UNDERSTANDING HAZARDOUS AREA MARKINGS

A hazardous area is one where a fire or explosion hazard may be present, either as an inevitable part of the process or as a consequence of an abnormal condition such as a gas leak. Electrical equipment used in a hazardous area must be designed so that it cannot be a source of ignition through sparks, hot surfaces or discharges of static electricity.

There are two commonly-used methods for classifying hazardous areas. Class and Division are used in the traditional North American system whereas Zones are used in the other parts of the world and, increasingly, in North America. In Canada, all new installations must use the Zone system

Nature of Hazard	Frequency	Rest of World IEC EX, Atex, UK EX	North America NFPA 70 NEC
Gas	Always	Zone 0	Class I Div 1
	Intermittent	Zone 1	
	Abnormal condition	Zone 2	Class I Div 2
Dust	Always	Zone 20	Class II Div 1
	Intermittent	Zone 21	
	Abnormal condition	Zone 22	Class II Div 2

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AMETEK Land products

Gas/Dust Groups (ATEX, IECEx and UKEX)

Group	Environment	Location	Typical Substance
I		Coal Mining	Methane (Firedamp)
IIC	Gases, Vapors and Mists		Hydrogen, Acetylene, etc
IIA			Methane Propane, etc
IIB			Ethylene
IIIC	Combustible Dusts	Surface and Other Locations	Conductive
IIIA			Combustible Flyings
IIIB			Non-Conductive

Equipment Groups, Categories and Protection Levels

Equipment Group	Equipment Category	Atmosphere	Protection Level	Required Performance & Suitability	Zone
I Mines	M1	Methane, Dust	Very High Ma	Two faults. Functions in explosive atmosphere	Very high level of protection for mines
I Mines	M2	Methane, Dust	High Mb	Severe operation. De-energized in explosive atmosphere	High level of protection for mines
II (All Other Areas)	1G 1D	Gas, Vapor, Mist, Dust	Very High Ga Very High Da	Two faults	Zone 0 Zone 20
II (All Other Areas)	2G 2D	Gas, Vapor, Mist, Dust	High Gb High Db	One fault	Zone 1 Zone 21
II (All Other Areas)	3G 3D	Gas, Vapor, Mist, Dust	Low Gc Low Dc	Normal operation	Zone 2 Zone 22

Protection Concepts (partial list)

Type of Protection	EX code	Suitable for Zone	Comments
Intrinsic safety	ia ib ic	0, 20 1, 21 2, 22	Limit energy of sparks and surface temperature
Flame-proof or Explosion-proof	da db dc	0 1 2	Explosion inside enclosure cannot ignite gases outside
Non-sparking	n	2	No arcs, sparks or hot surfaces
Pressurized	px py pz	1, 21 1, 21 2, 22	Enclosure is pressurized with an inert gas to prevent ingress of explosive atmosphere
Dust-protected	ta tb tc	20 21 22	Enclosure does not permit ingress of explosive atmosphere
Optical Radiation	Op is	0, 20	Limitation of optical energy

Temperature Class (T Class)

Temperature Class (T Class)	Autoignition temperature of some gasses
T1: 450 °C	Ammonia (650 °C), Hydrogen (500 °C), Methane (580 °C), Propane (455 °C)
T2: 300 °C	Ethylene (450 °C), Butane (405 °C), Acetylene (305 °C)
T3: 200 °C	Cyclohexane (249 °C), Kerosene (210 °C)
T4: 135 °C	Di-ethyl Ether (180 °C)
T5: 100 °C	
T6: 85 °C	Carbon Disulphide (90 °C)

Marking Explanations

Gas Atmospheres

Ex db	IIC	T6	Gb
Protection Concept	Gas Group	Temperature Class	Equipment Protection Level (EPL)

Dust Atmospheres

Ex tb	IIIC	T85C	Db
Protection Concept	Dust Group	Maximum Surface Temperature	Equipment Protection Level (EPL)

Compliance

Ex	II	2	G	D
Specific Marking for Explosion Protection	Equipment Group	Equipment Category	Environment (G - Gas)	Environment (D - Dust)

CE	UKCA
2813	0518
Complies with European Directive	Complies with UKCA Requirements

Typical Label Set

Ex db IIC T6 Gb
Ex tb IIIC T85C Db
Tamb = -40C TO +70C

Ex II 2 G D
CML 21ATEX11300X
IECEx CML 21.0158X
CML 21UKEX11316X
CE 2813
UKCA 0518

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