

Accurate in-line dissolved ozone measurements in bottled water

Ozone Analysis in Bottled Water

The measurement of dissolved ozone in the bottled water industry has two main concerns that need consideration when using process instrumentation to monitor O_3 concentrations. First, the use of O_3 as a disinfectant must not create any additional bi-products that affect the water quality, such as the formation of bromate from water containing bromide. In addition, ozone production uses electricity, and in many facilities oxygen, so it is critical to minimize the ozone concentration and deliver the optimal level of ozone in the process.

The best way to control ozone injection in the process water is by using feedback and PID controllers, which vary the levels of ozone into the water depending upon the real-time process conditions. Having fast accurate measurements allows for excellent control of ozone injection. This ensures that the proper amount of ozone is introduced into the product eliminating out-of-spec production and saving on energy and oxygen costs.

O_3 is relatively expensive to produce and if it is not accurately controlled it has the possibility of creating some undesirable disinfection by-products. For these reasons, it is essential for bottled water plants to monitor and control their ozonation process at precise levels.



Ozonation Control

Using accurate fast process instrumentation like the Hach C1100 ozone system can alleviate concerns regarding real-time process instrumentation. The C1100 sensor uses Hach's Orbisphere patented technology to build ozone sensors that have a true zero. There is never a need to "zero" the sensor during calibration. Just calibrate the sensor in "air" to deliver the highest accuracy possible.

Most disinfection by-products happen at higher ozonation levels, so low level measurement accuracy is extremely important. Having an ozone sensor with a true "zero" eliminates calibration and drift issues that can plague sensor where low level accuracy is crucial to the process.

Fast response and high accuracy are important to automated ozonation control. When coupled with an ozonation feedback-loop controller, the Orbisphere C1100 sensor with its fast response-time ensures that water is properly ozonated. Benefits include:

- Precise ozonation level feedback control
- Unique air calibration needs no wet chemistry
- Prevent product loss by measuring in the process pipe



C1100 Ozone Sensor

Sampling Methods

The C1100 O₃ sensor is rated IP 68 and will withstand harsh wet conditions. When sampling process water, it can be installed using two distinct methods.

1. Directly in a process pipe after the ozone tank or injector (in-line application)
2. To minimise product loss the C1100 sensor may be mounted directly in a process pipe.
3. In a sample side-stream drawn from the process pipe with a flow chamber (on-line application)

Where it is impractical to make measurements directly in-line, a sample may be flowed past the O₃ sensor mounted in a flow chamber on a sample side stream. Ideal measurement parameters call for the flow chamber to be mounted as close to the process pipe as ideal. Any flow rate control should be done after the ozone sensor, to assure that all the ozone remains in solution while it is being measured. The optimal flow rate for a C1100 sensor in a flow chamber is 350 mL/min.

Process Measurement Methods

In-line

- **29501 Weld-on stainless Sensor Socket**

Used to install a sensor into a stainless steel pipe. Line needs to be drained to extract the sensor for maintenance or calibrations.

- **33095 Stationary Housing**

Allows sensor to be installed onto a Varinline® in-line access unit. With this device, line needs to be drained to extract the sensor for maintenance or calibrations.

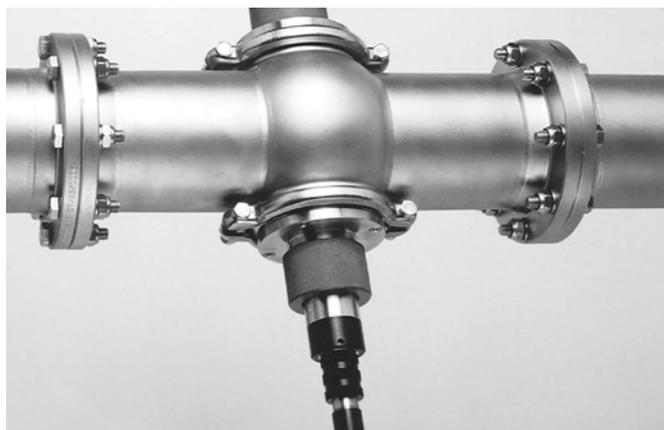
- **32003 ORBISPHERE ProAcc Insertion/Extraction Valve**

Allows for sensor removal and installation without having to drain the fluid in the line. It can withstand a pressure of up to 20 bars, with the sensor in place or not. Requires a Varinline® in-line access unit.

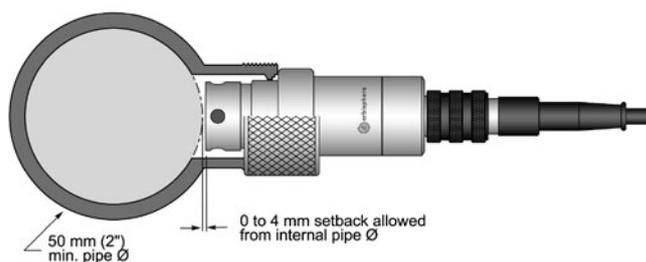
On-line

- **32001 Orbisphere Flow Chamber**

Sample taken from the production line and fed through a flow chamber with sensor installed. Sample conditions can be precisely controlled to ensure stable readings.



Varinline® in-line access unit with either Stationary Housing (33095) or Insertion/Extraction Valve (32003)



Weld-on Sensor Socket (29501)



Orbisphere Flow Chamber (32001)

Partnering with Hach Beverage

To help the bottled water industry, Hach takes from its vast experience helping pharmaceutical and semiconductor manufacturing facilities monitor their critical ozonation levels. This same commitment to quality and support is available through our beverage experts, who can help you achieve product quality.