EXPLOSIVE AREAS (ATEX)

94/9 EC (manufacturers)
99/92 EC (users)

AREA CLASSIFICATION

		Explosive atmospheres present continuously, long periods or frequently.	Explosive atmospheres are likely to occur.	Explosive atmospheres are unlikely to occur or present only infrequently and for a short period only
CENELEC / IEC		Zone 0 (Zone 20 - dust)	Zone 1 (Zone 21 - dust)	Zone 2 (Zone 22 - dust)
USA	NEC 505 class I (gas)	Zone 0	Zone 1*	Zone 2
USA	NEC 500 class I (gas) class II (dust) class III (fibers)	Division 1		Division 2

* Equipment which is certified for Class I, Zone 1 can automatically be used in Class I, Division2

MARKING FOR APPARATUS INSTALLED IN Ex AREA

CE 0081* Ex **II 1 G / D** **EEx ia** **II C** **T 6**

MARKING FOR ASSOCIATED APPARATUS (INSTALLATION IN SAFE AREA)

CE 0081* Ex **II (1) G / D** **[EEx ia]** **II C**

* Notified service number to quality evaluation

EQUIPMENT - GROUP I (MINING)

Category M 1	Category M 2
Very high level of protection by means of 2 protective measures / 2 faults.	High level of protection The equipment is intented to be deenergized in the event of an explosive atmosphere.

EQUIPMENT - GROUP II (OTHER EXPLOSIVE ATMOSPHERES)

Category 1*		Category 2*		Category 3*	
Very high level of protection by means of 2 protective measures / 2 faults.		High level of protection frequently occuring equipment faults / 1 fault.		Normal level of protection during normal operation.	
Zone 0	Zone 20	Zone 1	Zone 21	Zone 2	Zone 22
G (gas)	D (dust)	G (gas)	D (dust)	G (gas)	D (dust)
Example of allowed protection method and minimum IP index					
"ia" - IP20	"ia" - IP6x	"ia" - IP20	"ia" - IP6x	"ia" - IP20	"ia" - IP5x(1) ou IP6x(2)
"ded"* - IP55	"ded" - IP6x	"ed" - IP54	"ed" - IP6x	"ed" - IP54	"ed" - IP5x(1) ou IP6x(2)
		"d" - IP45	"d" - IP6x	"d" - IP45	"d" - IP5x(1) ou IP6x(2)

* Double protection.

(1) non-conducting dust
(2) conducting dust.

GAS AND VAPOUR CLASSIFICATION INTO EXPLOSION GROUPS AND TEMPERATURE CLASSES

	T1 450 °C	T2 300 °C	T3 200 °C	T4 135 °C	T5 100 °C	T6 85 °C
I	Methane					
II A	Acetone Ethane Ethylethanoate Ammonia Benzol (pure) Ethanoic acid Carbon oxide Methane Methanol Propane Toluene	Ethanol i-Amyl acetate n-Butane n-Butyl alcohol	Benzine Diesel fuel Aircraft fuel Heating oils n-Hexane	Acetylaldehyde Ethylether		
II B	Coal gas (lighting gas)	Ethylen				
II C	Hydrogen	Acethylen				Carbon disulphide

DUST IGNITION TEMPERATURE

Material	Cloud (°C)	Grain structure (µm)	5 mm layer (°C)
Paper fiber	570	16	335
Coffee grounds	580	290	290
Corn	530	1450	460
Lignite	410	21	270
Wheat	510	37	300
Aluminium	560	<10	430
Polyethylene	440	72	Fusion
Sugar	490	30	480
Charcoal	520	14	320
Cacao	590	20	250
Toner	520	<10	Fusion

Reference : HVBG (november 97)

SAFETY DEGREES OF HOUSING IEC 60529

First number for protection against dangerous access and entraneous elements	index	IP	Index	Second number for protection against water entrance
Non protected	0		0	Non protected
Hand back Solid element ≥ 50 mm	1		1	Vertical water drops
Finger Solid element ≥ 12.5 mm	2		2	Water fall with 15 ° angle
Tool Solid element ≥ 2.5 mm	3		3	Rain with 60 ° angle from vertical
1 mm thread Solid element ≥ 1 mm	4	54	4	Water projections from all directions
1 mm thread Dust	5		5	Water throwes from all directions
1 mm thread Dust, total water tightness	6		6	Powerful water throwes from all directions
			7*	Immersion
			8*	Extended immersion

* IP x8 and IP x7 do not allow IP x6

EQUIVALENCE BETWEEN IP(1) AND NEMA(1) 250 NORMS

IP 10	NEMA 1
IP 11	NEMA 2
IP 14	NEMA 3R
IP 52	NEMA 5-12-12K
IP 54	NEMA 3-3S-13
IP 56	NEMA 4 - 4X
IP 67	NEMA 6 - 6P

(1) The NEMA 7 to 10 norms agree with explosive areas apparatus

(1) International Electric Comitee
(2) National Electrical Manufacturers Association (US)

TYPES OF PROTECTION

Type of protection		Diagram	Main application	Standard
Intrinsic safety	ia or ib		Instrumentation, pressure and temperature switches, pressure and temperature transmitters, remote I/O, sensors, actuators IS barriers (associated apparatus).	EN 50 020 IEC 60 079-11 FM 3610 UL 2279
Increased safety	e		Instrumentation, pressure and temperature switches, control boxes with Ex-components (combining different types of protection).	EN 50 019 IEC 60 079-7 FM 3600 UL 2279
Flameproof enclosure	d		Instrumentation, pressure and temperature switches, temperature transmitters, junction boxes, Remote I/O.	EN 50 018 IEC 60 079-1 FM 3600 UL 2279
Pressurized apparatus	p		Switchgear control cabinets, analysers, large motors.	EN 50 016 IEC 60 079-2 FM 3620 NFPA 496
Oil immersion	o		Transformers, Starting resistors.	EN 50 015 IEC 60 079-6 FM 3600 UL 2279
Powder filling	q		Transformers, capacitors, Terminal boxes for heating conductors.	EN 50 017 IEC 60 079-5 FM 3600 UL 2279
Encapsulation	m		Switchgear for low power, control and display units, sensors.	EN 50 028 IEC 60 079-18 FM 3600 UL 2279
Type of protection n	n	Zone 2 This type of protection includes several methods of ignition protection	All electrical apparatus for Zone 2, lighting equipment, less suitable for switchgear and control gear. Remote I/O systems.	EN 50 021 IEC 60 079-15

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