



Precision Digital Presents

# Hazardous Area Classifications

# Webinar Organizers



Joe Ryan

Product Manager

Precision Digital  
Corporation



Ryan Shea

Applications Specialist

Precision Digital  
Corporation



Bruce McDuffee

Webinar Moderator

Precision Digital  
Corporation

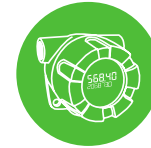
## Objectives & Takeaways



Learn the basics of why and how hazardous areas are labeled and classified



Learn how to breakdown the alphabet soup of labels, markings, agencies and regulations



Put it all together with an analysis of 2 real world labels

## Agenda

1

Why classify an area as hazardous

2

Definition of a Hazardous Location

3

Classification – Div, Area, Class

4

Markings and Specifications

5

Methods of protection

## Getting to know you

- Where are you located?
- What is your industry?
- What is your level of expertise?



## Why Classify an Area as Hazardous



Potential for an  
explosion

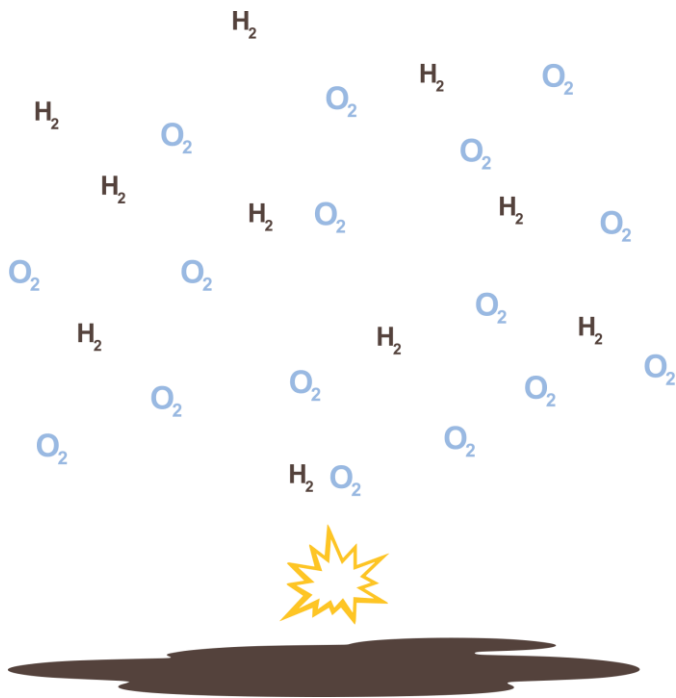


Safety of personnel



Property damage

# Elements Necessary for an Explosion



Ignition source  
(spark, high heat, open flame, etc.)



Oxidizer  
(usually the Oxygen in air)



Flammable substance

- Flammable gas, i.e. Hydrogen
- Flammable liquid or vapor, i.e. gasoline, acetone, kerosene
- Flammable solids, i.e. dust, fibers, etc.

## Typical Locations where explosions occur



Paint shops



Corn or flour mills



Refineries



Chemical plants



Liquid Transfer Terminals



Tanks



## 3 ways to prevent the explosion



- Contain the explosion with explosion proof devices and enclosures
- Remove the possibility of a spark or other potential source of ignition.
- Isolate the explosive substance

## Regulations, guidelines & laws

- OSHA
- National Electrical Code NEC (US)
- Canadian Electrical Code CEC (CA)
- National Fire Protection Association NFPA
- Insurance requirements





Certifying Agencies

## North American Agencies



- **Factory Mutual (FM)**
  - Private insurance organization
  - Popular US industry standard
  - Tests products for approval
- **Underwriters Laboratories (UL)**
  - Private standards testing organization
  - Popular US industry standard
  - Tests products for approval
  - CSA inter-agency agreements
- **Canadian Standards Association (CSA)**
  - Government -driven organization
  - Tests products for approval
  - Recently purchased SIRA for global reach
  - UL inter-agency agreements

## Outside North America



- **ATEX (Appareils destinés à être utilisés en Atmosphères Explosives)**
  - European Union (EU) and other worldwide countries
  - Set of harmonized standards
  - Testing performed by Notified Bodies
  - What ATEX means to US companies
    - Applicable to international business/companies
- **IEC (International Electrotechnical Commission)**
  - HQ Geneva
  - European Union (EU) and other worldwide countries
  - Competitor to ATEX
  - Testing performed by Notified Bodies
  - What IEC means to US companies
  - Applicable to international business/companies

## Getting to know you

- What is your primary application?



## Questions?

- Please enter your questions in the 'Questions' window



# Hazardous area ratings



Area classifications



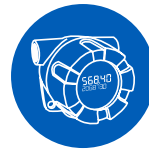
Division and/or zone



Equipment group



Temperature class



Protection concepts  
(application area and  
standard)



NEMA/IP Codes



## Class definition



### Class I

Areas where flammable vapors or gases may be present

#### Typical Environments

- Oil refinery
- Paint shops
- Offshore oil Rig



### Class II

Areas where combustible dust may be present

#### Typical Environments

- Coal mine
- Grain silo
- Hay storage



### Class III

Areas where ignitable fibers or flying debris may be present

#### Typical Environments

- Paper mill
- Textile mill
- Woodworking facility

## Area classification guidelines

- Classifications describe the frequency of the presence of combustible gasses and dusts within the hazardous area
- Area Classifications Include
  - Divisions
  - Zones – More detailed than Divisions, including different classifications for gasses and dusts



## Divisions (or Zones)

- **Division 1**  
Hazardous or ignitable substance present or expected to be present for long periods of time under normal operating conditions.
- **Division 2**  
Hazardous or ignitable substance only present under abnormal conditions (i.e. leaks)
- **Zones**  
Are newer (late 1990's) classifications to North America, based on more international standards.



## Gas and dust area classifications

Flammable Material	Present Continuously	Present Intermittently	Present Abnormally
<b>IEC / EU</b>	Zone 0	Zone 1	Zone 2
<b>US NEC 505</b>	Zone 0	Zone 1	Zone 2
<b>US NEC500</b>	Division 1		Division 2
<b>CA CEC Section 18</b>	Zone 0	Zone 1	Zone 2
<b>CEC Annex J</b>	Division 1		Division 2

IEC classification per IEC 60079-10

EU classification per EN 60079-10

US classification per ANSI/NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 505

Reprinted from Guide to Hazardous Locations, CA classification per CSAC22.1 Candian Electrical Code (CEC) Section 18 or Annex J

Explosive Gas Atmospheres, FM Approvals, © 2008

Combustible Dust	Present Continuously	Present Intermittently	Present Abnormally
<b>IEC / EU</b>	Zone 20	Zone 21	Zone 22
<b>US NEC 505</b>	Zone 20	Zone 21	Zone 22
<b>US NEC500</b>	Division 1		Division 2
<b>CA CEC Section 18</b>	Division 1		Division 2

US classification per ANSI/NFPA 70 National Electrical Code® (NEC®) Article 500 or Article 506

CA classification per CSAC22.1 Candian Electrical Code (CEC) Section 18 or Annex J

EU classification per EN 61241-10

Reprinted from Guide to Hazardous Locations, IEC classification per IEC 61241-10

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## Groups – traditional U.S. and Canada



### **US NEC® 500 or CA CEC Annex J Groups**

- Group A – Acetylene
- Group B – Hydrogen, Butadiene, Ethylene Oxide, Propylene Oxide
- Group C – Ethylene, Cyclopropane, Ethyl Ether
- Group D – Propane, Acetone, Ammonia, Benzene, Butane, Ethanol, Gasoline, Methanol, Natural Gas

## Groups - international



### **US NEC® 505 or CA CEC Section 18, EU, IEC**

- Group IIC – Acetylene
- Group IIB + H<sub>2</sub> – Hydrogen
- Group IIB – Ethylene
- Group IIA – Propane
- Group I - Methane

## Temperature class

- Maximum ambient surface (under dust) temperature the device can reach.
- Rated to prevent combustion
- Varies based on the internal heating elements of the device
- Examples:
  - T1: 450 °C
  - T3: 200 °C
  - T4: 135 °C
  - T6: 85 °C

Note: Traditional US and Canadian systems may include T2A, T2B, T3C, etc. for more precise temperature ratings.



## Protection concepts

- Protection concepts and example protection concepts include:
  - No arcs, sparks, or hot surfaces
    - Increased Safety, Non-Incendive)
  - Containing the explosion and extinguishing the flame
    - Explosion-proof, flame-proof, powder-filled
  - Limiting energy of spaces and surface temps
    - Intrinsically Safe
  - Keeping flammable materials out
    - Pressurized, encapsulation, oil emersion, fiber & flying protection, protection by enclosure
- Markings such as AEXd (Flameproof C1 Z1) and Ex ia (I.S. CI Z0)





## Common NEMA/IP codes



- NEMA – Generally accepted in North America
- Ingress Protection (IP) Code – Generally accepted worldwide
- Both indicate physical protections against water and material ingress, but are slightly different. Not harmonized, and no exact cross-over is possible.
- Most often, NEMA is used for protection against water and corrosion
- Additional NEMA classifications can include hazardous area protections, NEMA 7, 8, 9, 10

## NEMA/IP environmental codes

### **NEMA 4**

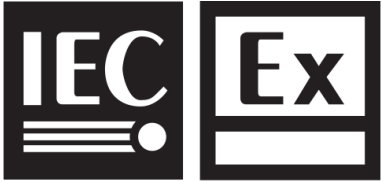
Indoor/outdoor protection to personnel against access to hazardous parts, protected against solid foreign objects (falling dirt, blown dust, etc.), ice, and hose-directed water.

### **NEMA 4X**

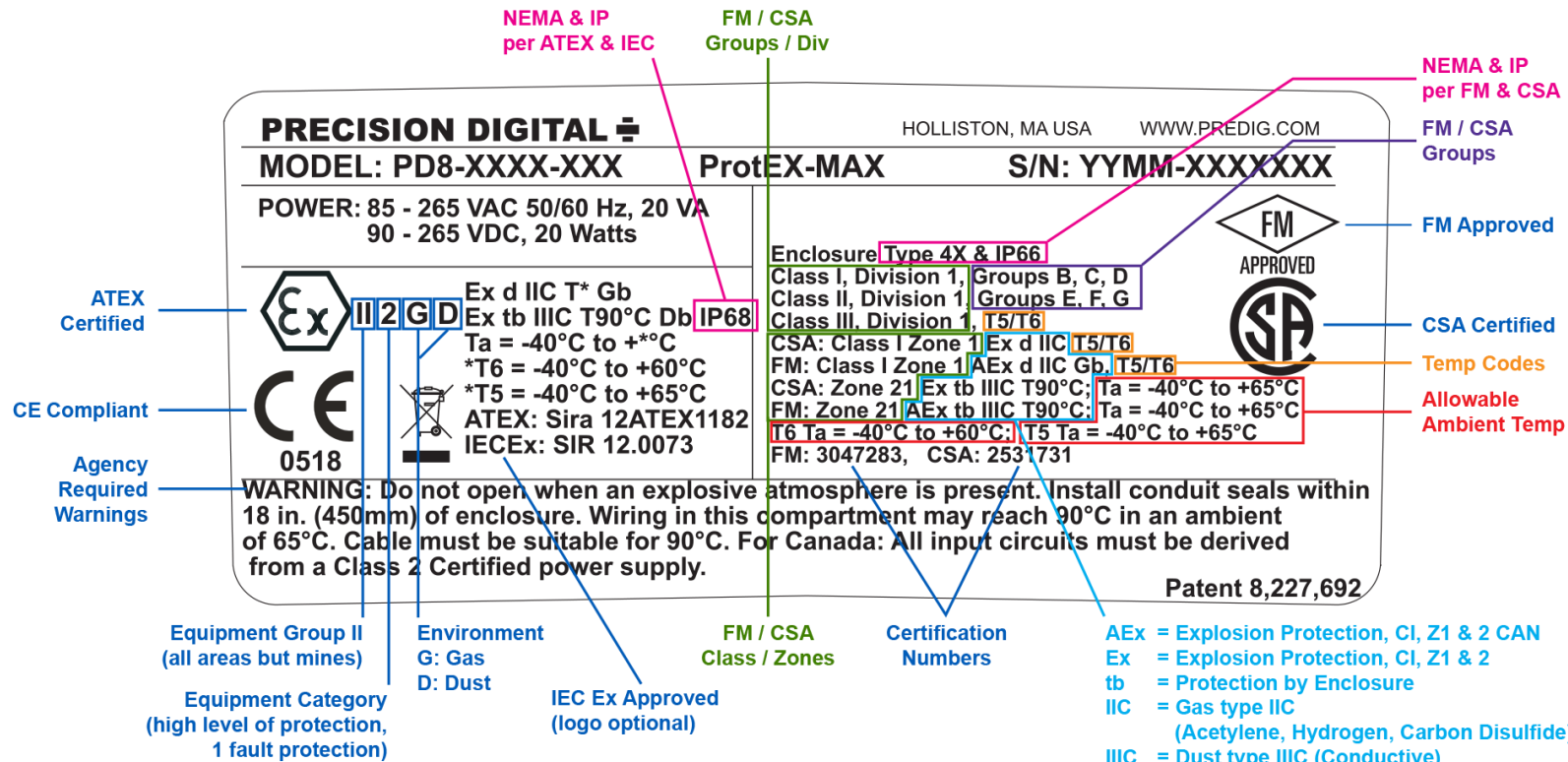
Similar to NEMA 4, with the addition of corrosion resistance.

- IP 55: Protection against dust and liquid such as water jets.
- IP 65: Dust-tight and protected against water jets.
- IP 66: Dust-tight and protected against powerful water jets and high seas.

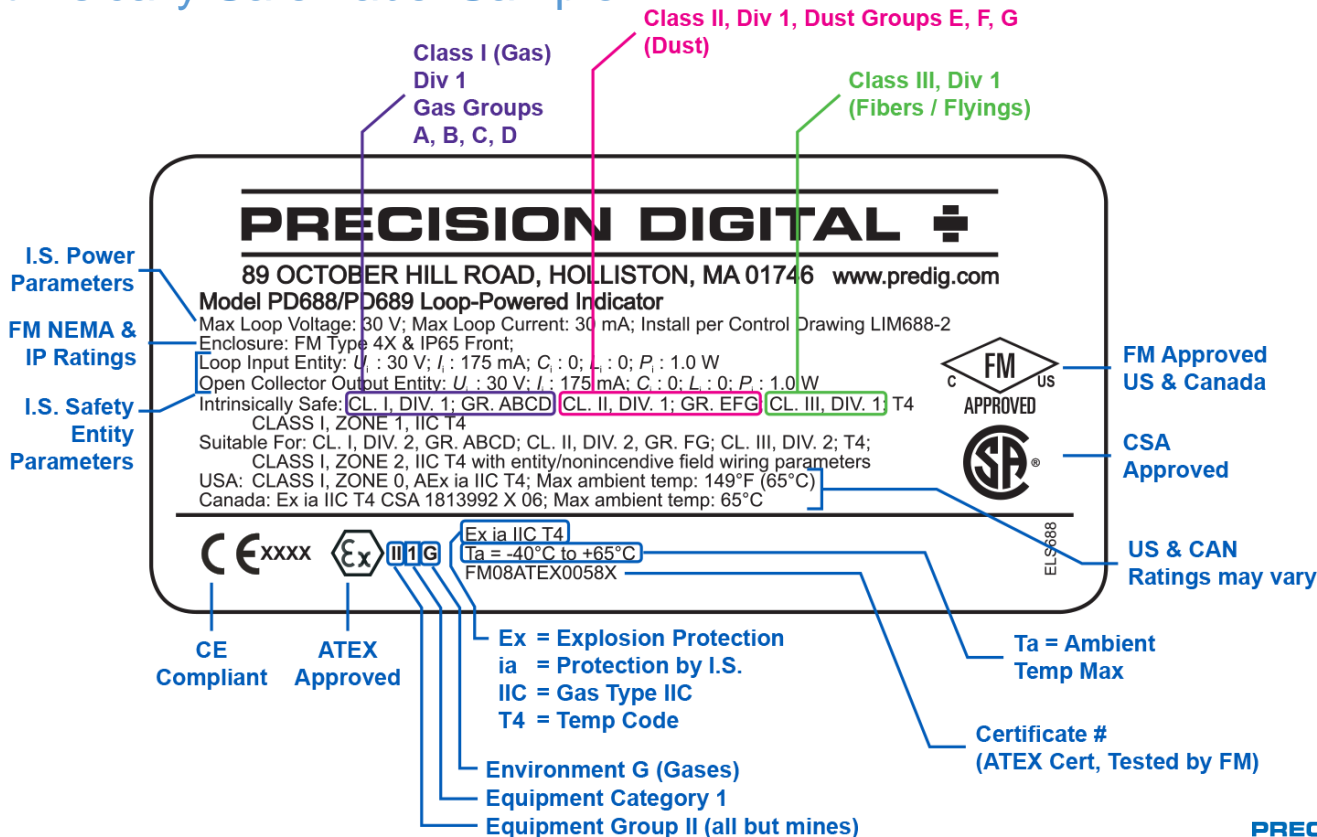
# Marking, symbols & specifications



# Explosion-Proof Label Sample



# Intrinsically Safe Label Sample



## Summary

1

Why classify an area as hazardous

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Methods of protection

For more information, contact your local Agency representative.

Posters, pamphlets, and other documentation is available to demystify the approvals.

## Getting to know you

- How often do you specify digital displays?



## Q & A

- Please enter your questions in the 'Questions' window
- Apologies if we do not get to your question today. We'll contact you offline with a response as soon as possible.





## Next Webinar – March 24

### Reducing Signal Noise

- Signal noise is an all too common complaint in industrial environments. In this webinar we'll discuss the problem behind high noise signals, best practices you can employ to reduce signal noise and show a couple of real life examples where signal noise is typically a big problem and how the noise problem is mitigated.



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- Explosion-Proof Instruments
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- And more



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thank you