



**Carbon Monoxide Monitoring of  
Below Ground or Enclosed Car Parks**

# Car Park fact sheet



## Carbon Monoxide Monitoring of Below Ground or Enclosed Car Parks.

### Gas Facts:

Carbon Monoxide (CO) is fractionally lighter than air. Dependent upon the atmospheric conditions and ventilation patterns, CO will linger at one level or gradually rise toward the ceiling or roof space of a car park.

CO is listed as a toxic substance in the UK Health & Safety Executives (HSE) guidance note EH40/2005 'Workplace exposure limits'.

### The exposure limits for CO are:

- 30ppm as a time weighted average (TWA) over an 8 hour working period; known as the Long Term Exposure Limit (LTEL)
- and
- 200ppm as a TWA over a 15 minute period; known as the Short Term Exposure Limit (STEL)

Its physiological effects are tiredness, headaches, nausea and ultimately the loss of life, however its effects are reversible if detected at an early stage.

Honeywell Analytics gas detection systems are designed to provide a number of alarm outputs inline with the published exposure limits.



Metro Addressable Gas Detection System

### The Hazard:

Carbon Monoxide (CO) is the main component of vehicle exhaust emissions. CO is toxic and a health risk to the general public or employees who operate below ground or enclosed car parks. This hazard is also present in below ground/enclosed road service tunnels used to deliver goods to shopping centres and engine test facilities.

A variety of organisations have published recommendations for the design of mechanical ventilation used to reduce or remove the risk of Carbon Monoxide poisoning. At the core of these recommendations, is the need to achieve an adequate number of air changes per hour. Whilst this approach is effective, the associated running costs of mechanical ventilation (in Kilowatt hours) often proves expensive. An acceptable alternative approach is to monitor CO levels and activate/ regulate the mechanical ventilation to ensure CO levels are within acceptable limits and therefore reduce ventilation running costs.

Honeywell Analytics has manufactured, installed and serviced gas detection systems for nearly 50 years. These systems monitor gas concentrations, and generate alarm outputs for interface to ventilation control panels and Building Management Systems (BMS). This fact sheet aims to provide an overview of gas detection as used in below ground or enclosed car parks.

For recommendations related to a specific project or site, our team of Area Managers is on hand to offer advice, a site survey and product demonstrations all **free of charge**.

### Car Park Ventilation Systems:

Within the UK (HSE) Guidance Note EH22 'Ventilation of the workplace', reference is made to the ventilation requirements for car parks.

Acceptable levels of ventilation can be achieved with natural ventilation provided the size of openings meet a minimum size in relation to the floor area, (aggregate area of openings must be  $>1/20$ th of the floor area on each level).

For car parks where the aggregate area of openings is less than  $1/20$ th and not less than  $1/40$ th of the floor area, mechanical ventilation providing a minimum of 3 air changes per hour is required.

Car parks with no natural ventilation must provide at least 6 air changes per hour and 10 air changes an hour at exits and ramps where cars queue with their engines running.

Alternatively variable mechanical ventilation can be employed provided CO levels do not exceed 50ppm as a TWA over 8 hours, or 100ppm TWA over 15 minutes. This can only be achieved with an effective CO gas detection system.

Further guidance can be found in: the 'Code of practice for ground floor, multi-storey and underground car parks' published by the Association for Petroleum and Explosives Administration and in the Chartered Institute of Building Services Engineers (CIBSE) 'Guide B'.

### The Detection System:

A gas detection system consists of a number of strategically located sensors hard wired to a control panel. Upon the detection of gas, alarm relay contacts within the control panel are activated. These relay contacts can be used to operate warning signs ('Switch off engines', 'Evacuate car park') and initiate increased levels of mechanical ventilation via the ventilation control panel or a Building Management System (BMS).



Detection system outputs must be able to avoid fan hunting and burn-out. These outputs should include time delays, alarm voting and TWA alarm trips.

Two basic system configurations are available. One where each sensor is wired individually back to the control panel and the second consisting of two addressable loops, each capable of having up to 125 detectors wired to one control panel. The addressable control panel is a compact unit and offers a considerable cost saving on installation for the most moderately sized system.

Some systems have event logging capability which enables the recording of CO concentration levels for future reference and or print out.

Prior to the availability of low cost, reliable CO gas sensors, some car parks used multipoint sequential sampling systems. Sequential sampling systems do offer an effective method of monitoring CO, however they have a number of limitations, these include:

- A slow speed of response as only one sample point is being monitored at any one time
- The cost to install sample tubing and associated mechanical protection is high
- The need to fit and replace end of line filters
- The future potential for contaminated, blocked or broken sample lines
- The wear and subsequent replacement of costly pumps and valve sets

### Gas Sensors:

Several types of gas sensor are available on the market. The most reliable are the electrochemical cell type. These are more specific and less prone to false alarms than the lower cost Solid State or Semi-Conductor types which are affected by changes in ambient temperature and humidity. The best electrochemical cell devices are called 'sure cells' which have a unique design which offer the most reliable operation in the most hot and dry of environments with an operation life of between 2 and 5 years.

Honeywell Analytics produces a wide range of CO gas sensors for interface to it's own control panels or those of a 3rd party supplier. Honeywell Analytics also manufactures the electrochemical cells used at the heart of each gas sensor.

### Location of Gas Sensors:

The quantity and location of gas sensors is often a joint decision involving a building services consultant, the site owners, the local authority and the equipment manufacturer.

Guidelines within continental Europe recommend one detector every 400m<sup>2</sup> (20m x 20m grid). These guidelines do not exist within the UK. Generally, gas sensors are located on the roof or ceiling or at head height for car parks with a high roof space.

Gas sensors are often located above or near to:

- Vehicle road ways
- Pedestrian entrances
- Exits and ramps
- Attendant pay booths

Consideration must be paid to the mechanical ventilation and its likely effect upon the path of CO when locating a gas sensor.

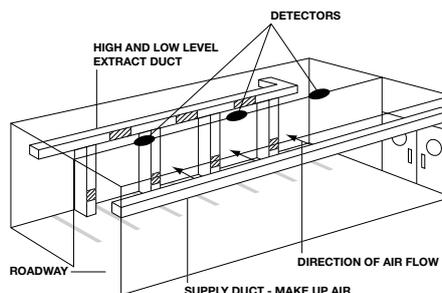
### Location of Control Equipment:

Gas detection control panels for car park applications are often located within the ventilation plant room, or in sight of the attendant/ supervisor.

Control panels are available in a number of mechanical configurations for ease of application, these include:

- Din rail mounting for inclusion within other plant control panels
- Wall mounting
- Rack mounting

An alternative power supply in the event of power failure is also good practice and battery back-up systems are also available.



### Further Considerations:

This fact sheet is focused on the monitoring of Carbon Monoxide only. Other gas hazards in car parks may include Oxides of Nitrogen, and leaks from vehicles fuelled by LPG (already a monitoring requirement in some European countries). Suitable equipment for the monitoring of these gases is also available from Honeywell Analytics.

The details contained in this Fact Sheet are equally applicable to other enclosed areas where motor vehicles operate e.g. underground service roads leading to shopping centres and premises where vehicles are maintained or tested.

### Routine Service:

All safety systems including gas detection systems should be regularly serviced to ensure safe and reliable operation. Commercial/ industrial gas detection systems are typically serviced and recalibrated twice a year.

This routine service should only be undertaken by the manufacturer of an approved service agent.

**Contact your local Honeywell Analytics representative for further information and assistance in selecting the best system for your application.**

### References:

- UK HSE EH 22 'Ventilation of the workplace'
- UK HSE EH 40/2005 'Workplace exposure limits'.

# Our Product Range



## Fixed Gas Monitoring

Honeywell Analytics offers a wide range of fixed gas detection solutions for a diverse array of industries and applications including: Commercial properties, industrial applications, semiconductor manufacturers, energy plants and petrochemical sites.

- » Detection of flammable, oxygen and toxic gases (including exotics)
- » Innovative use of 4 core sensing technologies – paper tape, electrochemical cell, catalytic bead and infrared
- » Capability to detect down to Parts Per Billion (ppb) or Percent by Volume (%v/v)
- » Cost effective regulatory compliance solutions

## Portable Gas Monitoring

When it comes to personal protection from gas hazards, Honeywell Analytics has a wide range of reliable solutions ideally suited for use in confined or enclosed spaces.

These include:

- » Detection of flammable, oxygen and toxic gases
- » Single gas personal monitors – worn by the individual
- » Multi-gas portable gas monitors – used for confined space entry and regulatory compliance
- » Multi-gas transportable monitors – used for temporary protection of area during site construction and maintenance activities

## Technical Services

At Honeywell Analytics, we believe in the value of great service and customer care. Our key commitment is providing complete and total customer satisfaction. Here are just a few of the services we can offer:

- » Full technical support
- » Expert team on hand to answer questions and queries
- » Fully equipped workshops to ensure quick turnaround on repairs
- » Comprehensive service engineer network
- » Training on product use and maintenance
- » Mobile calibration service
- » Customised programmes of preventative/corrective maintenance
- » Extended warranties on products

### Find out more

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