Figaro sensors for asphyxiating gases In Industrial Safety applications

In industrial safety applications, monitoring for oxygen (O_2) depletion and asphyxiant gases such as carbon dioxide (CO_2) and refrigerants is critical in environments where gases can displace oxygen and create life-threatening conditions without warning. Typical applications include confined spaces (e.g. tanks, utility tunnels, wastewater facilities), CO_2 storage and use areas (e.g. beverage production, cold storage, carbon capture systems), and refrigeration plant rooms and HVAC systems using modern low-GWP refrigerants. In these applications, detection systems must provide high reliability, fast response, and stable long-term performance, with particular emphasis on fail-safe operation for O_2 monitoring and accurate detection of CO_2 and refrigerant buildup before hazardous conditions develop. Within this context, the Figaro Engineering Inc. portfolio offers a range of complementary sensing technologies:

The **Figaro TGS 4260** is well suited to **fixed O_2 depletion monitoring** in environments such as inert gas blanketing systems, nitrogen storage areas, and confined spaces. It provides continuous measurement over a typical 0–25% O_2 range, covering both deficiency and enrichment conditions. Its key advantage lies in its long operational life of 5 years or greater and maintenance-free design, as it does not rely on consumable elements. With good long-term stability, high selectivity to O_2 and resistance to environmental variation, it is particularly suited to permanent installations where low maintenance is critical.

The **Figaro KE12F3-LF** is a galvanic electrochemical sensor designed for high accuracy, fast response oxygen monitoring in safety critical applications such as confined space entry and fixed safety systems. It provides a rapid response of less than 8 seconds and accurate measurement across a 0–25% O_2 range, with effectively no cross sensitivity to gases such as CO_2, H_2S, or SO_2, enabling reliable detection and alarming below critical thresholds (e.g. 19.5% O_2). Its linear output and high sensitivity support immediate detection and fast alarm response, making it a preferred choice where safety is critical.

The sensor is also particularly well suited to portable gas detectors and multi gas instruments, as it requires no external power and no warm up time, enabling instant

operation and efficient battery use. These characteristics, combined with its compact design and stable performance, make it ideal for personal safety monitoring.

Note that both the above oxygen sensors are lead-free and RoHS2 compliant.

Figaro Engineering does not currently offer a dedicated solution for industrial safety CO_2 monitoring. The NDIR-based Figaro CDM 7162 is designed for indoor air quality and ventilation control rather than safety-critical use. Its measurement range does not cover the higher concentrations (around 1–3% vol CO_2) associated with acute asphyxiation risk, and its response time of approximately 90 seconds (T90) is slower than typically required for safety alarm activation.

Importantly, unlike inert gases such as nitrogen or argon, CO_2 cannot be safely monitored using oxygen depletion alone, as it is toxic. Harmful effects, including loss of consciousness, can occur before oxygen levels fall to critical thresholds, making direct CO_2 detection essential in safety applications.

For refrigerant gas detection, the **Figaro TGS 2630** offers sensitivity to a wide range of refrigerants at concentrations below hazardous levels, also durability and resistance to interference gases. Its quick response enables early leak detection before significant oxygen displacement occurs.

The Figaro **TGS 3830** complements this by providing a low power consumption (120mW vs. 280mW for the TGS 2630 above) compact, even faster response solution suitable for intermittent use in portable and handheld devices, such as leak sniffers and inspection devices.

While the TGS 2630 and TGS 3830 excel at early leak detection and monitoring, even in high risk asphyxiation zones, they do not meet strict safety-critical performance standards (i.e. EN 60079-29-1) and thus should not serve as primary safety-critical sensors in such situations but as supplementary tools alongside more robust, certified systems.

For further information on sensors:
Lead-free electrochemical type oxygen sensors
TGS 4260 product information
KE12F3-LF product information
TGS 2630 product information
TGS 3830 product information