

CO₂ Purity Monitoring

Relevant for: Breweries and Cider Manufacturers

In breweries carbon dioxide (CO₂) from fermentation is collected and purified to improve brewing sustainability and ensure CO₂ self-sufficiency. The CO₂ Purity Monitor for inline measurement of oxygen gives critical information for efficient processing and high-quality CO₂.

1 CO₂ recovery

Large amounts of ultra-pure CO₂ are required during the beer production (for carbonation, adjusting counter pressure, filling and bottling). Many breweries are self-sufficient by recovery of CO₂ that naturally occurs during fermentation and maturing of beer.

In a CO₂ recovery plant CO₂ from fermentation is collected, filtered, compressed, dried and purified from permanent gases such as oxygen (O₂) and nitrogen (N₂). In recovered CO₂ the oxygen content should not exceed ~ 5 ppmv to minimize oxygen intake, ensure beer stability and long shelf life.

Reliable and accurate monitoring of O₂ is mandatory to ensure high purity of the recovered CO₂ and economical processing.

2 Measurement solution

The Anton Paar solution consists of the CO₂ Purity Monitor for accurate and reliable inline monitoring of the oxygen content and temperature continuously. An integrated, fully-automated O₂ monitoring gives critical information if incoming CO₂ from fermentation is within the limits to ensure high-quality and efficient CO₂ recovery. The influence of the process pressure is compensated. The measurement is not influenced by foreign gases and humidity. The CO₂ Purity Monitor is installed after foam removal and before compression (Figure 1). This avoids the risk of fluids completely covering the sensor – falsifying the measurement results.

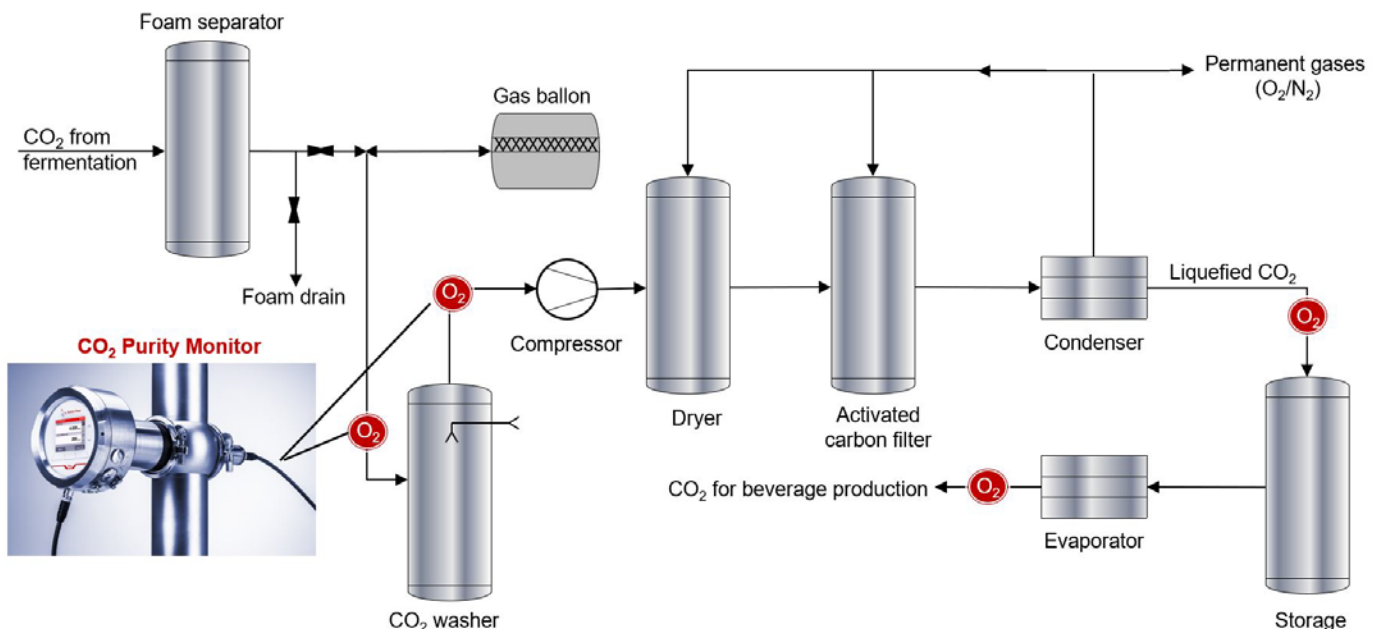


Figure 1: Anton Paar solutions for O₂ monitoring in CO₂ recovery plants

3 Measurement setup

The CO₂ Purity Monitor consists of an Oxy 5100 inline oxygen sensor and a pressure sensor which are installed directly in the line using a hygienic

VARIVENT® flange (Figure 2). The CO₂ Purity Monitor fulfills international hygienic standards and is EHEDG-certified. The application-specific calculations are carried out by the mPDS 5 or the Pico 3000

evaluation units. Up to 8 CO₂ Purity Monitors can be connected to one mPDS 5 and the results can be displayed and transferred to a PLC or to the Davis 5 data acquisition and visualization software. Alternatively, the CO₂ Purity Monitor can be connected to a Pico 3000 RC housing for remote control.



Figure 2: CO₂ Purity Monitor with Pico 3000

The Lifetime Estimator of the Oxy 5100 estimates the remaining cap life of the sensor cap [days, %] and warns you when a new sensor cap is required.

All sensor caps of Oxy 5100 are equipped with a Toolmaster™ enabling auto-detection of all required configuration and calibration parameters for each cap. Manual intervention via a HMI is not necessary, thus reducing downtime and human errors resulting in a quick and easy cap exchange.



Figure 3: Sensor caps with Toolmaster™

Specification: CO ₂ Purity Monitor	
Process pressure (measurement)	max. 5 bar abs. (72 psi abs.)
Process pressure	max. 12 bar abs. (174 psi abs.)
Pressure compensation	0.6 to 5 bar abs. (9 psi to 72 psi abs.)
Sample temperature	-5 °C to +65 °C
CIP/SIP temperature	max. 99 °C, max. 130 °C (max. 30 min)
Ambient temperature	-5 °C to +50 °C
Certificates	EHEDG (Type EL – Class I)
Communication (using Pico 3000)	Analog, Analog/Digital HART Modbus RTU/TCP PROFIBUS DP PROFINET IO EtherNet/IP

Depending on the required measuring range trace and wide range sensor caps are available:

Sensor cap	Measuring range ¹	Accuracy ^{1,2}
Trace range	0 – 4.2 % O ₂ (0 – 40 hPa)	≤ ± 25 ppmv or ± 3%
Wide range	0 – 50 % O ₂ (0 – 500 hPa)	≤ ± 0.1% O ₂ or ± 3%

¹at 20°C, 960-980 hPa

²two point adjusted, the larger value is valid

4 Benefits

The reliable and accurate CO₂ Purity Monitor enables

- Real-time inline monitoring of oxygen content
- Improved CO₂ processing quality and efficiency
- Detection of any irregularities and controlling the process in real-time
- Predictable, quick and easy sensor cap exchange
- Selective measurement (no influence of humidity)

5 Overview – Anton Paar Solutions

CO₂ Purity Monitor

O₂ content in CO₂ (in pressurized gas)

Oxy 5100

O₂ content in CO₂ (at atmospheric pressure)

Gas conditioning required and supplied by Anton Paar on demand.

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