804	ExVeritas - 2585	ExVeritas - 2804	UL	UL	VELES - RA.RU. АД07

Marking Explained

Example Marking Gas



Example Marking Dust



Data for Flammable Gases and Vapours (ISO/IEC 80079-20-1:2017)

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 °C	Melting Point °C	Boiling Point °C	Flammable Limits Volume % LEL	Flammable Limits Volume % UEL	Ignition Temperature °C	Maximum Experimental Safe Gap (MESG) mm	Temperature Class	Group	Minimum Ignition Current Ratio
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	
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	T1	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
108-88-3	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