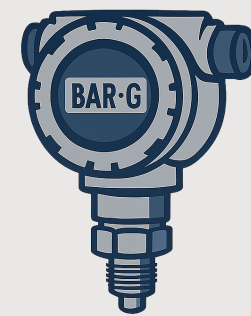


HAZARDOUS AREA CLASSIFICATION



INSTRUNEXUS

The process of identifying and categorizing areas where flammable gases, vapors, or dust may form explosive atmospheres. ensuring the right equipment selection and protection methods to prevent ignition and safeguard people, plant, and assets.

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Zone Definitions (IEC/ATEX)

- **Zone 0** → Explosive gas/vapor present continuously or long periods.
- **Zone 1** → Explosive gas/vapor likely during normal operation.
- **Zone 2** → Explosive gas/vapor unlikely, or if present, short duration.

Dust Zones:

- **Zone 20** → Dust cloud present continuously.
- **Zone 21** → Dust cloud present likely during normal operation.
- **Zone 22** → Dust cloud present occasionally or rarely.

Gas Groups (IEC 60079-0)

- **IIA** → Propane (less severe)
- **IIB** → Ethylene
- **IIC** → Hydrogen, Acetylene (most severe)

Dust Groups:

- **IIIA** → Fibers
- **IIIB** → Non-conductive dust
- **IIIC** → Conductive dust



Equipment Protection Techniques (IEC 60079 series)

EEx d – Flameproof / Explosion-proof (IEC 60079-1)

- Contains explosion inside enclosure.
- Used in motors, junction boxes, switchgear.

Ex e – Increased Safety (IEC 60079-7)

- Prevents arcs/sparks, adds insulation.
- Used in terminal boxes, lighting, motors.

Ex i – Intrinsic Safety (IEC 60079-11)

- Limits energy to prevent ignition.
- Ideal for instrumentation, transmitters, control loops.

Ex p – Pressurization (IEC 60079-2)

- Keeps enclosure under positive pressure.
- Used in analyzer shelters, MCC/DCS cabinets.

Ex m – Encapsulation (IEC 60079-18)

- Components embedded in resin.
- Used in coils, sensors, transformers.

Ex n – Non-Sparking (IEC 60079-15)

- Low-risk equipment, safe in Zone 2.
- Used in lighting, low-power devices.

Temperature Classes (T-Rating)

- **T1** = 450°C
- **T2** = 300°C
- **T3** = 200°C
- **T4** = 135°C
- **T5** = 100°C
- **T6** = 85°C

COMPONENTS OF A HAZARDOUS AREA



NEC Class/Division System (NFPA 70, NEC 500/505)

Classes (Type of Hazard)

- **Class I** → Flammable gases or vapors (Oil & Gas, Petrochemicals).
- **Class II** → Combustible dusts (Grain silos, Coal plants, Chemical powders).
- **Class III** → Easily ignitable fibers/flyings (Textiles, Wood, Paper mills).

Divisions (Probability of Hazard Presence)

- **Division 1** → Hazard present under normal operating conditions.
- **Example:** Inside pump rooms, compressor buildings, fuel handling units.
- **Division 2** → Hazard present only in abnormal conditions (leaks, failures).
- **Example:** Cable trenches, storage areas near vented equipment.

Protection Selection by Zone

- **Zone 0 (Gas)** - Ex ia (Intrinsic Safety, "ia"), Ex ma (Encapsulation), Ex s (Special)
- **Zone 1 (Gas)** - Ex d (Flameproof), Ex e (Increased Safety), Ex ib, Ex p, Ex m
- **Zone 2 (Gas)** - Ex n (Non-sparking), Ex ec (Enhanced Safety), Ex d, Ex e, Ex p
- **Zone 20 (Dust)** - Ex ta (Dust-tight enclosures, IP6X), Ex ma, Ex ia
- **Zone 21 (Dust)** - Ex tb, Ex mb, Ex ib
- **Zone 22 (Dust)** - Ex tc, Ex mc, Ex ic, Ex n

Ingress Protection (IP Ratings per IEC 60529)

- IP54 → Dust-protected, splash water.
- IP65 → Dust-tight, water jets.
- IP66 → Dust-tight, powerful jets.
- IP67 → Dust-tight, temporary immersion.
- IP68 → Dust-tight, continuous immersion.

Equipment Marking (IEC/ATEX):

Ex d IIB T4 Gb IP66

- Ex d = Flameproof
- IIB = Gas Group
- T4 = Max 135°C surface temp
- Gb = Equipment Protection Level (suitable for Zone 1)
- IP66 = Dust-tight, protected from water jets

Equipment Marking (NEC):

Class I, Division 1, Groups B, C, D, T4

- Class I → Gases/Vapors
- Division 1 → Hazard present in normal operation
- Groups B, C, D → Hydrogen, Ethylene, Propane atmospheres
- T4 → Max surface temp 135°C

