# Residual oxygen controlled blanketing in the chemical industry

- Built to CENELEC standards, category Ex ia IIC T 6, for greatest safety assurance
- High measurement accuracy helps control blanketing for improved quality of materials
- Continuous oxygen measurement ensures reliable blanketing control

## Application description

It is common in chemical plants to store certain products (raw materials and/or end product) under a blanket of modified (inert) atmosphere. The reasons are:

1. To avoid the formation of a flammable or explosive mixture (safety).
2. To prevent the material becoming deteriorated by oxygen in the air (quality).

Blanketing is commonly accomplished by use of two inert gas mixtures, either nitrogen (extracted from the air), or a mixture of $N_2$ and carbon dioxide (made out of air/fuel combustion). These gases are purged into the storage tank, covering the chemical product with a blanket of inert gas.

The blanketing process is controlled via an oxygen analysis system, measuring the residual $O_2$ present in the headspace of the storage tank, and injecting inert gas when required.

The choice of analyzer is generally made depending on the chemical product. Several aspects, such as selectivity (that is, influence of gases other than $O_2$ in the sample), speed of response, range, installation requirements, sample conditioning, and hazardous area classification, influence this choice.

Orbisphere's electrochemical $O_2$ analyzers perform very well in the harsh conditions present in the chemical industry. Their selectivity and response speed, together with the ease of sensor installation, make the Orbisphere $O_2$ analyzer a cost-effective and reliable means of blanketing control.

## Installation recommendations

Orbisphere's Intrinsically Safe analyzers consist of an $O_2$ sensor and an indicating instrument (with display) which can be installed in either the hazardous or the safe area.

The instrument electronics are housed in one or two tough, watertight stainless steel enclosures, depending on your hazardous area needs. Compact and lightweight, the indicating instrument can be mounted on a wall or directly on a process control panel.

The sensor can be installed either in-line or on-line to the storage vessel.

In-line installation is recommended for both cost-savings and speed of response. In this method, the sensor is installed directly on top of the storage vessel, in the hazardous area.

An Orbisphere sensor socket, welded onto a flange (for example, 2" ANSI 150 R.F.), is recommended for in-line sensor installation. The flange can be installed directly onto the storage vessel. Alternatively, for maximum maintainability, use a ball valve on a process line, such as the ProAcc Insertion/Extraction Valve, which enables sensor shut-off while the line is active. This allows sensor removal during maintenance, without the risk of $O_2$ pick-up or hazard for the operator.

For on-line installation, the gas sample is transported through tubing to the analyzer, located in a safe area, where the analysis is done using a sample flow chamber. Standard Orbisphere oxygen analyzers can be used in this configuration.

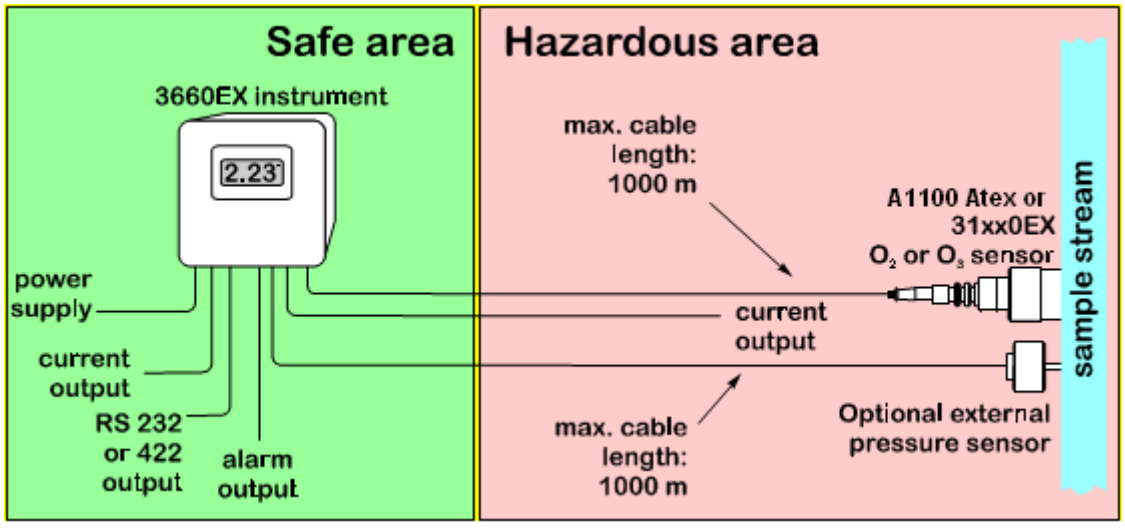
## Sensor materials

Since the $O_2$ sensor is in direct contact with the chemical substances, chemical resistance is a must. All wetted parts of Orbisphere's sensors are 316L stainless steel; as required, the sensor head can be made from other materials, such as Hastelloy C276. The sensor protection cap allows the use of a Gore-Tex water separation filter in applications where water vapor may condense onto the sensor. Kalrez washers are recommended instead of silicone to avoid swelling. Sensor head and sensor socket or flow chamber O-rings should be of Viton or Kalrez.

## Instrument output rage

Analog 0/4–20 mA current output of $O_2$ concentration is available as an isolated signal in the safe area and a non-isolated signal for the hazardous area. Often an application requires the instrument's output to match a specific measurement range. These output levels can be adjusted with the supplied Windows® software.

## Installation schematic



## Recommended systems components

| Model | Description |
|---|---|
| 3660EX.1xx | Intrinsically safe O2 instrument (xx = range: 0.1–999 ppm, 0.001–100 %, 0.1–999 pa, 1.00–999 kPa, 0.001–999 mbar, or 1.00–9.99 bar) |
| A110E-SVS | A1100 O2 sensor, ATEX, SS, viton o-rings, cap with grille |
| 32515E.mm | Intrinsically safe O2 sensor cable (mm = length) |
| 29501 | Sensor socket, stainless steel |
| 32003 | ProAcc Insertion/Extraction valve |
| 32685 | WIN3660 Windows PC software |
| 29552A-AV | Recharge kit, 29552A membranes (4x), viton o-rings for A1xxx sensors |

## Alternative sensors configuration

| Model | Description |
|---|---|
| A110E-SKS | A1100 O2 sensor, ATEX, SS, kalrez o-rings, cap with grille |
| A110E-HVS | A1100 O2 sensor, ATEX, hastelloy, viton o-rings, cap w/o grille |
| A110E-HKS | A1100 O2 sensor, ATEX, hastelloy, kalrez o-rings, cap w/o grille |
| 31120E.x1 | Intrinsically safe O2 sensor, parts in contact with sample in stainless steel, other parts PEEK, 50 bar pressure (x = O-ring material) |

## Options

| Model | Description |
|---|---|
| 2956A-AV | Recharge kit, 2956A membranes (4x), viton o-rings for A1xxx sensors |
| 2956A-AK | Recharge kit, 2956A membranes (4x), kalrez o-rings for A1xxx sensors |
| 29552A-AK | Recharge kit, 29552A membranes (4x), kalrez o-rings for A1xxx sensors |
| 32706 | Maintenance kit for oxygen electrochemical sensors. Includes membranes 29552A, electrolyte 2959, membrane holding ring 29229.01, and tools for sensor maintenance. (Replaces 32706L & 32706M.) |