



CONTAINERIZED
AND INDUSTRIAL
HYDROGEN
ELECTROLYZERS

**HYDROGEN
PROCESS
FACILITIES**



**Fire and Gas
Safety Suppression
System Solutions for
Hydrogen Electrolyzers
and Process Facilities**

Hazard Mitigation

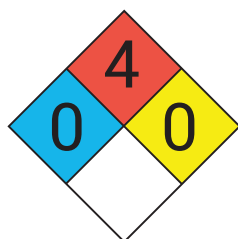
Hydrogen is the fuel of choice for the energy revolution. While it's better for the environment than its hydrocarbon fuel counterparts, the fire hazards remain. Det-Tronics can help you fulfill your hydrogen gas and fire safety system requirements.

Hydrogen

CAS RN: 1333-74-0

NFPA Hazard Classification

Hydrogen



Complete solution must:

- Provide reliable detection and releasing under varying environmental factors
- Include detectors that are appropriate for the application
- Provide immunity to false alarm sources
- Be tolerant to electromagnetic and radio frequency interference
- Integrate detection, extinguishant releasing and notification functionality
- Automatically initiate corrective action, including engaging the emergency shutdown system
- Aim detection equipment for optimum coverage
- Use a performance-based design that adheres to codes and standards

Hydrogen Flames

- Hydrogen fire is a pale blue color and is largely invisible to the human eye in daylight conditions
- A pure hydrogen fire produces no smoke and very little radiant heat, so human senses are unreliable as flame detectors



Hydrogen



Hydrocarbon A



Hydrocarbon B

No ambient light

Hydrogen Gas

- Hydrogen-air mixtures can ignite with 1/10th the energy of igniting gasoline-air mixtures
- It is hard to tell if there is a hydrogen leak because hydrogen has no intrinsic odor
- Hydrogen is approximately 14 times lighter than air and there are no known odorants that are light enough to diffuse at the same rate as hydrogen
- If a leak occurred in a confined space with poor ventilation, the hydrogen concentration could easily reach the lower flammability limit of 4%
- Hydrogen has a very wide ignition range - 4% to 74% in air
- Ignitions are very energetic with an exceedingly low ignition energy
- If hydrogen collects under a roof or overhang, it could quickly form an explosion hazard
- A leak outdoors will tend to rise quickly and simply diffuse
- The small hydrogen molecule size increases the risk for leaks however environmental factors and leak direction will have significant impact on any cloud formation or dispersion



Appropriate detectors to detect hydrogen fire and gas leaks

Traditional hydrocarbon flame and gas detection devices are not suitable for hydrogen risk. In these applications, it's important to consider the benefits and limitations of alternative technologies available.

Hydrogen gas leaks:

- Catalytic Bead sensing technology preferred for %LFL/LEL detection
- Electrochemical sensing technology preferred for parts per million (ppm) detection
- Acoustic Gas Leak Detection technology provides an additional layer of protection
 - This technology is typically used to augment direct detection methods
- **Note:** Infrared (IR) gas detection technology cannot presently detect hydrogen gas

Hydrogen fires:

- Multispectrum infrared (MIR) flame detection – hydrogen version
- Ultraviolet flame detection
- **Note:** Many conventional Infrared (IR) flame detection technology products cannot detect hydrogen flames
- MIR flame detectors provide an increased detection range and field of view compared to ultraviolet flame detection technology



Control system and releasing capability

Listed and third-party approved gas and fire detection panels with suppression releasing capabilities provide code-compliant solutions to complete the protection system.



Meeting and exceeding industry requirements

Protecting hydrogen installations requires high-performance flame and gas detection, suppression and notification systems. Det-Tronics understands what is needed to meet and exceed the requirements of the Authorities Having Jurisdiction (AHJ). In every application, there are applicable standards:

- NFPA2 – Hydrogen Technologies Code
- ANSI/ISA FM 3260 – Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling
- FM3010 – Fire Alarm Signaling Systems
- IEC61508 – Functional safety of electrical/electronic/programmable electronic safety-related systems
- IEC60079 – Electrical apparatus for explosive atmospheres

Det-Tronics will:

- Clarify detection system requirements
- Help to guide detector selection and placement against a defined safety case to meet desired performance for your safety system
- Design system architecture and capability to meet the needs of your facility
- Provide wiring diagrams and Cause-and-Effect logic to ensure clarity of system performance
- Navigate code requirements and application complexities to achieve desired results



Det-Tronics has been committed to helping protect people and property in high-risk environments globally with reliable flame and gas detection systems that have been delivering unparalleled reliability for the last five decades. We have the necessary skills, technology, and experience to help you navigate the risks in the growing market in hydrogen production, storage, and transportation.

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