



# Honeywell Gas Detection

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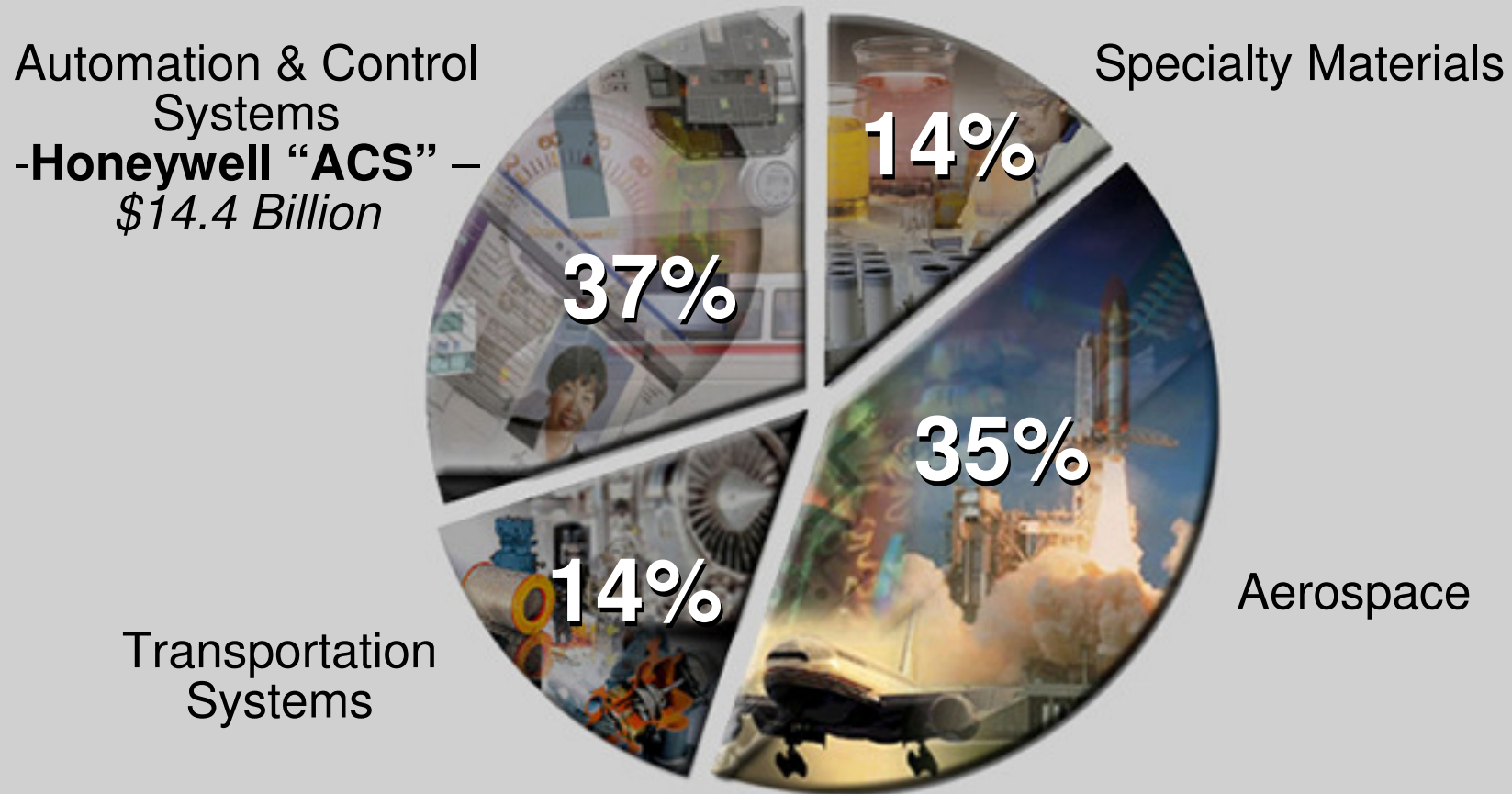
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**Honeywell**

24 September 2009 VIK

- A Fortune 100 company – \$37 billion in '08 estimated sales
- 125,000 employees in more than 100+ countries
- One of 30 select Dow Jones industrial companies



**Honeywell**

## Profile

**\$9.5B Revenue**

**More than 45,000 Employees**

## Strengths

- Large installed base
- Local customer relationships
- All are industry leaders
- Many diverse channels... OEM, retail, trade, consumer
- Key technologies drive growth

### Process Solutions

**\$1.8B**

Process Controls



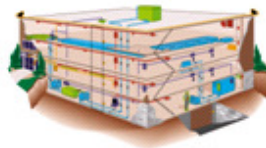
Distributed Control



### Building Solutions

**\$1.9B**

Buildings



Instant Alert



### Sensing and Control

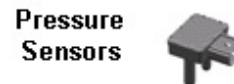
**\$0.8B**



Speed and Position Sensors



Accelerometers



Pressure Sensors



### ECC

**\$2.1B**



Thermostats



Building Automation



Water Control

Gas Valves



### Security

**\$1.8B**

Motion / Human Presence Sensors



CCTV/ DVR User Interfaces



Control Systems



### Life Safety

**\$1.1B**

Fire/Smoke Sensors



System Panels



Home Medical Care



Gas Detection



***A leader in key segments ... Where technology wins***

2008: \$2.5B Sales

~ 11,000 Employees

Fire Control  
Systems  
~35%



Sensors and  
Actuating  
Devices  
~15%



Gas Detection  
Systems  
~20%



Safety  
Products  
~30%



Honeywell  
HomMed  
~1%



- Global Scope: Systems and Sensors
- Multi Brand and Channel Presence
- History of Exciting New Products
- Leading Smoke and Gas Technology

- Strong Dealer Partnerships
- Lowest Total Cost Solution, Global Mfg / Distribution, Productivity Culture
- Safety Products Strong Portfolio Extension
- Long-Term Track Record of Growth

***Top Performing Business In Growing Industries***

## Honeywell Gas Detection EMEA Profile 2009

### Profile:

**560 Employees**

### Strengths:

- Mature portfolio serving diverse markets
- Excellence in flam/toxic gas detection
- Record of innovation, inventors of core technologies, proven track record
- Dedicated to acting upon the 'voice of the customer'; product development, sales, service, quality & reliability
- Excellent brand names/reputation
- Locally focused with global mindset
- Strong customer relationships enabling value capture via 'high & early' sales
- Able to leverage low cost country supply but maintain highest quality standards
- Leaders in SwissCo implementation

### Customers, Products by Lines of Business:

| Oil & Gas   | Semi/Hi-Tech  | Industrial  | Commercial   | Consumer  | Portable  | Service   |
|---|---|---|--|---|---|---|
|  |  |  |  |  |  |  |
| Oil & Gas<br>Exploration<br>Production<br>Distribution                              | Semiconductor<br>R&D/Laboratories<br>Aerospace<br>Foaming                           | Petrochemical<br>Utilities<br>Manufacturing   | Building Aut'n<br>Car Parks<br>Plant Rooms<br>HVAC/IAQ                               | Residential<br>Specifier<br>Recreational<br>Security                                  | Confined Space<br>(Reg. Compliance)<br>Operational<br>(Safe Practice)                 | Workshop (RTB)<br>Field Operations<br>Contract Services                               |

## What does Honeywell Gas Detection do ?

“We design & manufacture gas detection equipment to protect plant & personnel from flammable and toxic gas hazards.”

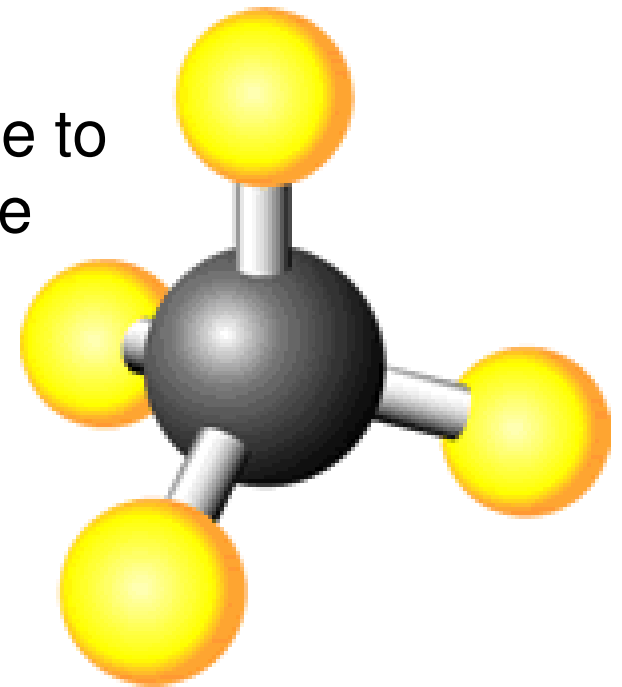
“The equipment is used in homes, commercial property, manufacturing and the oil & gas industry. It can be portable or a hard wired system”

1. Gas detectie - Basisbegrippen
2. Gas detectie sensor technologieën
3. Sensor plaatsbepaling
4. SIL in gasdetectie
5. Calibratie en onderhoud
6. ATEX

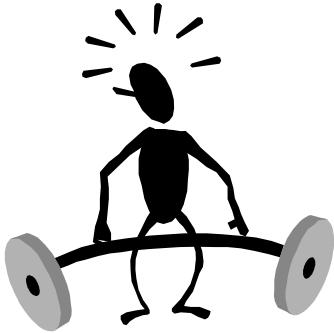
# 1 Gas detection basics

## What is Gas?

- The name gas comes from the word chaos
- Gas is a swarm of molecules moving randomly and chaotically; constantly colliding with each other and anything else around it.
- Gases fill any available volume and due to the very high speed at which they move will mix rapidly into any atmosphere in which they are released



## What is Gas?



**Gases can be lighter, heavier or about the same density as air**



**Gases can have an odour or be odourless**



**Gases can have colour or be colourless**

## The 3 types of gas hazards

1.



Flammable

- Risk of fire and or explosion,  
e.g. Methane, Butane, Propane

2.



Toxic

- Risk of poisoning,  
e.g. Carbon Monoxide, Hydrogen Sulfide, Chlorine

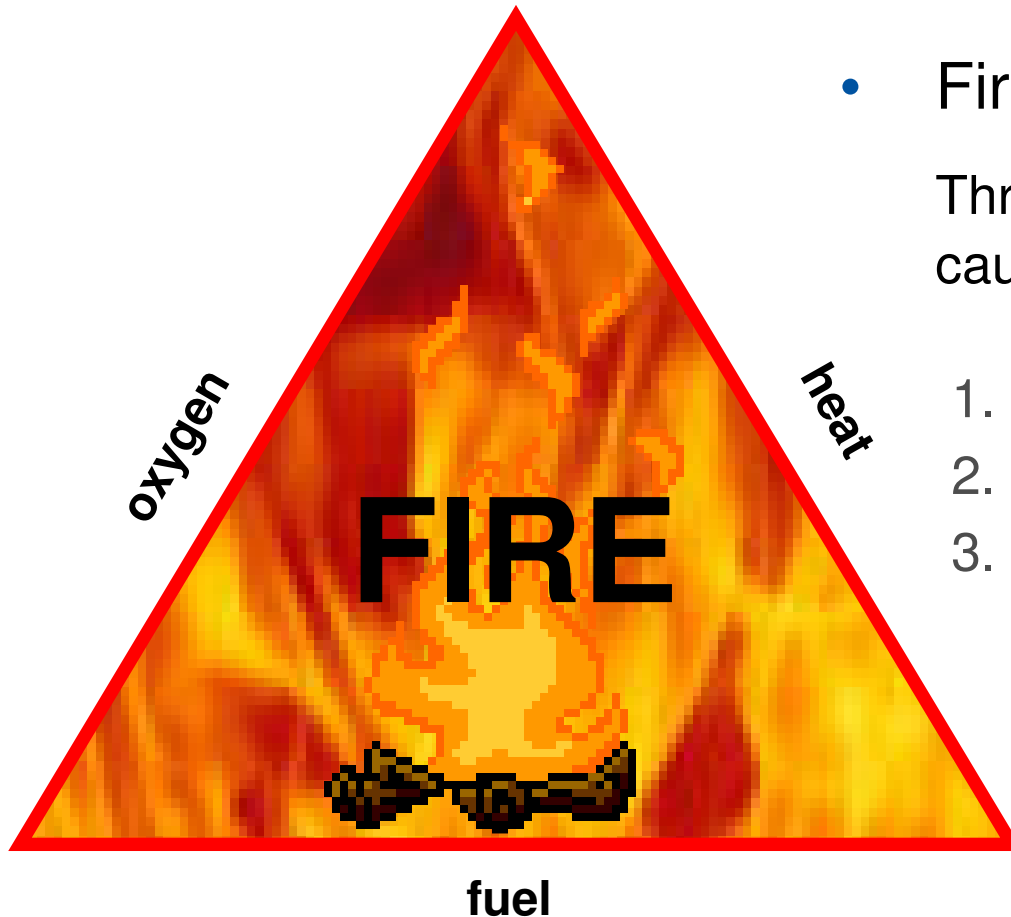
3.



Asphyxiant

- Risk of suffocation,  
e.g. Oxygen deficiency, Nitrogen

## Flammable Risk



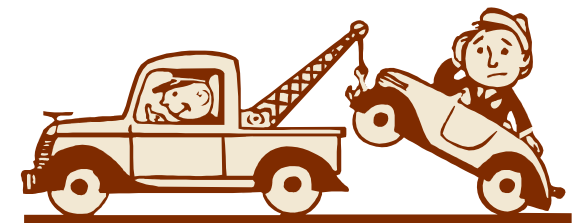
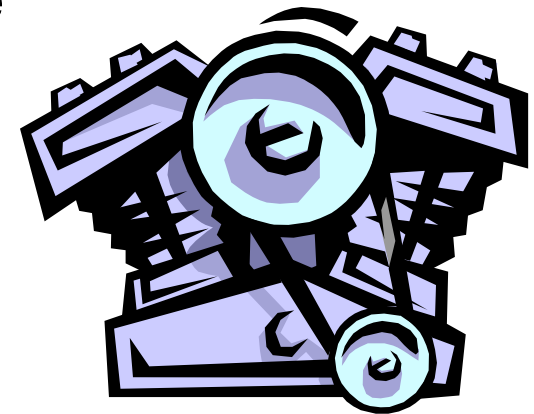
- Fire Triangle

Three factors are always needed to cause combustion:

1. A source of ignition
2. Oxygen
3. Fuel in the form of a gas or vapour

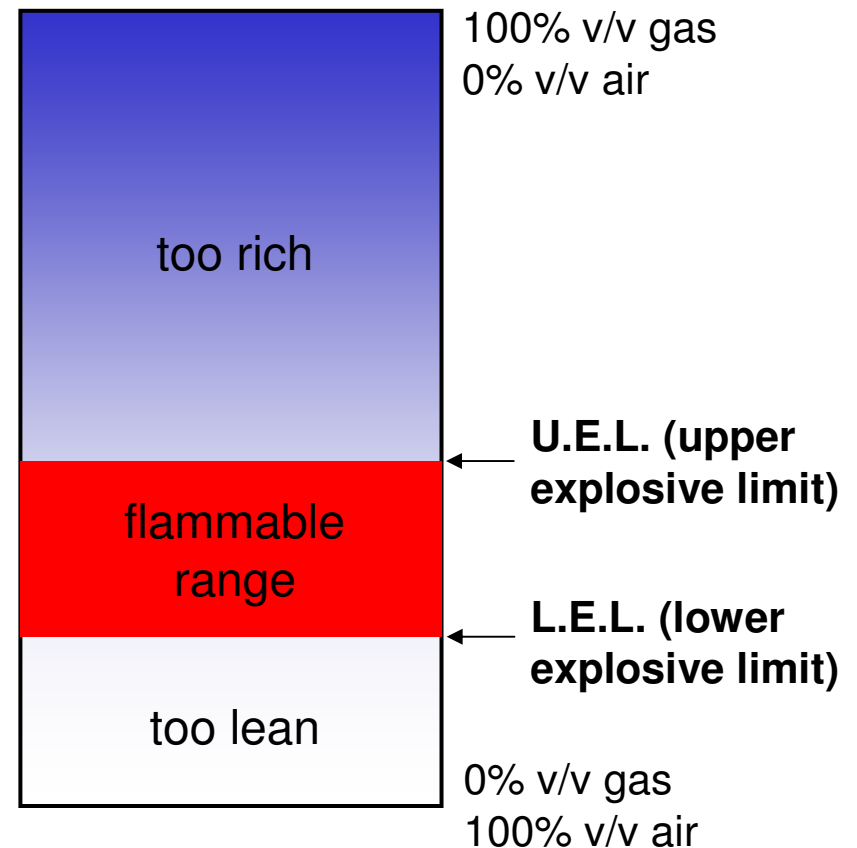
## Flammable Risk

- This can be demonstrated by taking the example of an original type car combustion engine
- The spark plug supplies the ignition source, the fuel is compressed into a vapour and the choke adjusts the amount of oxygen available.
- The engine will not run if there is no spark from the plug or if there is no fuel.
- It will also not run if the air/fuel mixture controlled by the choke is either too lean or too rich



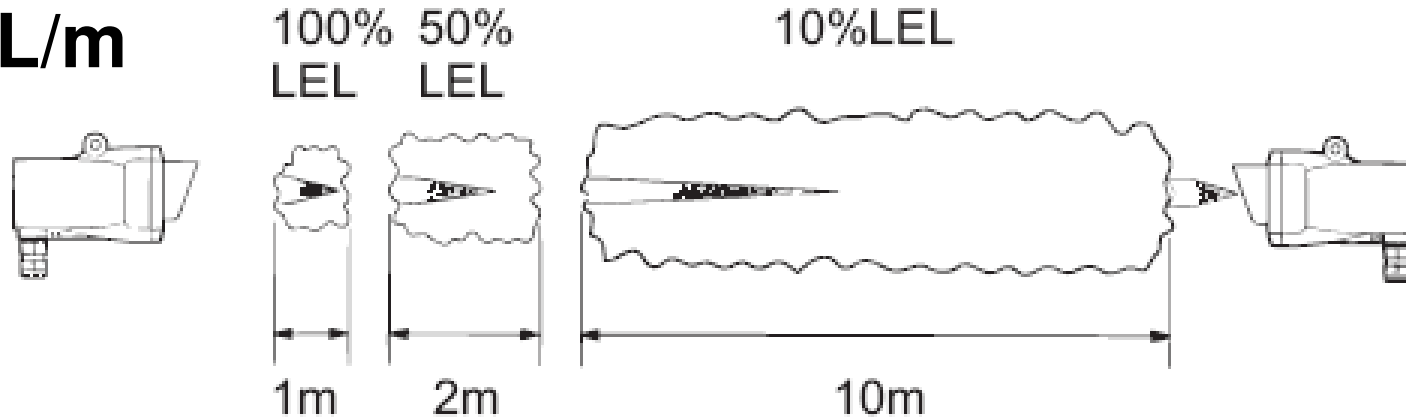
# Flammable Risk

- The operation of a car's choke illustrates an important part of flammable gas hazards
- All flammable gases are only ignitable over their flammable range
- Flammable gases tend to be measured in percentage of their explosive Limit (%LEL)



# Flammable Risk Open Path Detectors

**LEL/m**



**LEL/m = Lower Explosive Limit per metre.**

Open path detectors measure the amount of gas present in the beam. Does not differentiate between a low concentration gas cloud over a large area or a high concentration gas cloud in a small area.

# Flash Point

- Flash Point (F.P. °C)
  - The flash point of a flammable liquid is the lowest temperature at which the surface of the liquid emits sufficient vapour to be ignited by a small flame.
  - Don't confuse with Ignition Temperature as the two can be very different:

| Gas / Vapour | Flash Point °C | Ignition Temp. °C |
|--------------|----------------|-------------------|
| Methane      | <-200          | 595               |
| Kerosene     | 38             | 210               |
| Bitumen      | 270            | 310               |

## Ignition Temperature

- **Flammable gases also have a temperature where ignition will take place, even without an external ignition source such as a spark or flame**
- **This temperature is called the Ignition Temperature**
- **Apparatus for use in a hazardous area must not have a surface temperature that exceeds the ignition temperature**
- **Apparatus is therefore marked with a maximum surface temperature or T rating**



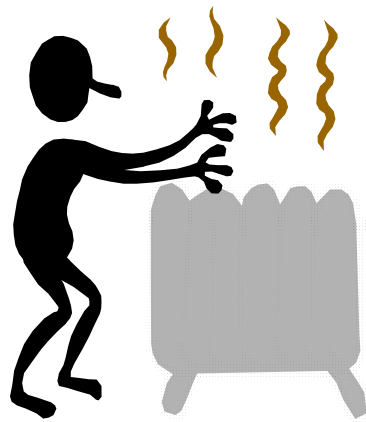
## Toxic Risk



- Some gases are poisonous and can be dangerous to life at very low concentrations.
- Some toxic gases have strong smells like the distinctive 'rotten eggs' smell of  $H_2S$  !
- Others are completely odourless like Carbon Monoxide

## Toxic Risks

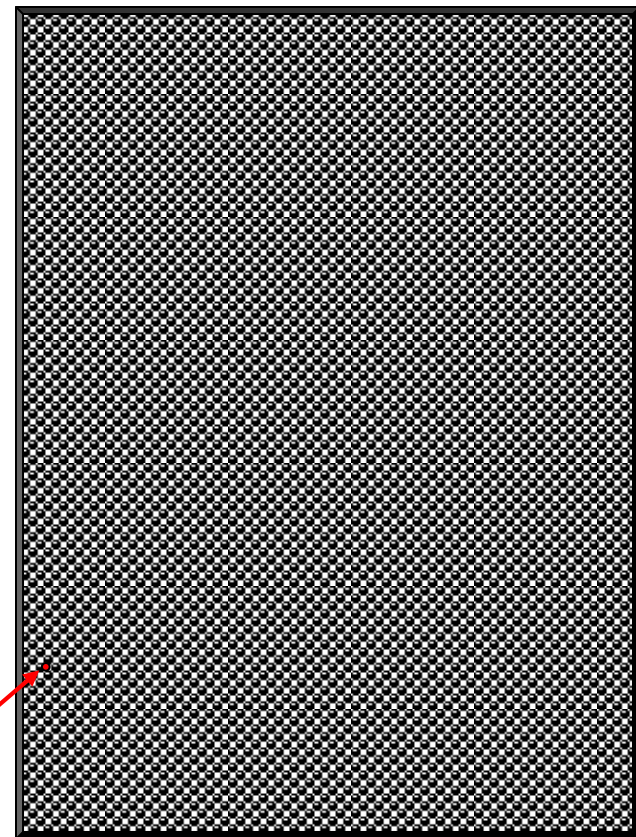
- A toxic gas that is a risk in the home is CO.
- CO is a product of the burning of the natural gas used in heating systems.
- Badly maintained hot water gas boilers can give off dangerous levels of CO.



## General Definition PPM

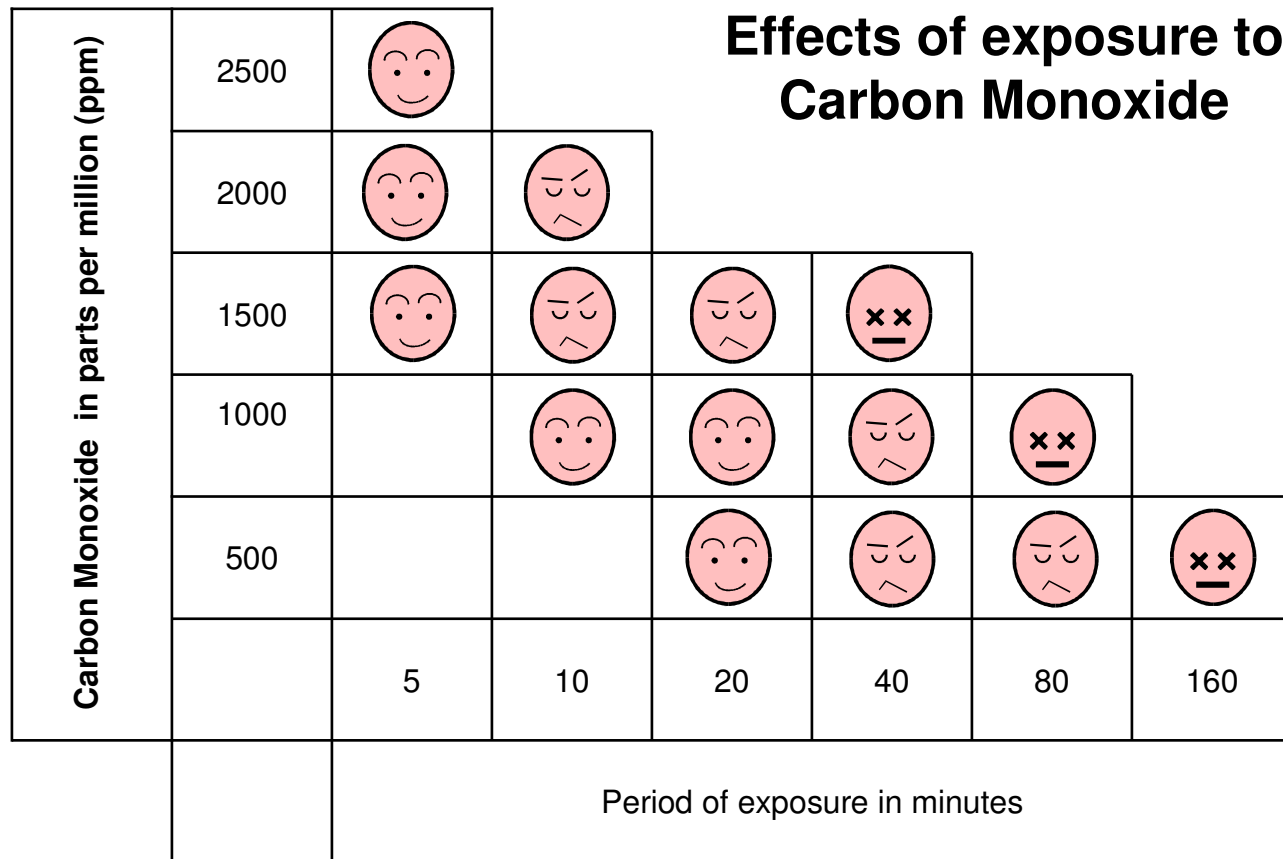
- The measurement most often used for the concentration of toxic gases is **parts per million (ppm)**.
- Example:  
1ppm would be equivalent to a room filled with a total of 1 million balls and 1 of those balls being red.  
The red ball would represent 1ppm.

1 million balls



1 red ball

# Toxic Risk



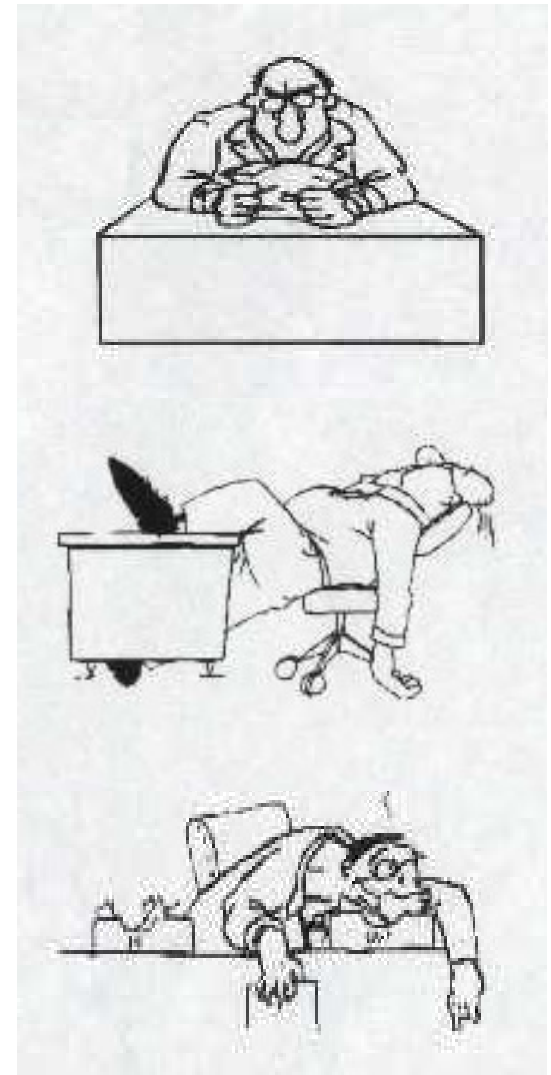
## Toxic gas limits & terminology



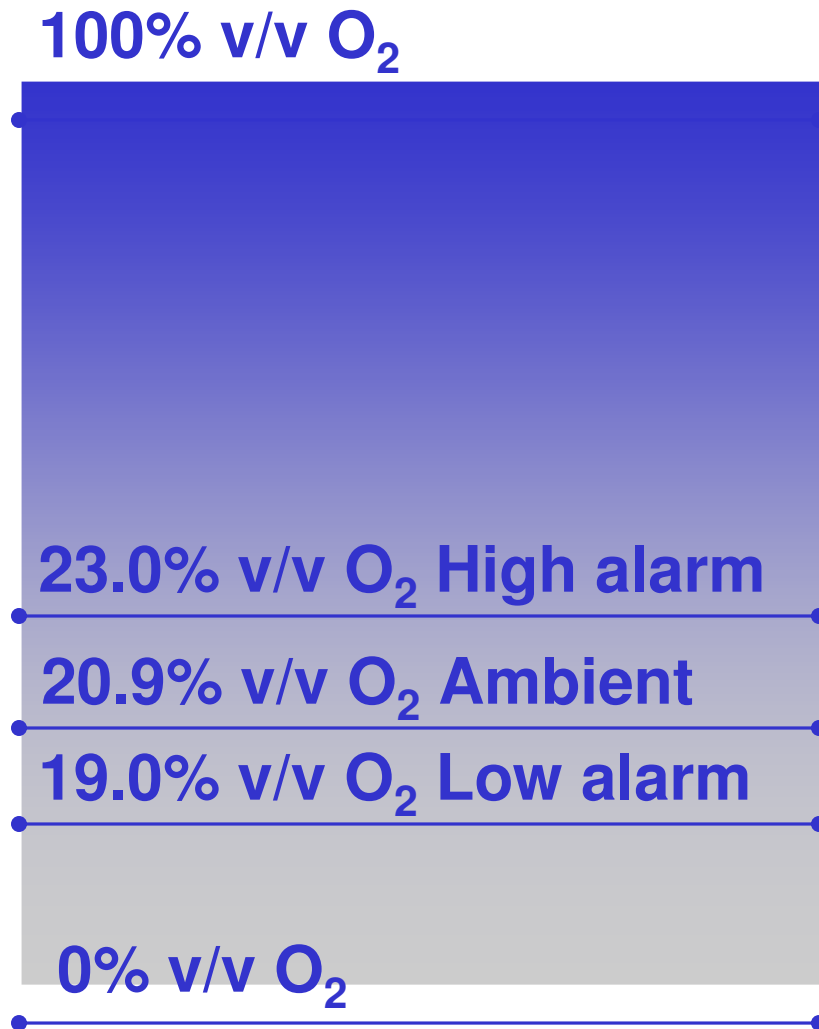
- Time Weighted Average (TWA)
  - Toxic gas limits related to concentration & time
- Short Term Exposure Limit (STEL)
  - The maximum allowable concentration over 15 minutes.
- Long Term Exposure Limit (LTEL)
  - The maximum allowable concentration over an 8 hour period.
- Units of measure
  - Parts per million (ppm)
  - Milligrams per cubic metre (mg/m<sup>3</sup>)
- Levels
  - COSHH
  - OSHA, NIOSH

## Asphyxiant (oxygen deficiency) Risk

- We all need to breathe the oxygen ( $O_2$ ) in air to live.
- Normal ambient air contains an oxygen concentration of 20.9% v/v.
- When the oxygen level dips below 19.5% v/v, the air is considered oxygen-deficient.
- Oxygen concentrations below 16% v/v are considered unsafe for humans.



# Asphyxiant gas limits



- Oxygen, Nitrogen
- Not flammable or toxic
- < 6% v/v O<sub>2</sub> Instantly FATAL
- O<sub>2</sub> depletion caused by:
  - Displacement
  - Combustion
  - Oxidation
  - Chemical reaction



## Oxygen Enrichment



- Oxygen enrichment can also cause a risk.
- At increased O<sub>2</sub> levels the flammability of materials and gases increases.
- At levels of 24% items such as clothing can spontaneously combust.
- Oxyacetylene welding equipment combines oxygen and acetylene gas to produce an extremely high temperature.
- Leaks from the O<sub>2</sub> cylinders is the main hazard.

## Typical areas that require gas detection



**Chemical Plants**



**Power Stations**



**Water Treatment Plants**



**Boiler Rooms**



**Hospitals**



**Tunnels**

## **2 Gas detection sensing technology**

## How do gas detectors work ?

- **4 Core sensing technologies**

- Manufactured by HA
- Lead through innovation

- **Flammable gases**

- Catalytic bead
- Infrared

- **Toxic gases**

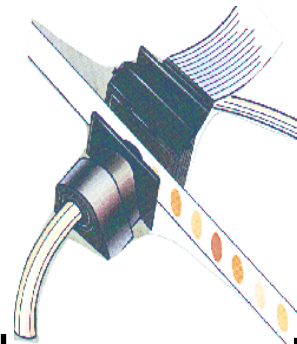
- Chemcassette
- Electrochemical
- Infrared



Catalytic bead



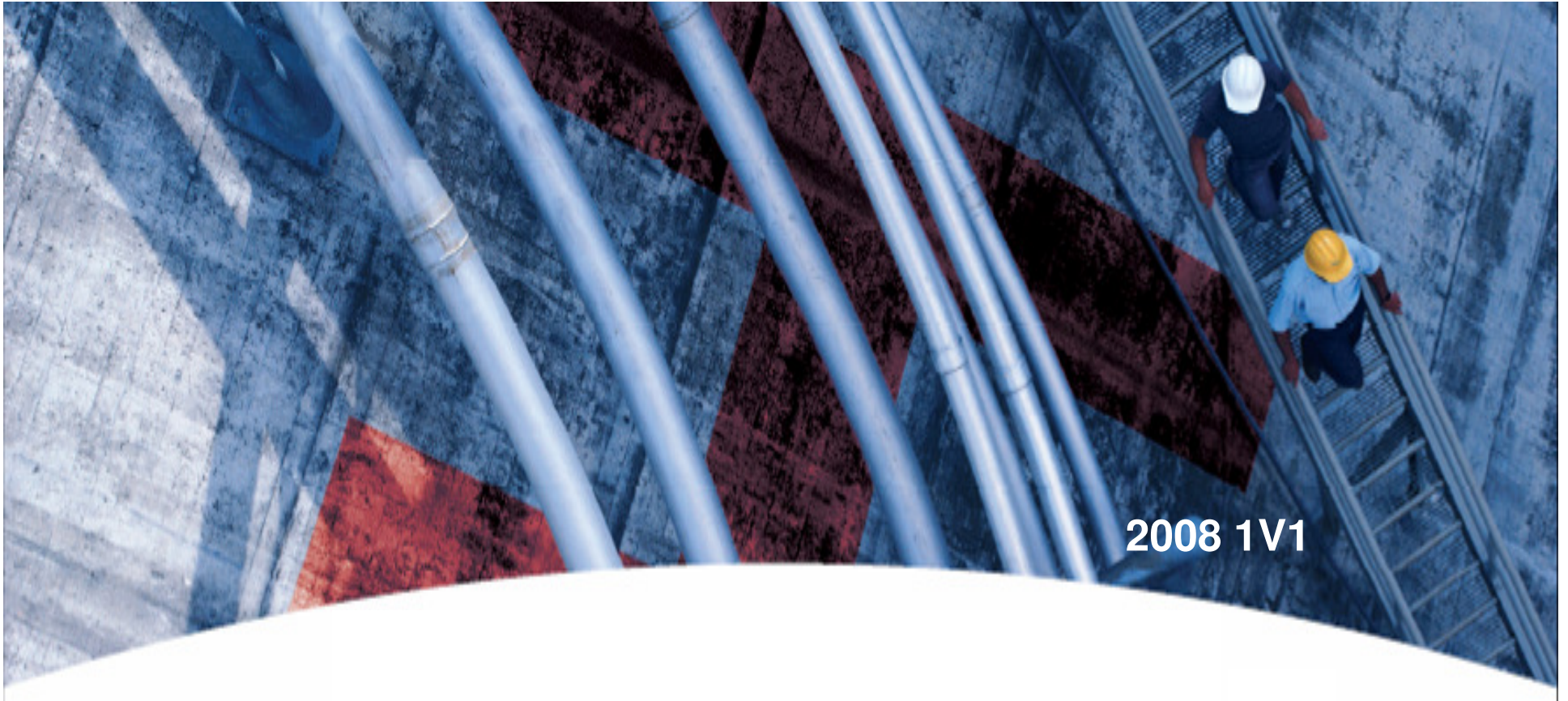
Infrared



Chemcassette



Electrochemical



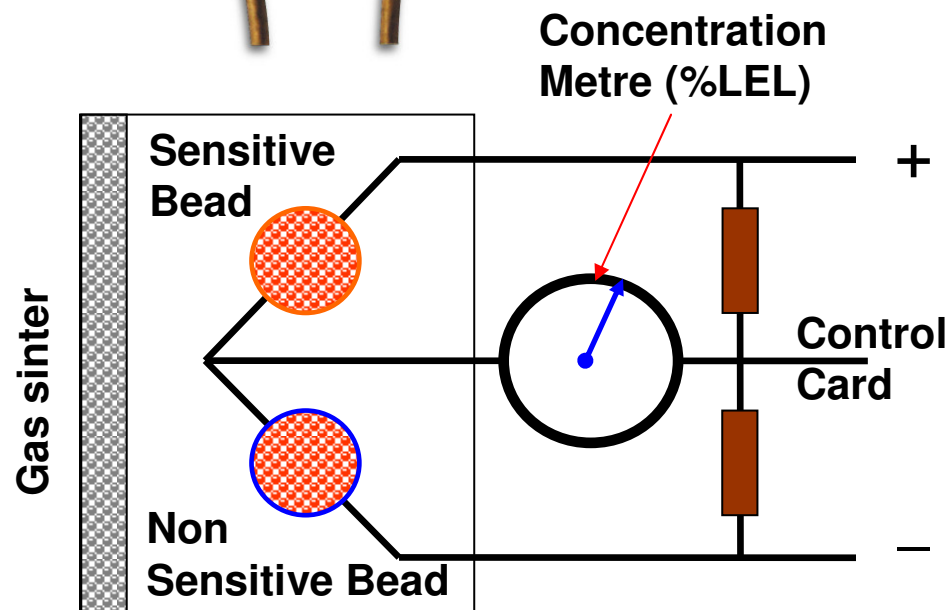
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# **Catalytic Bead Gas Detectors**

## **Detection of flammable Gases**

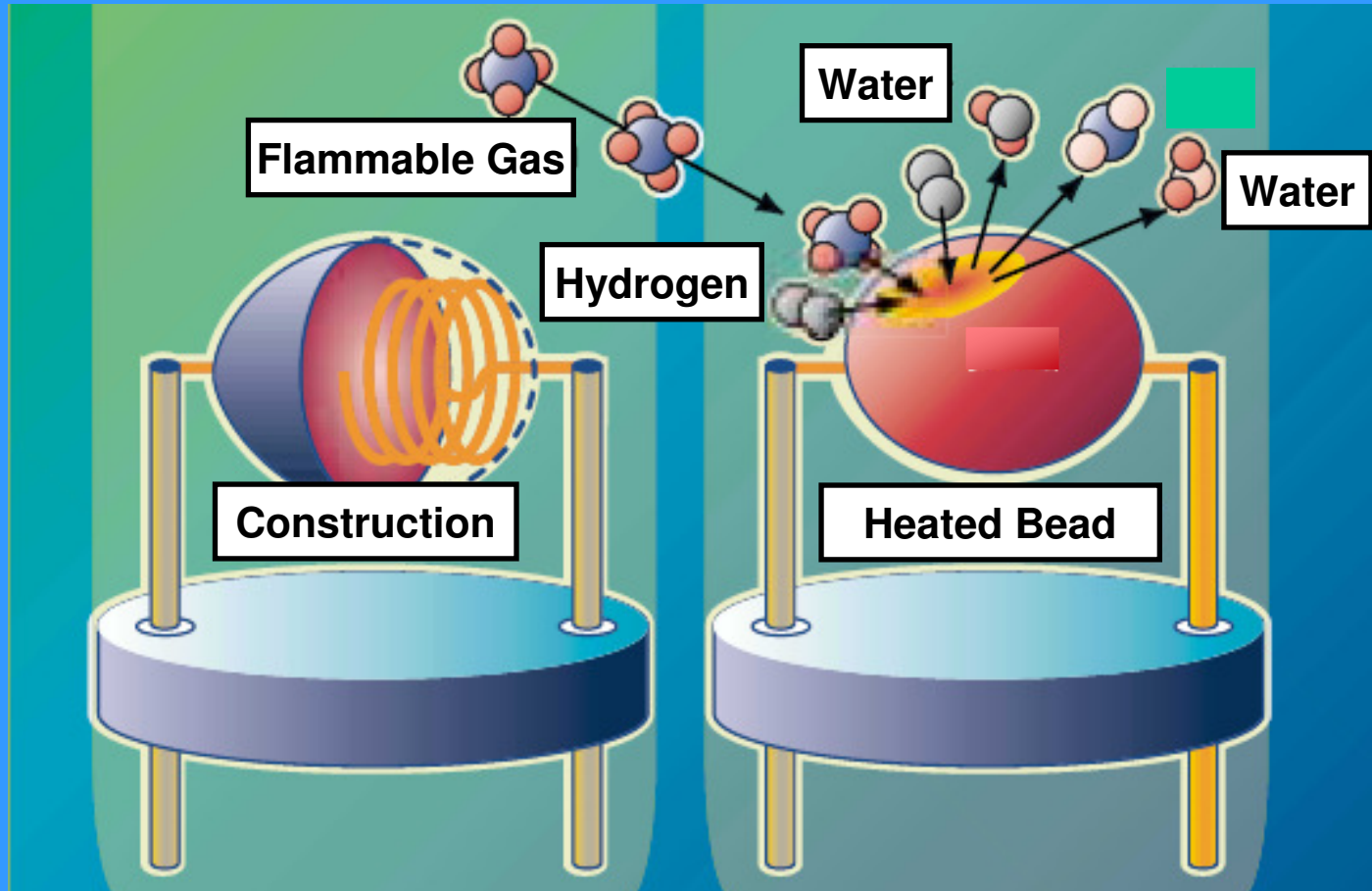
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## Catalytic gas detection (mV output)



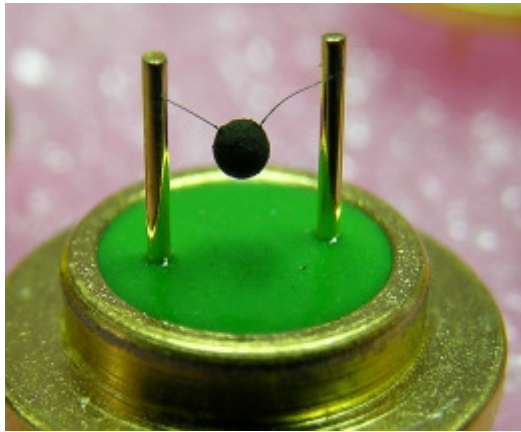
- Pellistor (Pellet resistor)
  - Catalytic beads
  - Requires Oxygen to operate
- 450 - 500°C operating temp
  - Gas combustion on sensitive bead
- Sensitive bead
  - Platinum wire coil
  - Rhodium catalyst
- Non sensitive bead
  - Gas coated or restricted inlet
  - Pressure & temp compensation
- Poison resistant
  - Long life porous structure

# Catalytic Bead Construction/Operation

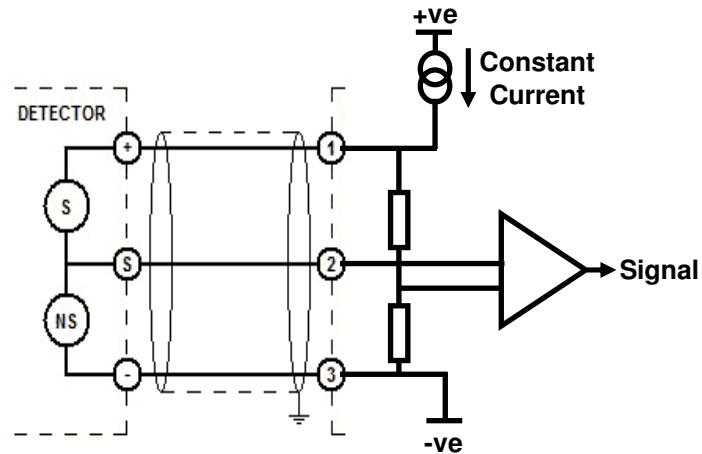
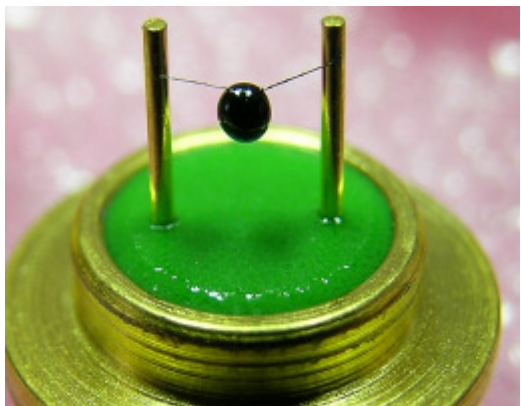


## Catalytic Beads Operate as 'Matched Pairs'

- Sensitive



- Non-sensitive



- 3 wire mV bridge
- 200mA +/- 2mA constant current
- +/-1mV per %VOL typically (subject to gas type)

### Examples

Signalpoint LEL



Sensepoint LEL



705



Apex





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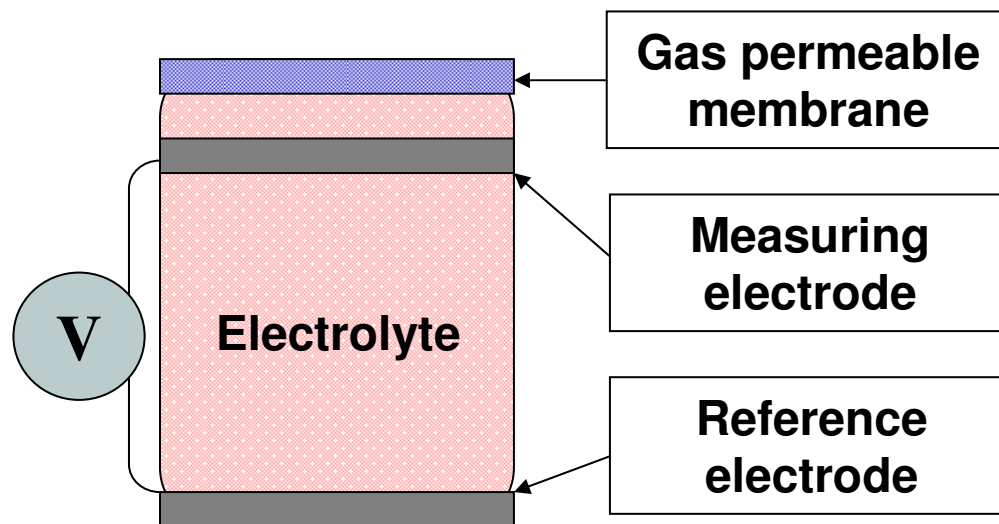
# Electrochemical Sensors for toxic Gases

**Honeywell**

## Electro-chemical cells (mA output)

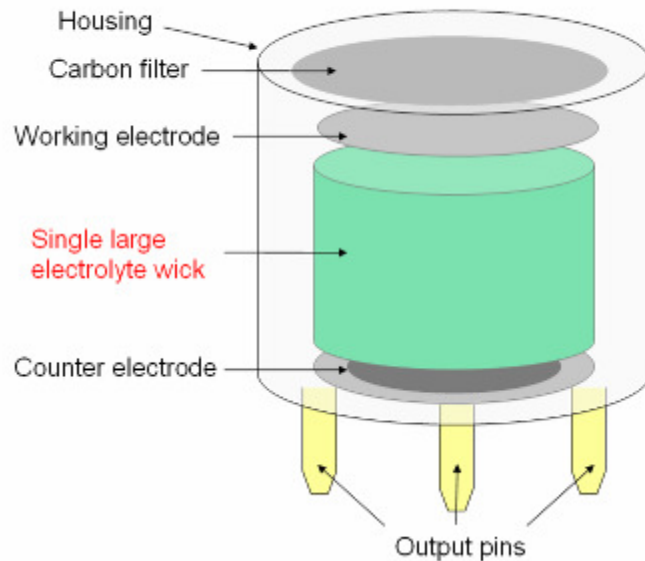


- Speed of response
  - 10-90 seconds (T90)
- Sensitivity
  - Part Per Million (ppm)
- Life
  - 1 to 2 years
- Not fail safe
  - Except O<sub>2</sub> deficiency
- Low powered
  - Ideal for portable devices
- Costs
  - Low initial cost
  - Moderate routine maintenance costs



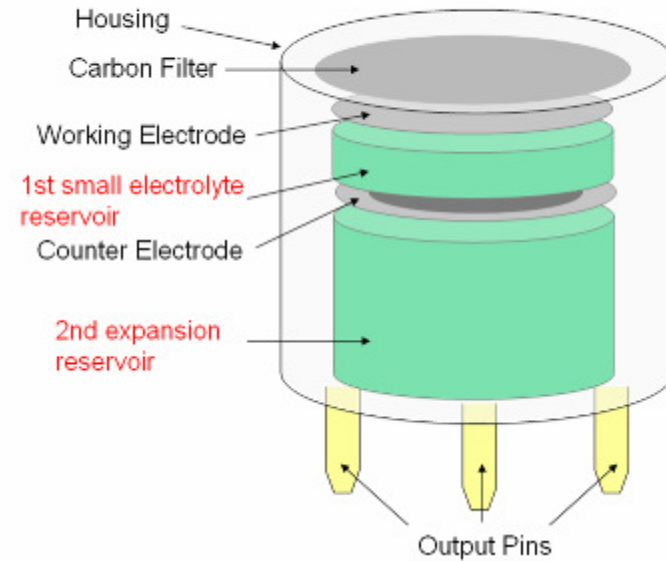
## Modern Electrochemical Sensor Design

### Traditional Cell Design



- Single reservoir
- Metal housing
- Compression fittings

### Surecell™ Design



- Dual reservoir
- Plastic housing
- Moulded/ultrasonically welded

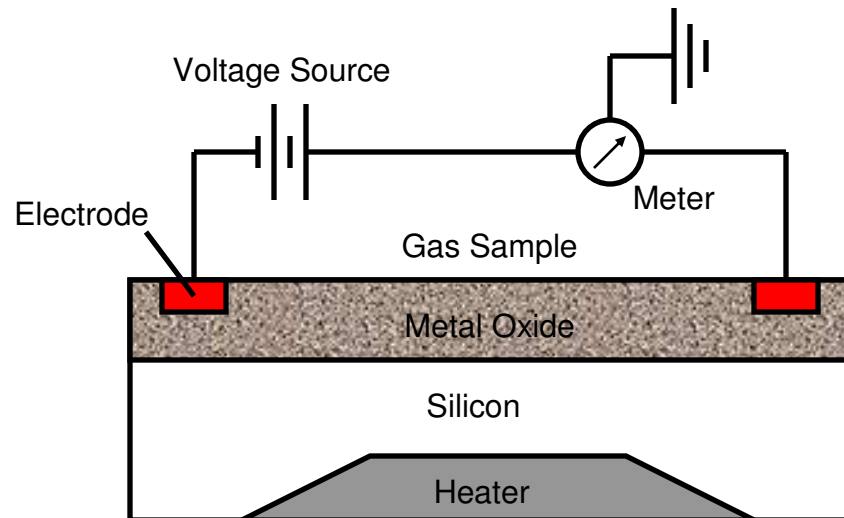


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# Semi-Conductor Sensors for Toxic Gases

**Honeywell**

## Semi-Conductor Gas Detection



- Metal oxide film deposited onto a silicon slice
  - Similar to computer Silicon ‘Chips’
- Surface heated to 200-400°C depending on design
  - Thin film, Thick Film, MOS, MMOS
- Absorption of the sample gas on the oxide surface plus catalytic oxidation
  - Causes change of electrical resistance
  - Resistance change can be related to sample gas concentration.



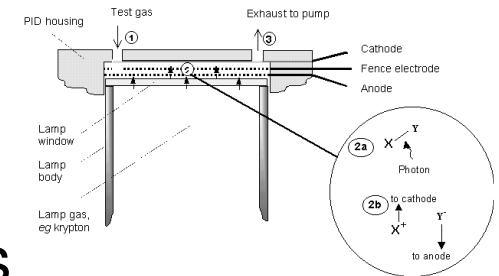
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# Photo Ionization Detector (PID) Sensors for toxic Levels of VOC Gases

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## How does a PID work ?

- An ultra violet lamp ionises the sample gas, causing it to become electrically charged
- If the Ionisation Potential (IP) of the gas is less than the eV output of the lamp, the gas will be ionised
- The sensor detects the charge of the ionised gas and converts the signal into a current
- The current is amplified and displayed on the meter as ppm, ppb or mg/m<sup>3</sup> reading



## Volatile Organic Compounds VOCs

- VOCs are carbon containing chemicals which vaporise at ambient temperatures and typically have no colour or taste making them difficult to detect
- They can be found in every day life and in a wide range of industries
- Some are VOCs are immediately dangerous to life and other are known to cause long term health problems such as cancer

## Why Measure ppm Instead of LEL?

| Compound          | HSE Limit Value<br>8-Hour TWA in ppm | 5% LEL in ppm |
|-------------------|--------------------------------------|---------------|
| Acetone           | 800                                  | 1250          |
| Butane            | 600                                  | 950           |
| Diesel            | 15 ppm US Limit                      | 300           |
| Ethanol           | 1000                                 | 1650          |
| Hexane            | 20                                   | 550           |
| Isopropyl Alcohol | 400                                  | 1000          |
| MEK               | 200                                  | 700           |
| Petrol            | 650 ppm US Limit                     | 650           |
| Styrene           | 100                                  | 450           |
| Toluene           | 50                                   | 500           |
| Xylenes           | 50                                   | 450-550       |



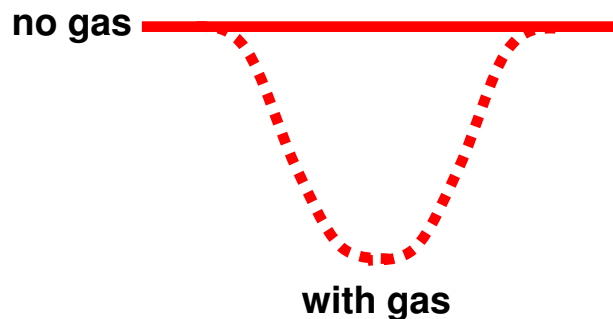
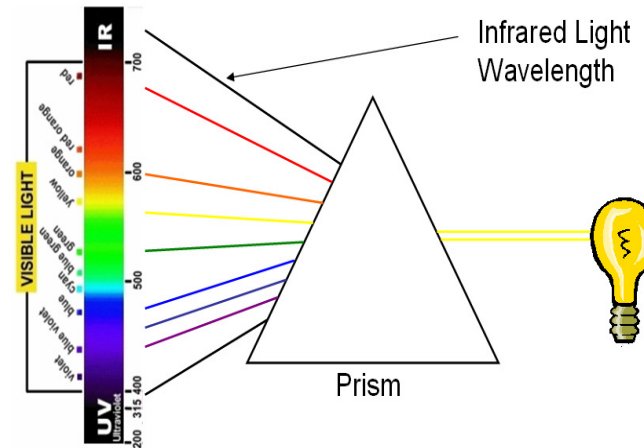
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# Infra Red Sensors for Hydro-Carbon Gases

**Honeywell**

## Infrared Operating Principles

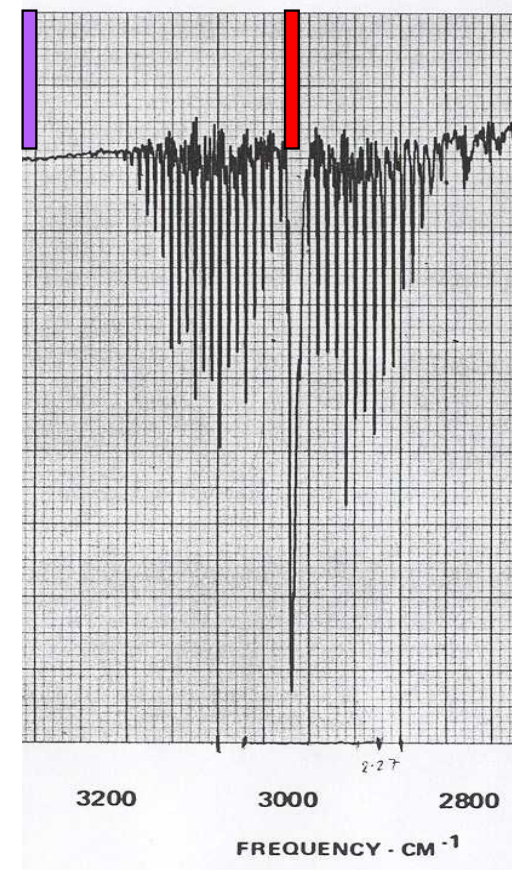
- Light is made up of many different wavelengths
- All diatomic molecules absorb light at various wavelengths
  - HC, H<sub>2</sub>S, NH<sub>3</sub>, HF, CO<sub>2</sub> etc
  - Some more than others
- Flammable Infrared Detectors
  - Use optical filters to 'tune' source to wavelength that's absorbed by gas



## How does Infrared Gas Detection work ?

- All flammable hydrocarbon gas molecules absorb light in the infrared region of the Spectrum.
- The specific wavelength used is dependent on a number of factors including gas type to be detected, interference from others gases, strength of signal and effect of water vapour.
- This absorption characteristic can be used as the basis of a hydrocarbon gas detector.

IR Spectrum of Methane Gas  
at 3.4 microns

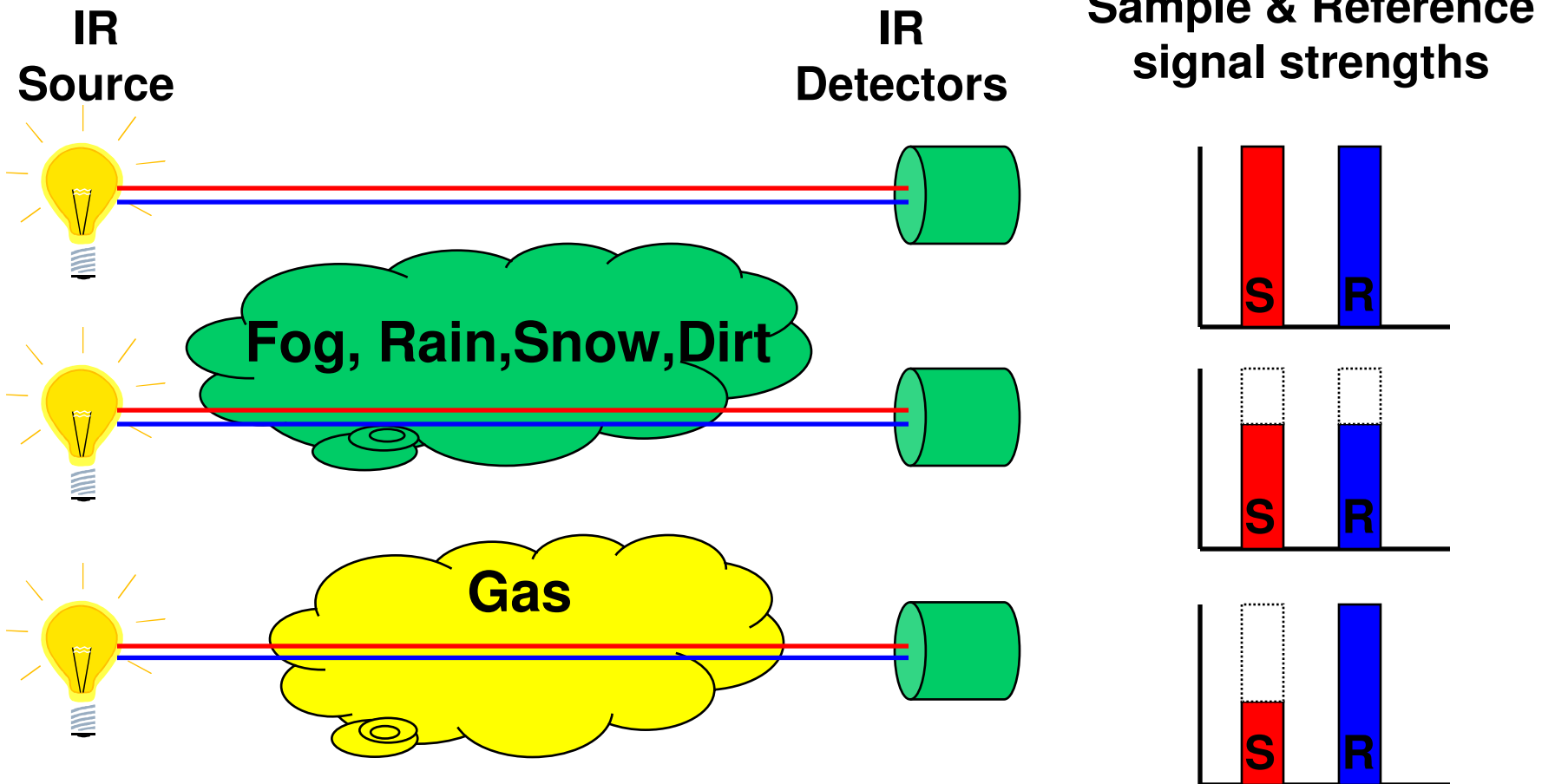


## Infrared Gas Detection Pros & Cons

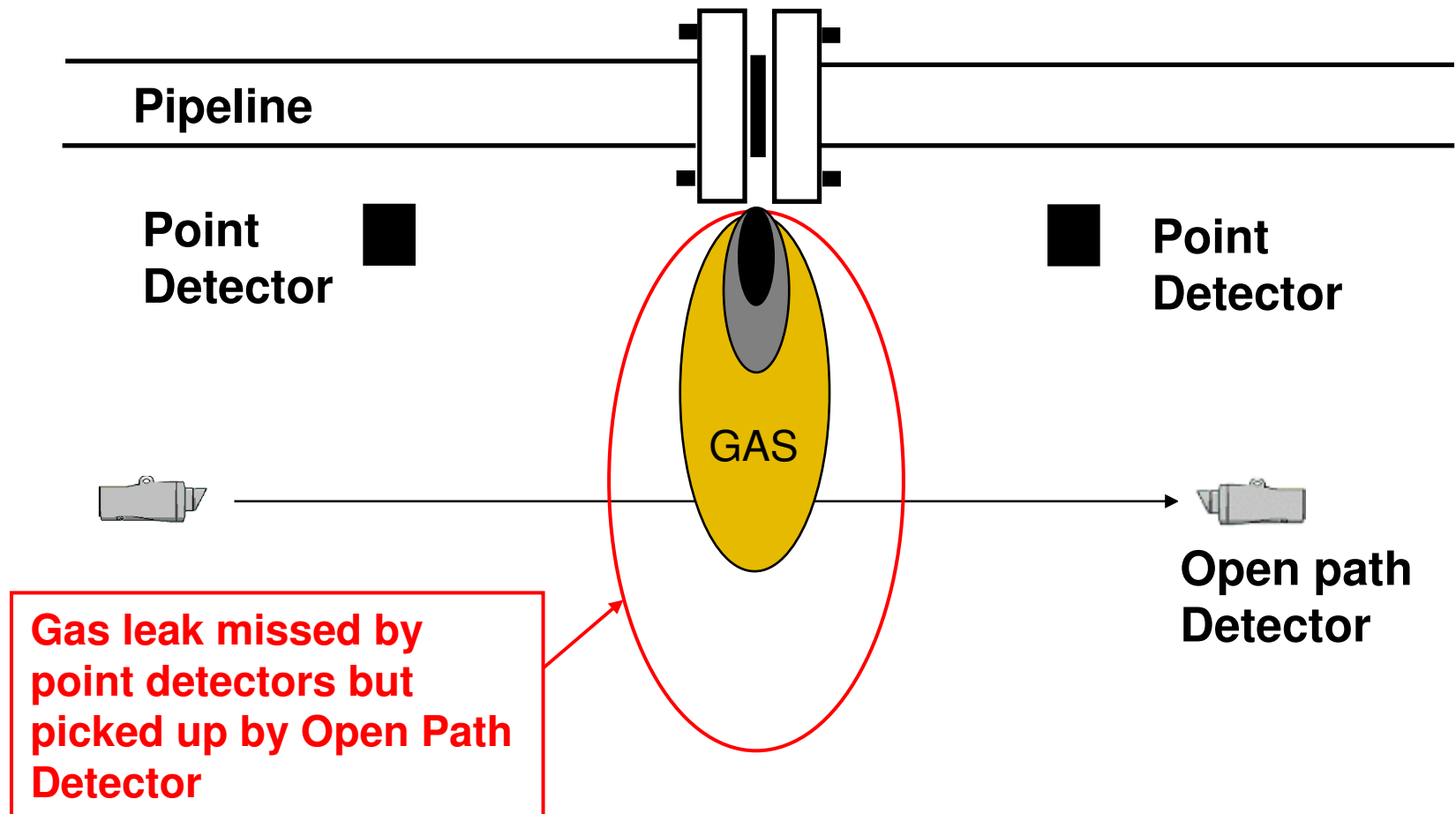


- Fast speed of response
  - >5 seconds (T90)
- Sensitivity
  - 0-100% LEL or LEL Metres
- Works in Oxygen free atmospheres
- Fail safe
  - Self checking diagnostics
- Costs
  - High initial cost
  - Low routine maintenance costs

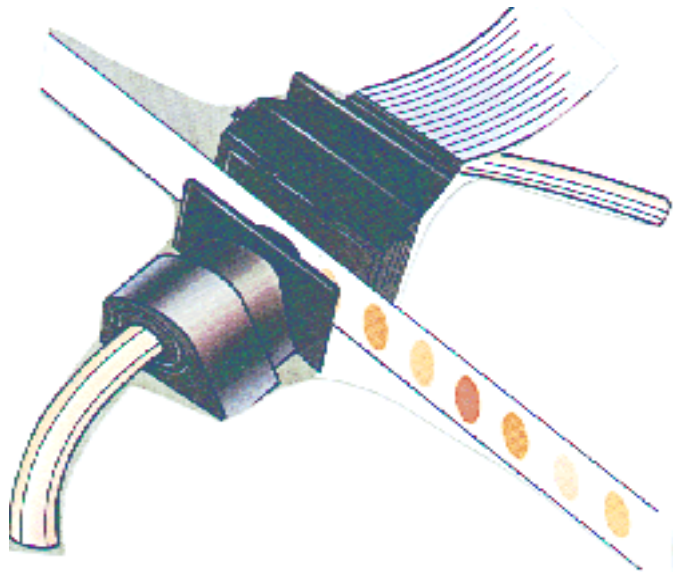
# Closed Path Working at Two Wavelengths



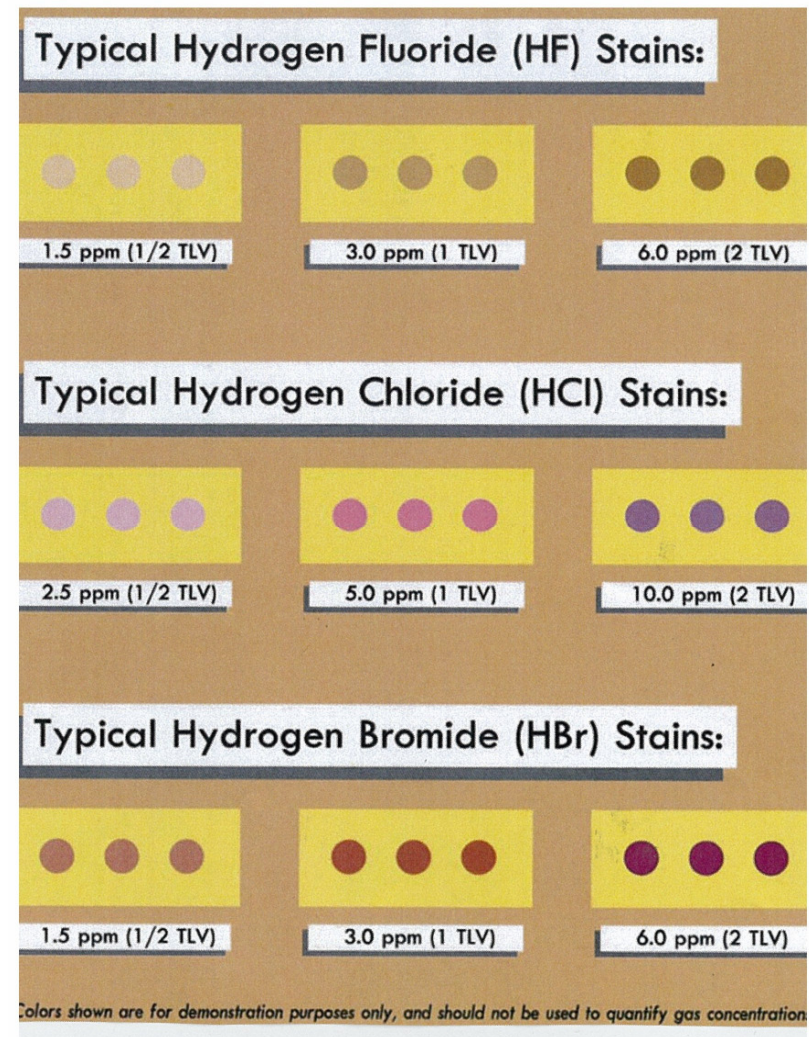
## Open Path Increases the Chance of Seeing Gas



## Paper tape gas detection



- Paper Tape Doped with Chemicals to cause 'stain' when subjected to target gas.
- IR sensors monitor 'stain' colour



## Paper Tape Gas Detection

- Used in Semi-Conductor Industry
  - Physical Evidence of Gas Response
- Popular for Low Level Toxic Gas detection
  - Clean Room / Laboratory
  - FAB applications
  - Low Cross Interference
- Wide range of standards gases
  - H<sub>2</sub>S, Ammonia, Chlorine etc.
- High Sensitivity
  - Part Per Billion (ppb) to ppm levels
- Susceptible to environmental fluctuations
- Tape Storage
  - Limited Shelf Life
- Sample System Operation
- Costs
  - High initial cost
  - High routine maintenance costs
  - Replacement Tape

# 3 Sensor Location

## Main purpose of gas detection

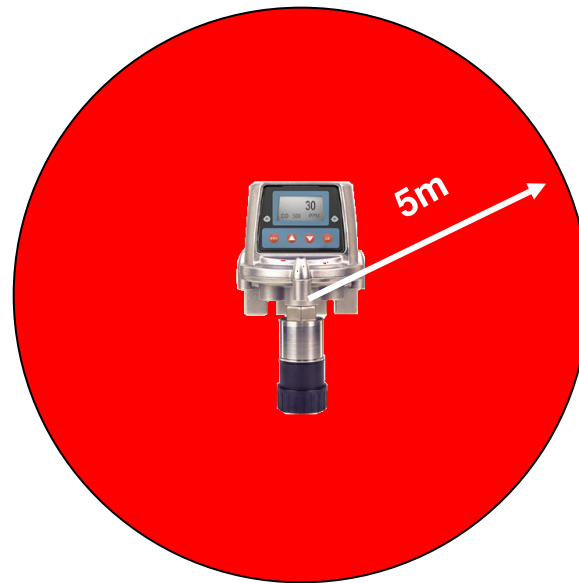
- Protect human live
- Prevent/minimize environmental pollution
- Protect production
- Protect infrastructure



## Guidelines

- Indoor or outdoor site
- Potential leak source (i.e. Shell > 2 bar – 10mm)
- Nature of the gas or vapour to be detected
- Nature of possible gas or vapour release ( high pressure jet, evaporation, liquid leaks)
- Presence or cavities, pits or cable channels
- Topography of the site
- Air movements: Temperature effects, Indoor natural ventilation, Indoor mechanical ventilation. Outdoors – wind speed and direction.
- Local environment to plant
- Population of plant and locations
- Locations of potential sources of ignition.
- Alarm levels (TLV and %LEL)

## Detection Area



### Some actual values used currently in the Petrochemical industry:

|                       |                         |
|-----------------------|-------------------------|
| Outdoor installation: | <b>250m<sup>2</sup></b> |
| Indoor (Pumphousing): | <b>100m<sup>2</sup></b> |
| Along piperacks       | <b>50m</b>              |

# 4 SIL in Gas Detection

# Positioning of gas detection solution in your plant ?

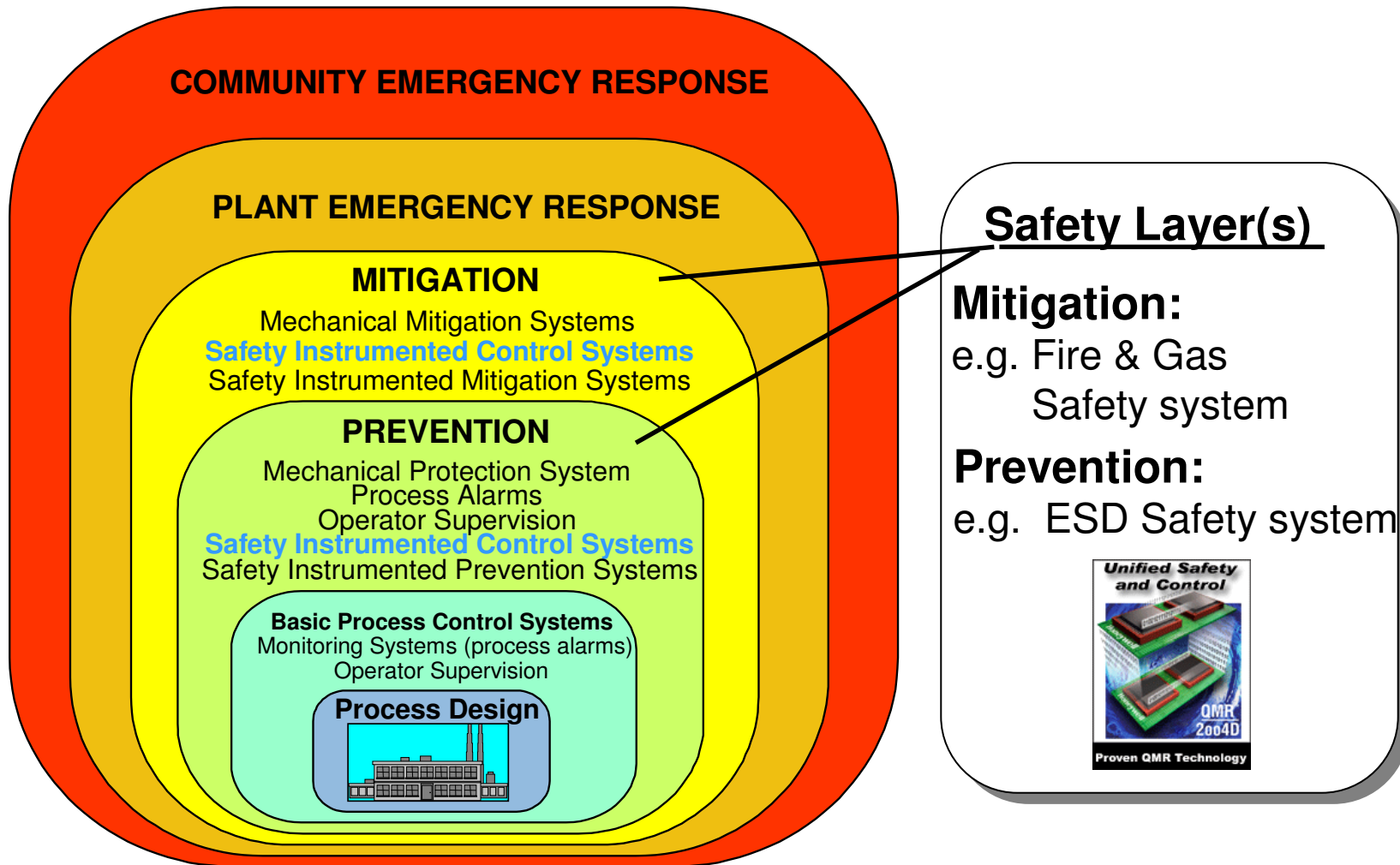
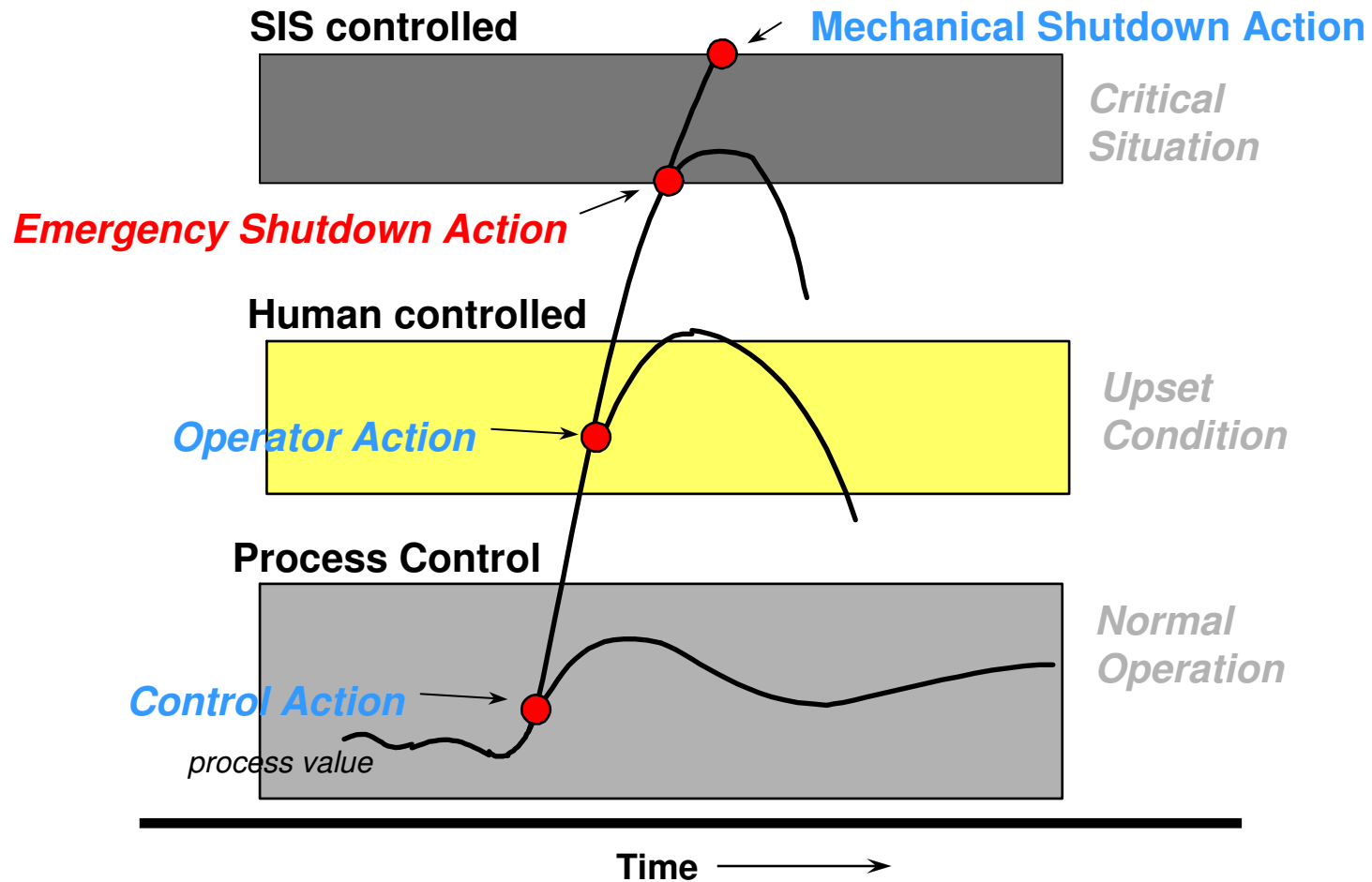


Figure 9 of IEC 61511

# Anatomy of an Abnormal Situation



**There are required actions taken at each step to mitigate this escalation.**

## Summary of the cases

- ESD: up to SIL 3
- F&G: up to SIL 2
- Alarm: up to SIL 1

# **5 Calibration/Maintenance**

# Interval

- According to EN61779\_1
- Follow manufacturers guidelines
- Environmental conditions (f.e. Frequency, inhibitors)
- Government / Insurance policy

## 4.4.3 Calibration and adjustment

### 4.4.3.1 Initial preparation of the apparatus

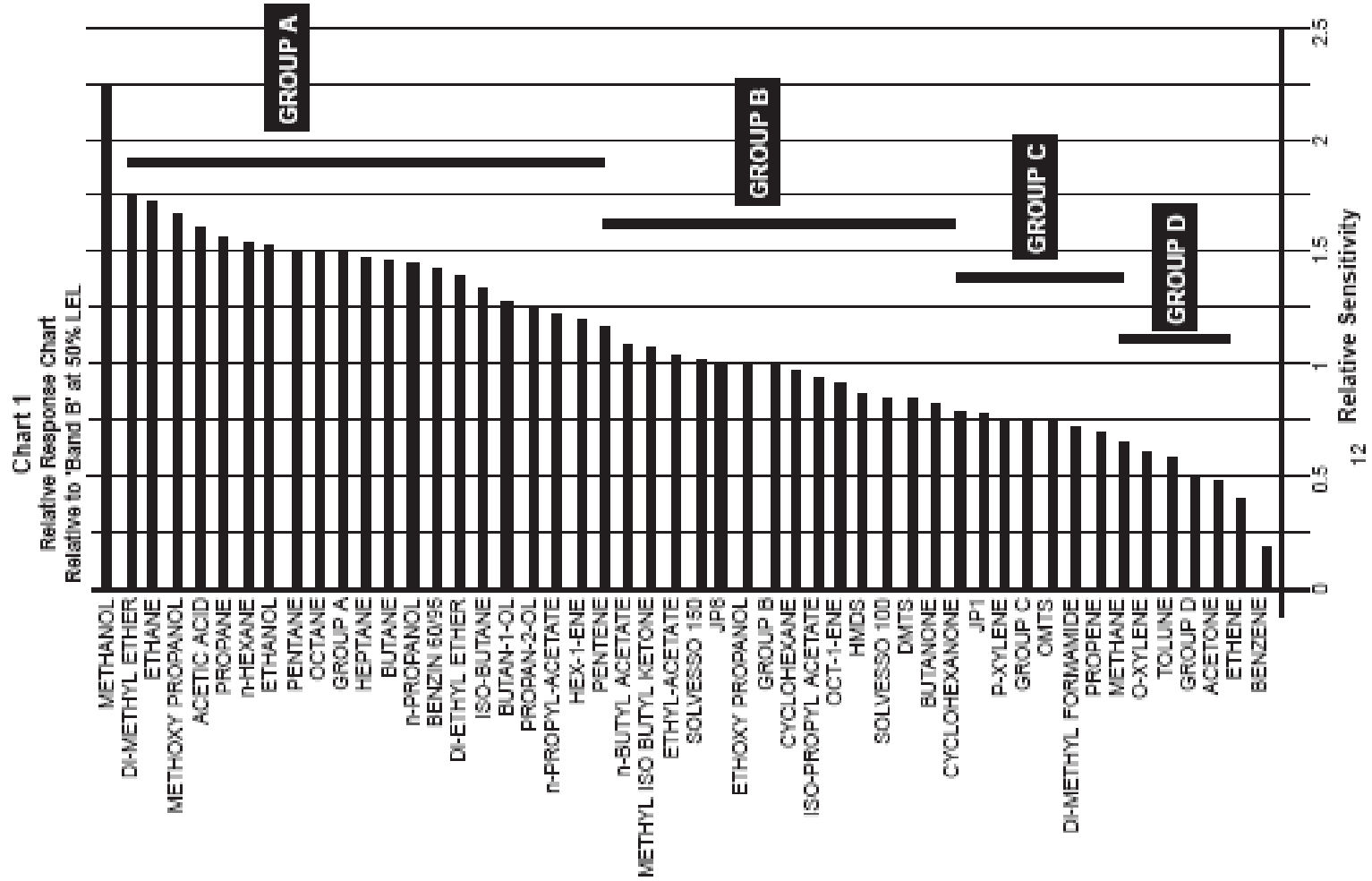
The apparatus shall be calibrated and adjustments shall be carried out, if needed, to obtain correct indications in accordance with the manufacturer's instruction manual.

For apparatus having more than one selectable range or scale for the same or different gases or vapours, the necessary amount of testing shall be agreed upon between the manufacturer and the test laboratory.

## Catalytic sensors

| <b>Table 2</b>  |  |                   |  |                   |
|---|--|-------------------|--|-------------------|
| <b>RELATIVE RESPONSE of SENSEPOINT FLAMMABLE GAS DETECTOR<br/>(USING SG16ZA CATLYTIC BEAD SENSOR)</b> |  |                   |  |                   |
| Target Gas  | Unit Calibrated 0-100%LEL Methane          |                   | Unit Calibrated 0-100%LEL Hydrogen         |                   |
|   | Displayed "Reading" for 100%LEL Target Gas | Relative Response | Displayed "Reading" for 100%LEL Target Gas | Relative Response |
| Hydrogen  | 95   | 0,95              | 100  | 1,00              |
| Methane   | 100  | 1,00              | 106  | 1,06              |
| Ethane  | 84   | 0,84              | 89   | 0,89              |
| propane   | 67   | 0,67              | 71   | 0,71              |
| Butane  | 60   | 0,60              | 63   | 0,63              |
| Pentane   | 53   | 0,53              | 56   | 0,56              |
| Hexane  | 50   | 0,50              | 53   | 0,53              |
| Heptane   | 46   | 0,46              | 48   | 0,48              |
| Octane  | 46   | 0,46              | 49   | 0,49              |
| Ethylene  | 75   | 0,75              | 79   | 0,79              |
| Methanol  | 75   | 0,75              | 79   | 0,79              |
| Ethanol   | 69   | 0,69              | 73   | 0,73              |
| Propan-2-ol   | 54   | 0,54              | 57   | 0,57              |
| Acetone   | 56   | 0,56              | 59   | 0,59              |
| Cyclohexane   | 51   | 0,51              | 54   | 0,54              |
| Toluene   | 49   | 0,49              | 52   | 0,52              |
| <b>Xylene</b>   | <b>36</b>                                  | <b>0,36</b>       | <b>38</b>                                  | <b>0,38</b>       |
| Butanone  | 52   | 0,52              | 55   | 0,55              |
| Di-ethyl ether  | 54   | 0,54              | 57   | 0,57              |
| Ethyl acetate   | 51   | 0,51              | 54   | 0,54              |

# Infrared detectors



# Electrochemical sensors

**Table 2a** **CROSS INTERFERENCES OF SENSEPOINT TOXIC GAS DETECTORS**

| INTERFERENT GAS   | DETECTOR GAS TYPE |                    |                          |                    |
|-------------------|-------------------|--------------------|--------------------------|--------------------|
|                   | Ammonia           | Carbon Monoxide    | Chlorine                 | Hydrogen           |
| Acetone           |                   | 1000ppm = 0ppm CO  | -                        | -                  |
| Acetylene         |                   | 40ppm = 80ppm CO   | -                        | -                  |
| Ammonia           |                   | 100ppm = 0ppm CO   | -                        | 100ppm = 0ppm H2   |
| Carbon Dioxide    |                   | -                  | -                        | 1000ppm = 0ppm H2  |
| Carbon Monoxide   |                   | 100ppm = 100ppm CO | 300ppm = 0ppm Cl2        | 100ppm = 150ppm H2 |
| Chlorine          |                   | 2ppm = 0ppm CO     | 5ppm = 5ppm Cl2          | 1ppm = 0ppm H2     |
| Ethanol           |                   | 2000ppm = 3ppm CO  | -                        | -                  |
| Ethylene          |                   | 100ppm = 85ppm CO  | -                        | -                  |
| Hydrogen          |                   | 100ppm = 20ppm CO  | -                        | 500ppm = 500ppm H2 |
| Hydrogen Chloride |                   | -                  | -                        | -                  |
| Hydrogen Cyanide  |                   | -                  | -                        | 20ppm = 0ppm H2    |
| Hydrogen Sulfide  |                   | 25ppm = 0ppm CO    | 15ppm = -7.5 to 0ppm Cl2 | 20ppm = 4ppm H2    |
| Iso-Propanol      |                   | 200ppm = 0ppm CO   | -                        | -                  |
| Nitrogen Dioxide  |                   | 800ppm = 20ppm CO  | -                        | 10ppm = -40ppm H2  |
| Nitric Oxide      |                   | 50ppm = 8ppm CO    | 35ppm = 0ppm Cl2         | -                  |
| Sulfur Dioxide    |                   | 50ppm = 0.5 ppm CO | 5ppm = 0ppm Cl2          | 5ppm = 0ppm H2     |

## Cross Interferences of Sensepoint Toxic Gas Detectors

# 6 ATEX

## ATEX ↔ ATEX Performance

- According to EN60079-29-1:2007
- Functional safety of installation



Translation

### EC-Type Examination Certificate

- (1)
- (2) **- Directive 94/9/EC -**  
Equipment and protective systems intended for use in potentially explosive atmospheres
- (3) **BVS 04 ATEX G 001 X**
- (4) **Equipment:** system 57
- (5) **Manufacturer:** Zellweger Analytics Ltd.
- (6) **Address:** Poole, Dorset, BH17 ORZ, United Kingdom
- (7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.
- (8) The certification body of EXAM BBG Prüf- und Zertifizier GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.  
The examination and test results are recorded in the test report PFG-no. 41300197P NIV, 41300197P NIII and 41300197P NII.
- (9) The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:  
  
EN 50054:1998  
EN 50057:1998  
EN 50058:1998  
EN 50271:2001  
  
This EC-type examination certificate covers the measuring function of this control unit, when operated with remote sensors sensepoint, for the gases and vapours hydrogen, propane, n-butane, ethylene, propylene, methane, butanone, 2-propanol, ethanol, methanol, ethyl acetate, 1,2-epoxypropane, toluene, p-xylene and unleaded petrol with the measuring range 0 - 100 %LEL.  
This EC-type examination certificate covers the measuring function of this control unit, when operated with remote sensors with 4-20 mA interface, for the gases and vapours listed in the EC-type examination certificate of the remote sensor.  
This EC-type examination certificate covers control cards 5701 with software-version V2.60, control cards 5704 with software-version V1.70, high-integrity relay cards with software-version V1.0, engineering cards with software-version V2.2 or V2.5, and engineering interface software with software-version V5.4.
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

## Zareba: Comm/Light Ind Fixed Systems



- Flammable & toxic gases
- Local display or blind
- PLC / BMS direct interface
- Single & multipoint controllers

## Sieger: Petrochemical Fixed Systems



- Flammable & toxic gases
- Infrared: point, open path & cross duct detectors
- Smart transmitters
- Modular controller system

## MDA Scientific: PPM/PPB Toxic gas detection



### •Vertex

- 8-72 point toxic gas system
- 40 gases @ ppm/ppb levels
- Chemcassette technology
- Up to 400ft per sample line
- Relay & serial outputs



### •SPM

- 1 point toxic gas system
- 50 gases @ ppm/ppb levels
- Chemcassette technology
- Up to 100ft per sample line
- Relay & serial outputs



### •CM 4

- 1-4 point toxic gas system
- 25 gases @ ppm/ppb levels
- Chemcassette technology
- Up to 300ft per sample line
- Relay & serial outputs

## SF Detection: Domestic gas detection



- SF350 CO**
- Alarm sounder & LED
- 5 year life
- Battery operated
- EN50291 & UL2034



- Z10 Natural gas & LPG**
- Mains operated
- Alarm sounder & LED
- Relay output



- SF340 CO**
- Alarm sounder & LED
- 5 year life
- Mains & 12-24V dc
- Battery backup
- Relay output



- Ez Sense Flammable**
- Leak tracer
- Alarm sounder & LED
- Battery operated