



the danger of confined spaces

Areas with a volume of less than 100m³, where there is no natural ventilation or areas that measure less than 2 metres in diameter, length, width and depth are classed as confined and enclosed danger zones. Special attention needs to be drawn to the dangers posed by gases when space is restricted and typical examples of confined spaces within industry include: shafts, trenches, pits, boilers, tanks, pipelines and containers, as locations for emergency response units. Please see the table below for a list of the typical gases that can be found in industrial enclosed spaces:

Gas Characteristics

Gas	Methane CH ₄	Oxygen O ₂	Carbon Monoxide CO	Hydrogen Sulphide H ₂ S	Carbon Dioxide CO ₂
LEL (EN 61779)	4.4 vol. %	-	10.9 vol. %	4.3 vol. %	-
UEL	16.5 vol. %	-	74.0 vol. %	45.5 vol. %	-
TWA (LTEL) (over 8 hrs)	-	-	30 ppm	5 ppm	0.5 vol. %
TWA (STEL) (over 15 mins)	-	-	200 ppm	10 ppm	3.0 vol. %
Properties	Gas, colourless and odourless, less dense than air, combustible/ highly explosive when combined with Oxygen	Gas, excess Oxygen deemed to apply at concentrations > 23.0 vol.%, lack of Oxygen deemed to apply at concentrations < 19.0 vol.%, concentrations of 6.0 vol.% are lethal	Gas, colourless and odourless, less dense than air, highly poisonous, combustible (if burnt with O ₂ , produces CO ₂)	Gas, colourless, smells strongly of rotten eggs in small concentrations, more dense than air, highly poisonous, combustible, corrosive	Gas, colourless and odourless, more dense than air, toxic, asphyxiant

Gas	Ammonia NH ₃	Chlorine Cl ₂	Nitrogen Dioxide NO ₂	Sulphur Dioxide SO ₂	Hydrogen Cyanide HCN
LEL (EN 61779)	15.4 vol. %	-	10.9 vol. %	-	4.5 vol. %
UEL	30.2 vol. %	-	74.0 vol. %	-	46.6 vol. %
TWA (LTEL) (over 8 hrs)	25 ppm	0.5 ppm	-	-	-
TWA (STEL) (over 15 mins)	35 ppm	1 ppm	-	-	10 ppm
Properties	Gas, colourless, strong, pungent odour, caustic, combustible, toxic, asphyxiant, poisonous	Gas, yellowish, strong pungent odour, toxic, poisonous	Gas, brownish, almost odourless, more dense than air, highly poisonous, combustible, caustic, corrosive	Gas, colourless, strong pungent odour, caustic, toxic	Liquid, colourless, smells of almonds, highly poisonous, explosive when mixed with air

Key:

LEL: Lowest Explosive Limit
 UEL: Upper Explosive Limit
 TWA: Time Weighted Average
 ppm: Parts per Million

NOTE: All figures represent typical values. Local or national TWA limits may vary.

Risk Analysis and Safe Entry to Confined Spaces

Did you know?

Hydrogen Sulphide bubbling up from the sea may have caused a global extinction of flora and fauna nearly 250 million years ago.

If entry to a potential danger zone cannot be avoided, then it is essential to monitor the atmosphere. The check should be carried out from a safe location and ensure that all zones are measured. Sometimes, a combination of several gases can be found in potential danger zones. Consequently, the area must undergo a risk analysis. The official rules and regulations often specify the kinds of potential dangers that are to be expected and which gases need to be detected (sewage systems: O₂/EX/CO₂/H₂S). In enclosed

danger zones, the O₂/EX/CO/H₂S components should be continuously measured using a tested and approved multi-gas detector.

Honeywell Analytics has a number of portable gas detectors ideally suited to confined space monitoring; the Impact Pro can detect all the gases in the tables above (with the exception of HCN). In addition, the Impulse XP can monitor HCN as well as O₂, CO, H₂S, NH₃, Cl₂, NO₂, SO₂.