EVOQUA WATER TECHNOLOGIES

LENNTECH WATER TREATMENT SOLUTIONS

WALLACE & TIERNAN® ANALYZERS/CONTROLLERS DEOX/2000® MEASUREMENT MODULE FOR SO_2 DECHLORINATION

Product Overview

The Deox/2000® dechlorination measurement module is the most effective on-line instrument for accurate measurement of both sulfite and total chlorine residuals in wastewater plant effluent. With its unique "center zero" residual analysis capability, control to a SO_2 setpoint is achievable and ensures complete dechlorination at a level to support compliance with discharge permits. Costly SO_2 overfeed is minimized. This measurement technology is used with either the SFC electronic package for single point analysis and control or the versatile MFC electronic package for multiple measurement and control capabilities.

The Deox/2000 measurement module incorporates a unique process to measure sulfite residuals. It is based on the principle of biasing the sample with an iodine source that is unaffected by sample quality. With this stable "iodine bias", a reduction in the iodine level in the sample is proportional to a SO_2 residual. Conversely, an increase in the iodine level is proportional, to a Cl_2 residual. Therefore, you can measure and control to either a SO_2 or Cl_2 residual in the dechlorination process.

Applications

- Municipal wastewater chlorination / dechlorination processes
- Cooling water
- Industrial process water and wastewater

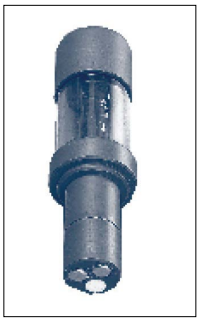
Standard Features

- Continuous, on-line measurement of both sulfite and chlorine residuals
- Five operating ranges from 0.5mg/L SO_2 - 0.5mg/L Cl_2 to 10.0mg/L SO_2 - 10.0mg/L Cl_2
- Proven, amperometric, three electrode measuring cell for direct measurement of residuals
- Unaffected by varying water quality, changes in turbidity, temperature or conductivity
- Stable chloramine-T reagent for generation of the iodine bias

Key Benefits

- Supports compliance with discharge permits for Cl_2 residuals in wastewater and cooling water processes
- Sulfite residual monitoring prevents costly overfeed of the dechlorination chemical
- Low sample flow cell design for economical reagent usage
- Fast speed of response for control applications and monitoring rapid water quality changes
- Separate flow cell and electronic packages for installation flexibility

DEOX2000



Measuring Cell

Optional Features

- Choice of peristaltic pump speed - for monitoring applications, a 1 rpm pump is used to minimize reagent usage; for use in a control loop, a 2 rpm pump is used to provide a quick response to a process change
- Sample line dosing - a biocide metering pump can be used with the integral control software to prevent biofouling of the sample line
- Circular chart recorders - feature "zero-centered" chart ranges (mg/L SO_2 - 0-mg/L Cl_2)

Modular Design

The Deox/2000® measurement module is used with either an SFC or MFC electronic package. The Deox/2000 measurement module consists of a separate flow cell enclosure for wall mounting and a plug-in electronic module. Typically, the Deox/2000 enclosure is mounted adjacent to either the SFC or MFC electronics, but can be separated for a distance up to 2m (6 ft). The lift-off, removable cover provides quick access to the flow block, measuring cell and peristaltic sample/reagent pump. All liquid lines are piped to a common drain. When required, reagent bottles are mounted below the analyzer enclosure with the supplied brackets. Utilizing "plug and play" technology, the SFC or MFC automatically recognizes the Deox/2000 electronic modules to display the correct information. The SFC or MFC electronics provide multiple alarm outputs, a 0/4-20 mA residual output signal and an RS 232 or RS 485 digital interface. In addition, center-zero setpoint control can be provided in the SFC or MFC.

Three Electrode Measuring Cell

Utilizing universally accepted and time-proven amperometric measurement technology, the Deox/2000 flow cell uses an innovative 3-electrode measuring cell to provide direct measurement of residuals. This provides you with an accurate, verifiable output for monitoring and control independent of changing water conditions. With its bare electrode design, the Deox/2000 flow cell is not susceptible to the fouling typical in membrane probe analyzers, caused by bacteria, grease or turbidity. The 3-electrode cell eliminates the need for constant zero adjustments typical of other analyzers. Reliability and stability are vastly improved while maintenance is drastically reduced.

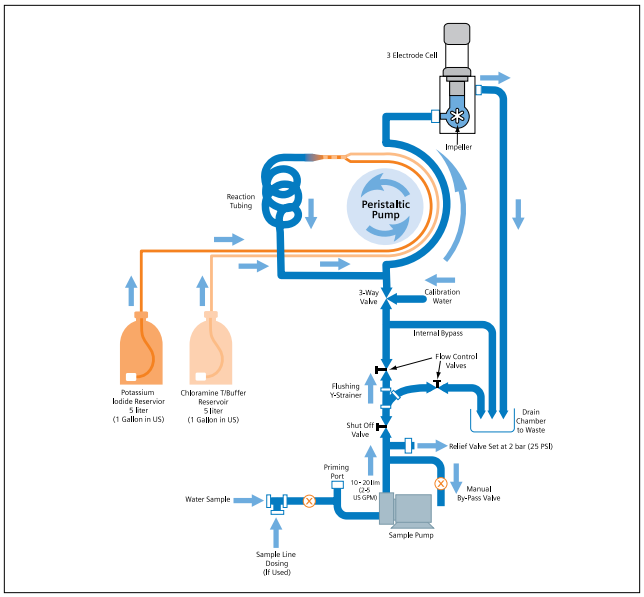
Unique Sample Flow System

The dechlorinated sample is delivered to the Deox/2000 measurement module at a rate of 11 - 19 l/m (3-5 US gpm) via a suitable sample pump downstream of the sulfite application point. A flushing Y-strainer in the sample line filters the sample and divides it into two streams. The larger excess sample stream is used to continuously flush the strainer screen. The smaller stream is throttled and flows to the analyzer.

Inside the Deox/2000 measurement module, a valveless peristaltic pump is utilized to ensure a consistent sample reaches the analyzing cell for timely measurement in parallel with the actual process lag time. This pump also delivers liquid reagents in a fixed proportion to the sample. Separately stored, a stable chloramine-T buffer and KI solutions are mixed prior to entering the sample. The mixture converts to iodine for biasing the sample while providing the necessary pH adjustment. A motor driven impeller in the analyzing cell maintains stable fluid velocity and provides constant grit bombardment for cleaning electrode surfaces. The cell measures the amount of Iodine after reaction with the sample and compares it to the known bias to determine the amount of SO_2 or Cl_2 in the sample.

Automatic Sample Line Dosing

One of the inherent problems in wastewater dechlorination applications is biological growth in the sample line, from the sample pump to the analyzer, due to very low or no chlorine residuals. As an option, the analyzer can be supplied with a small dosing pump for metering a suitable biocide (typically sodium hypochlorite) to clean the sample line. The pump is activated by the analyzer software to automatically dose the sample line periodically. During dosing, the analyzer's 4-20 mA output is frozen to prevent upsets to the control or monitoring operations. Analyzer reliability is enhanced and maintenance is reduced.



Sample Flow Diagram

Technical Data

Type of Measurement
Amperometric. Continuously measures and indicates Sulfite or Chlorine residuals in wastewater or cooling water applications.

Accuracy
+/- 5% of full scale (over the range from SO_2 to CL_2 residual).

Sensitivity
2% of full scale.

Repeatability
0.001 mg/L or 1% of full scale, whichever is greater.

Stability
Under favorable conditions +/- 5% of full-scale for 1 month. However, recalibration may be required on replenishment of the Iodate reagent.

Residual Measurement Ranges
Five standard ranges are available.
0.5 mg/L SO_2 - 0 - 0.5 mg/L CL_2
1.0 mg/L SO_2 - 0 - 1.0 mg/L CL_2
2.5 mg/L SO_2 - 0 - 2.5 mg/L CL_2
5.0 mg/L SO_2 - 0 - 5.0 mg/L CL_2
10.0 mg/L SO_2 - 0 - 10.0 mg/L CL_2

Speed of Response
90 sec. with 2 rpm pump motor.
180 sec. with 1 rpm pump motor.
(Sample is pumped to cell via an internal peristaltic pump.)

Output Signal
Isolated 4-20mA DC analog output proportional to residual, zero centered (4-12mA proportional to SO_2 residual, 12-20 mA proportional to CL_2 residual). Maximum impedance 600 ohms.

Sample Requirements
Approximately 10 to 20 l/m (2 - 5 US gpm), depending on application. Recommended fluid velocity is 1.5 m/sec (5 ft/sec). Maximum pressure 8 bar (125 psi), throttled to less than 0.3 bar (5 psi) at the Y-strainer before the analyzer inlet. (Measuring cell sample requirements 0.5 l/m.) In long sample lines, greater flow will prevent a lag in readings. An optional remote sample pump is available.

Liquid Reagents
pH 4 buffer solution is added via the internal peristaltic sample pump. This same pump feeds Potassium Iodate solution. The two reagents are mixed and added to the sample. Detergent is added to the pH 4 buffer to minimize grease and oil deposition in the cell.

Salinity
Fresh to sea water.

Piping Connections
13 mm (1/2") female NPT sample line, 1 mm (3/8") and 32 mm (1-1/4") drain hose connections.

Temperature
Ambient, 2°C (35°F) to 52°C (125°F). Sample, -3° C (26°F) to 52° C (125°F).

Electrical Requirements
Powered through required MFC or SFC electronic module.

Mounting
Analyzer unit, with or without circular chart or strip chart recorder supplied separately for wall or control panel mounting.

Dimensions (W x H x D)
331 x 329 x 251 mm (13-1/16" x 12-15/16" x 9-13/16"). See lit number WT.050.585.100.IE.CN.

Shipping Weight
9 kgs (20 lbs).

SFC Electronics

Monitoring and data logging of one Deox/2000® measurement module is the basic function of the SFC unit. The control of related dosing equipment is also provided by the SFC unit. The unit is prepared for flow proportional, closed loop and compound loop control of gas feeder actuators, pumps and other dosing devices with analog signal processing. See lit. no. WT.050.090.000.IE.PS for complete details. Some basic information is provided below:

- Output contacts: 4 configurable alarm contacts / general fault messages as well as inc /dec control outputs. Max. 5A, 250 VAC, 1250 VA; Max. 5A, 220 VDC, 150 W
- Analog outputs: 1 available 0/4 to 20 mA, configurable. Load <500 Ohm, accuracy < 0.5% FS. Galvanically isolated up to 50V relative to earth
- Interfaces: RS 232; RS 485 to connect with the Wallace & Tiernan® ChemWeb-Server, OPC-server or CMS software, and can interface for sensor-actuator bus
- Power Supply: 100 - 240 VAC ±10%, 50-60 Hz, 30VA 24 VDC ±20%, 30 W
- Protection Category: IP 66 / NEMA 4X
- Dimensions (W x H x D): 270 x 147 x 185 mm (10-5/8" x 5-13/16" x 7-1/4") See lit. No. WT.050.590.100.UA.CN.
- Shipping Weight: 2 kg (4.4 lbs)

SFC Electronics

MFC Electronics

MFC Electronics

In addition to the functionality of the SFC unit, the MFC unit is designed to include up to 5 measurements from the range of sensor modules for the MFC/SFC series. So the MFC unit is adaptable to the application needs. See lit. no. WT.050.580.000.IE.PS for complete details. Some basic information is provided below:

- Output contacts: 8 configurable alarm contacts / general fault messages as well as inc /dec control outputs. Max. 5A, 250 VAC, 1250 VA; Max. 5A, 220 VDC, 150 W.
- Analog outputs: 4 available 0/4 to 20 mA, configurable. Load <1000 Ohm, accuracy < 0.5% FS. Galvanically isolated up to 50V relative to earth
- Interfaces: RS 232; RS 485 to connect with the Wallace & Tiernan® ChemWeb-Server, OPC-server or CMS software
- Power Supply: 200 - 240 VAC ±10%, 50-60 Hz, 30VA 100 - 120 VAC ±10%, 50-60 Hz, 30VA 24 VDC ±20%, 30 W
- Protection Category: IP 66 / NEMA 4X
- Dimensions (W x H x D): 320 x 270 x 175 mm (12-5/8" x 10-5/8" x 6-7/8") See lit. No. WT.050.580.104.UA.CN.
- Shipping Weight: 5.5 kg (12.1 lbs)

Accessories Furnished

Y-strainer, shut-off valve and two manual throttling valve for sample waterline, 3 ft. tubing for analyzer drains, 2 empty 1 gallon reagent bottles, 15 liters (4 gallons in US) of pH 4 buffer with 4.8 oz. bottle Potassium Iodate, 1 lb. of granular Potassium Iodate, 6 oz. of detergent. Tube of grit, instruction book, 3-way valve for calibration with de-ionized water.

Optional Accessories

Recorders (supplied with 400-24 hour of 100-7 day circular charts or 24 z-fold strip charts and one year's supply of fiber tip pens). Metering pump for sample line dosing system, amperometric titrator for calibration. Sample pump, spare reference junction, door lock for analyzer enclosure.

Series A-790 Amperometric Titrator

Measures free, combined and total chlorine residuals as well as potassium permanganate, chlorine dioxide and sulfur dioxide. Used for the calibration of on-line analytical equipment. Suitable for tests in Standard Methods and ASTM Method D-1253. For more information, see lit. no. WT.050.262.000.UA.PS. Titrator not sold in all countries; check with appropriate local sales office for availability.

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