

## CO<sub>2</sub> & O<sub>2</sub> Meter Series



Lab & At-line  
CO<sub>2</sub> and O<sub>2</sub> Meters  
for the Beverage  
Industry

# Wherever You Are: Measurement of Dissolved CO<sub>2</sub> and O<sub>2</sub> in Beverages

In the production of alcoholic and non-alcoholic beverages, it is essential to check and control the CO<sub>2</sub> and O<sub>2</sub> content of the product both during the production process and after bottling.

The CO<sub>2</sub> content strongly influences the taste of beverages and is a considerable cost factor in beverage production.

**Precise measurement of the carbon dioxide ensures consistent taste and cost-efficient dosing.**

A high level of dissolved O<sub>2</sub> in beverages has a negative impact on the taste and shelf life of the beverage.

**The continuous monitoring of the oxygen content ensures product safety and permanent beverage quality.**



## Have it all: CO<sub>2</sub> and O<sub>2</sub> combined

Anton Paar's new instrument, CboxQC™, combines the fast measurement of CO<sub>2</sub> and O<sub>2</sub> in one measuring cycle.

CboxQC™ is available for portable use at-line as well as in a standalone version for the laboratory. For the utmost flexibility, the instruments' new and robust design is small, compact and lightweight.

# The Best Instrument for Your Application

Whether directly at the production line, in the laboratory or as part of a larger beverage analyzing system, Anton Paar provides the best instrument for your measurement application. The range includes instruments for measuring dissolved oxygen and dissolved carbon dioxide without being influenced by other dissolved gases.

## At-line

measurement

CO<sub>2</sub>  
Air|N<sub>2</sub>|O<sub>2</sub> Index



CarboQC At-line

CO<sub>2</sub> | O<sub>2</sub>  
Air|N<sub>2</sub>|Index



CboxQC™ At-line

O<sub>2</sub>



OxyQC  
OxyQC Wide Range

## Laboratory

measurement



CarboQC



CboxQC™



OxyQC  
OxyQC Wide Range

## System modules

integrated in PBA Gen. M  
measuring systems



CarboQC ME



CarboQC ME  
with Option O<sub>2</sub>



# At-line Instruments from the Measurement Experts

At-line measurements – whether from filling lines, tankers, BBTs, kegs or casks – provide the assurance that your production process is under control. Besides this, at-line instruments are used to monitor process instruments.

## Fully protected for harsh environments

Anton Paar's at-line series of instruments are built to operate for years under rough conditions. The robust and leakproof housings keep humidity out of the electronics and stop any spills from entering the instrument.

## Easy to use, easy to read

The color display makes sure you see your measuring results clearly, even in dark surroundings. Due to the intuitive user interface, standard operations can be performed easily in nine different languages. The eight large keys enable operation of the instrument even when wearing protective gloves.

## Continuous control of CO<sub>2</sub> and O<sub>2</sub>

Using the CO<sub>2</sub> and O<sub>2</sub> Data Logger function you define the interval for automatic continuous measurements from the sample point. With a memory capacity of 500 measurement data sets, Anton Paar's at-line instruments are prepared for a long working day.

## Get started fast with RFID

Equipped with an RFID interface option, the instruments enable you to quickly and conveniently start the measurement by just reading a programmed RFID tag. Whether using RFID or manual settings, the instruments ensure full traceability.



## Keeping within your beverage targets

The Threshold value functionality enables you to set CO<sub>2</sub> and O<sub>2</sub> target margins. Whenever your production process shows slight target deviations, the instrument reports immediately and you are on the safe side! This is a time- and money-saver – your operators can take action within seconds!

## Fast measurement saves you time and money

By measuring CO<sub>2</sub> and O<sub>2</sub> in only 90 seconds, Anton Paar's CboxQC™ At-line saves you valuable working time and money.

## Teams up with process instrumentation

The at-line instruments are the ideal complement to Anton Paar's process instrumentation, such as the Carbo 510 online CO<sub>2</sub> analyzer and Cobrix 5 inline beverage analysis system for °Brix, Diet and CO<sub>2</sub> monitoring.

### Specifications:

		CarboQC At-line	CboxQC™ At-line	OxyQC OxyQC Wide Range
Measuring range	CO <sub>2</sub>	0 g/L to 12 g/L (0 vol. to 6 vol.) at 30 °C (86 °F)		
	O <sub>2</sub>		0 ppm to 4 ppm	0 ppm to 4 ppm
				0.015 ppm to 45 ppm
	Temperature	-3 °C to 40 °C (27 °F to 104 °F), acc. ± 0.2 °C		
	Pressure	0 bar to 10 bar absolute (0 psi to 145 psi), acc. 0.01 bar		
Repeatability s.d.	CO <sub>2</sub>	0.04 g/L (0.02 vol.)		
	O <sub>2</sub>		± 2 ppb (< 200 ppb)	± 2 ppb (< 200 ppb)
				± 20 ppb (< 5 ppm)
Resolution	CO <sub>2</sub>	0.01 g/L		
	O <sub>2</sub>		0.1 ppb (< 100 ppb)	0.1 ppb (< 100 ppb)
				1 ppb
Measuring units	CO <sub>2</sub>	g/L, vol., mg/L, kg/cm², MPa, % w/w		
	O <sub>2</sub>		ppm, ppb, mg/L, µg/L, % Air-sat., % O <sub>2</sub> -sat.	
Measuring time		55 seconds	90 seconds	50 seconds
Data memory		500 measurement data sets		
Built-in support		CO <sub>2</sub>   O <sub>2</sub> Data Logger, threshold value functionality, system check		
Portable use		Up to 10 hours continuous use		
Interfaces		1x USB, 1x RS-232; optional: RFID, Bluetooth		
Accessories		High-performance battery, carrying strap, RFID tags, printer		
Protection class		IP 67		
Weight		2.1 kg (4.6 lbs)	2.7 kg (6 lbs)	1.7 kg (3.7 lbs)



# Your Longstanding Partner for the Laboratory Measurements

Using Anton Paar's laboratory solutions for dissolved gas measurement allows you to perform reliable QC on finished packages and run measurements for product development with the highest accuracy.

## Small sample amount? No problem!

The very low required sample volume of around 100 mL allows reliable CO<sub>2</sub> and O<sub>2</sub> results, even out of very small packages.

## High accuracy, more benefit

The patented selective CO<sub>2</sub> measuring method is not influenced by other dissolved gases such as air or nitrogen. Together with the high-resolution optochemical oxygen sensor the results achieve the highest accuracy.

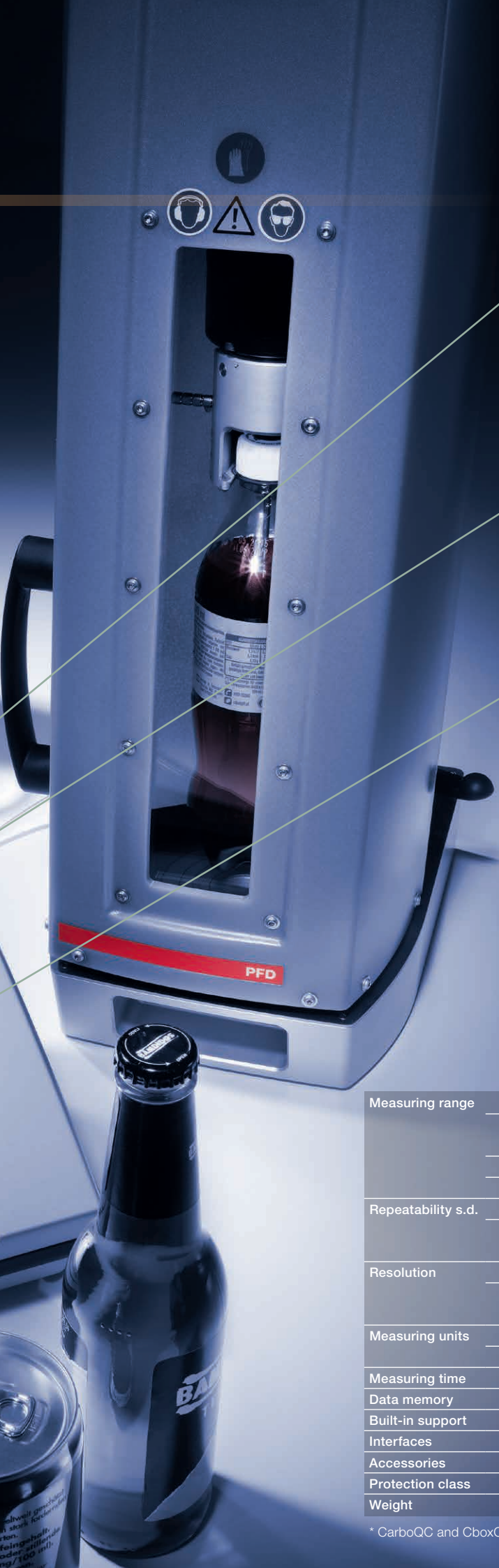
## Low-carbonated beverages? No problem!

With a measuring range from 0 g/L to 12 g/L, Anton Paar's CO<sub>2</sub> meters not only measure highly carbonated beverages, but also samples at low CO<sub>2</sub> levels with outstanding accuracy.

## TPO quick check? For sure!

By measuring dissolved oxygen the Total Package Oxygen value can be determined cost-effectively via Anton Paar's free software AP-SoftPrint or by connecting to a DMA Generation M system.





## ○ Easy checks – reliable results

Anton Paar's CO<sub>2</sub> and O<sub>2</sub> meters are supplied factory-adjusted and can be used right from the start. Numerous wizard features guide you through periodical recommended system checks and help in your everyday work.

## ○ Correct filling for correct results

Correct results strongly depend on the right filling under pressure: the new series' integrated FillingCheck™ feature automatically detects filling errors.

## ○ Works through power outages

Voltage fluctuations or power outages are no threat for the new series of instruments. They automatically switch to battery-operated mode and you can easily continue your measurements as planned without losing any data, time or money.

### Specifications:

		CarboQC	CboxQC™	OxyQC OxyQC Wide Range
Measuring range	CO <sub>2</sub>	0 g/L to 12 g/L (0 vol. to 6 vol.) at 30 °C (86 °F)		
	O <sub>2</sub>		0 ppm to 4 ppm	0 ppm to 4 ppm
				0.015 ppm to 45 ppm
	Temperature	-3 °C to 40 °C (27 °F to 104 °F), acc. ± 0.2 °C		
	Pressure	0 bar to 10 bar absolute (0 psi to 145 psi), acc. 0.01 bar		
Repeatability s.d.	CO <sub>2</sub>	0.01 g/L (0.005 vol.)		
	O <sub>2</sub>		± 2 ppb (< 200 ppb)	± 2 ppb (< 200 ppb)
				± 20 ppb (< 5 ppm)
Resolution	CO <sub>2</sub>	0.001 g/L		
	O <sub>2</sub>		0.1 ppb (< 100 ppb)	0.1 ppb (< 100 ppb)
				1 ppb
Measuring units	CO <sub>2</sub>	g/L, vol., mg/L, kg/cm², MPa, % w/w		
	O <sub>2</sub>		ppm, ppb, mg/L, µg/L, % Air-sat., % O <sub>2</sub> -sat.	
Measuring time		55 seconds	90 seconds	50 seconds
Data memory		500 measurement data sets		
Built-in support		FillingCheck™, threshold value functionality, system check		
Interfaces		1x USB, 1x RS-232 (CAN-open*); optional: RFID, Bluetooth		
Accessories		PFD, SFD, carrying strap, RFID tags, printer, rubber protection		
Protection class		IP 67		
Weight		2.0 kg (4.4 lbs)	2.6 kg (5.7 lbs)	1.7 kg (3.7 lbs)

\* CarboQC and CboxQC™ only



# The Perfect Complement

Using Anton Paar's CO<sub>2</sub> and O<sub>2</sub> instruments in combination with a piercing and filling device means easy handling. Just press 'Start' and the sample is transferred to the measuring chamber without any loss of CO<sub>2</sub> and O<sub>2</sub>. Reliable results can therefore be guaranteed.

## SFD Sparkling Wine Filling Device

Transfers samples from wine and sparkling wine bottles closed with corks. Using the SFD, the operator pierces the cork manually and inserts a sample tube. The sample is transferred under pressure. The SFD filling device can be used with most plastic and traditional corks.

- ▶ Full operator protection
- ▶ For all sizes, from small bottles to magnum bottles
- ▶ Sample transfer directly from the bottle

## PFD Piercing and Filling Device

Fills samples reliably and safely directly out of closed PET bottles, glass bottles or cans into the measuring chamber. No sample preparation, such as degassing or filtering, is needed.

PFD pierces the bottle closure or the base of the can automatically and transfers sample from the package using compressed gas.

- ▶ Gas spring for safety shield ensures operator safety
- ▶ Easy cleaning due to removable safety shield
- ▶ Robustness guaranteed by clever design and high-quality materials
- ▶ Additional splinter shield for protection when the full amount of sample is needed out of glass and PET bottles



### Specifications:

	SFD piercing and filling device for sparkling wine and wine
Filling mode	Pressurized filling from closed and open packages
Compressed gas supply	7.5 bar rel. ± 0.5 bar (109 ± 7 psi) for sparkling wine 3 bar rel. ± 0.5 bar (44 ± 7 psi) for wine
Package types	Glass bottles: 0.2 L to 1.5 L
Ambient temperature	0 °C to +40 °C (+)
Dimensions	320 mm x 370 mm x 550 mm (12.6 in x 14.6 in x 21.7 in)
Weight	12.3 kg (27.1 lbs)



# Built to Work in a Team

Which beverage parameters do you need to determine? Combine a CarboQC ME module with a wide range of Anton Paar instruments to get the beverage analysis you need in one measuring cycle, with minimum sample preparation required. This teamwork brings quick and efficient results and saves space in the lab.

## Stability for years

As the measuring module is permanently connected to the density meter and does not have to be disconnected or moved, it has a high level of system stability. This gives you reliable results over a long working life.

## Fit for the future

Whether you require an Alcoalyzer, the Option O<sub>2</sub>, pH or other modules at a later date, Anton Paar's modular concept allows you to create a measuring system to exactly suit your requirements.



### PFD (Plus) piercing and filling device

Pressurized filling from closed packages

6 bar rel.  $\pm$  0.5 bar (87  $\pm$  7 psi)

Glass bottles | cans | PET bottles

-32 °F to +104 °F)

190 mm x 270 mm x 670 mm (7.5 in x 10.6 in x 26.4 in)

10.1 kg (22.3 lbs)



# What to Know as a CO<sub>2</sub> Expert

Based on the main physical laws in gas measurement, Anton Paar invented and patented (AT 409673, GB 237 3584, US 6,874,351) the CO<sub>2</sub> measuring principle called Multiple Volume Expansion (MVE) method. It selectively determines the true dissolved CO<sub>2</sub> content in beverages based on pressure and temperature measurement.

## Multiple Volume Expansion (MVE) method speaks for itself – a certain volume is expanded! How often?

Based on Henry's law, the filled CO<sub>2</sub> measuring chamber is expanded twice and temperature and pressure are measured two times.



*Henry's law states that at equilibrium the concentration of dissolved gas in a liquid is proportional to the partial pressure of that gas above the liquid.*

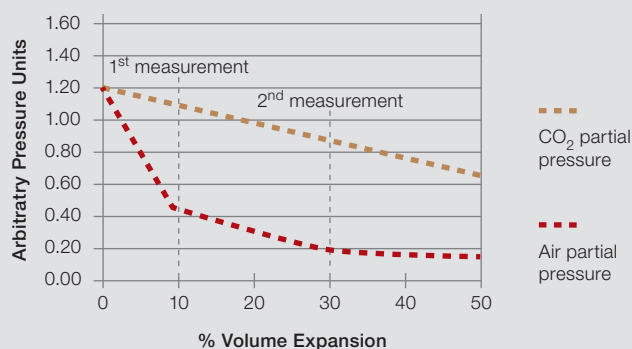
## What makes the MVE method that outstanding?

Based on Dalton's law, it makes use of the fact that the solubility of air in beverages is much lower than that of CO<sub>2</sub>. When expanding the volume of the measuring chamber twice, the partial pressures of air and CO<sub>2</sub> can be separated! The result: the true CO<sub>2</sub> content can be measured selectively!



*Dalton's law states that the total pressure measured in a gas phase is the sum of the partial pressures of all gases present in the gas phase. In the case of beverage analysis, these are the partial pressures of carbon dioxide, oxygen and nitrogen as well the vapor pressure of water.*

## Multiple Volume Expansion Method



The difference between the equilibrium pressure and temperature results measured at the first and second volume expansions is used to determine the amount of dissolved air and mathematically calculate and compensate for this amount. The result is the true CO<sub>2</sub> concentration in the beverage.

## What are the benefits of the patented MVE method?

- ▶ No influence of weather & altitude – absolute pressure sensor integrated!
- ▶ Not influenced by dissolved air – selective measurement of dissolved CO<sub>2</sub>!
- ▶ MVE enables low carbonation measurement – down to 0 g/L!
- ▶ No sniffing required – no compensation tables!
- ▶ Most precise measurement performance!

# What to Know as an O<sub>2</sub> Expert

Anton Paar's oxygen meters for laboratory, at-line and system use contain the highly accurate optochemical sensor for fast measurement of dissolved oxygen. Based on the effect of luminescence quenching the state-of-the-art sensor provides precise results within seconds based on a proven technology.

## How does the sensor work?

Inside the optochemical oxygen sensor, a light-emitting diode illuminates the light-sensitive layer which is in direct contact with the sample.

The luminescent dye molecules absorb the light that is emitted as a pulse from the LED and get transferred to a higher energy level. The photodiode quantifies the emitted light.

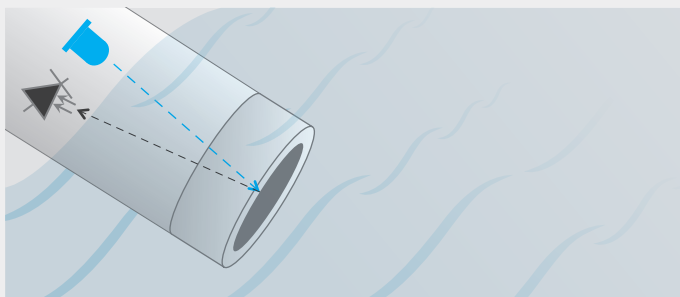


## What's the luminescence quenching effect?

*The more oxygen is present, the more energy gets transferred from the excited dye to the oxygen molecules. The fact that oxygen takes over energy from the excited dye is called "luminescence quenching".*

## What makes the optochemical sensor that outstanding?

The highly accurate determination of dissolved O<sub>2</sub> is based on the optochemical sensor's very fast response time and ideal temperature behavior. This leads to stable and precise results in less than 50 seconds. Durability and minimal maintenance make the long-lasting optical sensor stand out.



## What happens in the absence or presence of oxygen?

If no oxygen is present, the entire absorbed light gets emitted again. If dissolved oxygen is present, the energy gets transferred to the oxygen.

In short, knowing the amount of excitation light, the quantity of emitted light is a measure of the amount of oxygen in the sample.

The more oxygen the less emitted light gets to the photodiode.

## What are the benefits of the optochemical way of measuring oxygen?

- ▶ No electrolyte solutions necessary!
- ▶ No consumption of oxygen in the measurement process!
- ▶ Excellent long-term stability of the sensor!
- ▶ No influence by any flow rate of samples!
- ▶ No influence by any other gases!



