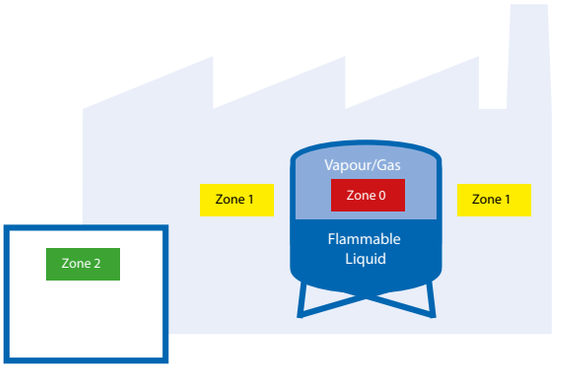
A Guide to

Hazardous Area Classification Systems & Ingress Protection

Flow & Pressure Instrumentation

Typical industries with hazardous areas

Gases and vapours	Dusts
Offshore drilling rigs Oil refineries LNG plants	Chemicals/fertilizers Pharmaceuticals Explosives factories
Chemical plants Sewage treatment plants Distilling	Grain handling/storage Milk powder Flour mills
Paint manufacturers Spray Booths Laboratories	Wood, pulp, paper Recycling operations Fiberglass manufacturing
	Plastics Food manufacturing Metal processing



Zone System

	Zone 0	An area in whitch an exlosive mixture is continously present or present for long periods (>1000 hrs/year)
Dust	Zone 20	
	Zone 1	An area in which an explosive mixture is likely to occur in normal operation conditions (10 - 1000 hrs/year)
Dust	Zone 21	
	Zone 2	An area in which an explosive mixture is not likely to occur in normal operation and if it occurs it will exist only for a short time (<10 hrs/year)
Dust	Zone 22	

Class/Division System

Gas	Class I	Division 1			
Dust	Class II	Division 1			
Gas	~~Class I~~	~~Division 1~~			
Dust	~~Class II~~	~~Division 1~~			
Gas	Class I	Division 2	Fiber	Class III	Division 1
Dust	Class II	Division 1	Fiber	Class III	Division 1

Europe

Examples for Zone, Group

NEC & IEC Zone System Gas & Dust Groups

	Group	Representative Materials
Zone 0, 1 & 2	IIC	Acetylene & Hydrogen (equivalent to NEC Class I, Groups A and B)
	IIB+H2	Hydrogen (equivalent to NEC Class I, Group B)
	IIB	Ethylene (equivalent to NEC Class I, Group C)
	IIA	Propane (equivalent to NEC Class I, Group D)
Zone 20, 21 & 22	IIIC	Conductive dusts, such as magnesium (equivalent to NEC Class II, Group E)
	IIIB	Non-conductive dusts, such as flour, grain, wood & plastic (equivalent to NEC Class I, Groups A and B)
	IIIA	Ignitible fibers/flyings, such as cotton lint, flax & rayon (equivalent to NEC Class III)
	IIIA	Ignitible fibers/flyings, such as cotton lint, flax & rayon (equivalent to NEC Class III)
Mines susceptible to firedamp	I (IEC only)	Methane

North America

Examples for Class, Division, Group

NEC Division System Gas & Dust Groups

Area	Group	Representative Materials
Class I, Division 1 & 2	A	Acetylene
	B	Hydrogen
	C	Ethylene
	D	Propane
Class II, Division 1 & 2	E	Metal dusts, such as magnesium (Division 1 only)
	F	Carbonceous dusts, such as carbon & charcoal
	G	Non-conductive dusts, such as flour, grain, wood & plastic
Class III, Division 1 & 2	None	Ignitible fibers/flyings, such as cotton lint. flax & rayon

BROOKS® INSTRUMENT

Beyond Measure

Equipment Protection Level (EPL)

Group	Ex risk	Zone	EPL	Minimum type of protection
I (mines)	energized		Ma	
II (gas)	explosive atmosphere > 10000 hrs/yr	0	Ga	ia, ma
II (gas)	explosive atmosphere between 10 and 1000 hrs/yr	1	Gb	ib, mb, px, py, d, e, o, q, s
II (gas)	explosive atmosphere between 1 and 10 hrs/yr	2	Gc	n, ic, pz
III (dust)	explosive surface > 1000 hrs/yr	20	Da	ia
III (dust)	explosive surface between 10 and 1000 hrs/yr	21	Db	ib
III (dust)	explosive surface between 1 and 10 hrs/yr	22	Dc	ic

Temperature Classification

USA °C		International (IEC) °C	Germany °C Continuous – Short time
T1 - 450	T3A - 180	T1 - 450	G1: 360 - 400
T2 - 300	T3B - 165	T2 - 300	G2: 240 - 270
T2A - 280	T3C - 160	T3 - 200	G3: 160 - 180
T2B - 260	T4 - 135	T4 - 135	G4: 110 - 125
T2C - 230	T4A - 120	T5 - 100	G5: 80 - 90
T2D - 215	T5 - 100	T6 - 85	
T3 - 200	T6 - 85		

Ingress Protection

Protects against solids		Protects against water	
1	> 50 mm (e.g. hand)	1	drops, verticaly falling
2	> 12,5 mm (e.g. finger)	2	drops, tilted up to 15° from vertical
3	> 2,5 mm (e.g. screwdriver)	3	sprays, tilted up to 60° from vertical
4	> 1 mm (e.g. wire)	4	splashed from all directions
5	dust (limited ingress)	5	jets (limited ingress)
6	dust (tight)	6	heavy seas or powerful jets
		7	immersion up to 1m depth (30 mins.)
		8	immersion under pressure (long periods)

IP66

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