biosystems Application Note	Using a Cl2 sensor to monitor for ClO2	Date	1-1-2000
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Using a chlorine sensor to monitor for the presence of chlorine dioxide

The standard chlorine (Cl_2) sensor used in Biosystems instruments shows an excellent response to chlorine dioxide (ClO_2) In fact, the response is about 3.1:1 in favor of ClO_2, making it ideal for monitoring for this contaminant. There are some important considerations to bear in mind when making use of a chlorine sensor for this purpose:

1. Chlorine sensors respond both to chlorine *and* chlorine dioxide

Although the chlorine sensor is 3.1 times more responsive to chlorine dioxide than to chlorine, it *will* respond to either hazard. A sensor which has been calibrated for the detection of ClO_2, then exposed to a concentration of 3.1 ppm chlorine will still show a reading of 1 ppm. It works the other way as well. If you calibrate the sensor to chlorine, then expose it to 1 ppm ClO_2 it will show a reading of 3.1 ppm. We take advantage of this cross sensitivity ratio when calibrating the sensor.

2. How do you calibrate the chlorine sensor for the measurement of chlorine dioxide

Biosystems normally suggests using the same mixture of 5 ppm chlorine (balance nitrogen) for calibrating the sensor for the detection of *either* hazard. If the sensor is calibrated for the detection of chlorine, simply adjust the readings of the sensor when exposed to the 5 ppm calibration gas to register 5 ppm. On the other hand, if the sensor is being calibrated for the measurement of chlorine dioxide, the readings should be adjusted to register 1.7 ppm.

Because 1.7 ppm of ClO2 produces the same electrical output from the sensor as 5 ppm chlorine, a concentration of 1 ppm ClO_2 will produce a reading of 1 ppm when the instrument is adjusted in this manner.

3. Instruments which have been calibrated for measurement of chlorine dioxide should not be used for measurement of chlorine unless they are recalibrated

Be careful that instruments which have been calibrated for chlorine dioxide are labeled "Not for use for measurement of chlorine". Remember that in an instrument calibrated for chlorine dioxide, it would take 3.1 ppm chlorine to produce a reading of 1 ppm on the instrument LCD. Instruments *must* be recalibrated before being used to measure chlorine. To recalibrate your instrument simply adjust the readings to 5 ppm when you expose the sensor to 5 ppm chlorine calibration gas.

4. Can you still use "One Button" automatic calibration adjustment when calibrating your instrument for chlorine dioxide?

You can still use the automatic calibration adjustment feature, all you have to do is specify that the concentration of gas being used is 1.7 ppm. Section 5.2 of the Toxi Ultra Owner's Manual discusses how to re-set the calibration gas concentration. Once again, make sure the instrument is labeled "Not for use for measurement of chlorine". If the calibration gas concentration has been changed it will be necessary to change the calibration gas concentration back to 5 ppm if the instrument is recalibrated for chlorine.

5. Where should I set the alarms?

Environmental conditions can have an effect on electrochemical toxic sensor readings. Chlorine sensors can be affected by shifts in humidity and the presence of interfering gases. When the alarms for ClO_2 are set at 0.1 ppm it doesn't take much to generate a false positive alarm.

Generally customers who use chlorine sensors to monitor for ClO_2 develop their own "custom" alarm points based on their own program requirements.

One strategy used by some of our customers is to set the TWA alarm deliberately high. If the TWA alarm is set at 0.5 ppm or higher, humidity induced alarms are much less likely. The ceiling (instantaneous) alarm and the STEL alarm should be set at 0.3 ppm. The NIOSH TLV and OSHA (1989) permissible exposure limit for ClO 2 allows workers to spend up to 15 minutes in concentrations of up to 0.3 ppm. Setting the ceiling (instantaneous) alarm at 0.3 ppm and instructing workers to immediately leave the affected area ensures that workers are not exposed to dangerous concentrations.