WALLACE & TIERNAN® ANALYZERS/CONTROLLERS MICRO/2000® MEASUREMENT MODULE FOR CL_2, CLO_2, $KMNO_4$

Product Overview

The Micro/2000® residual measurement module is a versatile, accurate, and reliable on-line instrument for continuous measurement of oxidant residuals. 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. High accuracy and the ability to measure low residuals down to 1 ppb bring a new level of efficiency to the disinfection process regardless of the application. From potable water and wastewater treatment to cooling water, swimming pools and industrial processes, the Micro/2000 measurement module helps you control your entire treatment process from pretreatment using Potassium Permanganate, Chlorine Dioxide or Chlorine to distribution residual monitoring of Chloramines or free Chlorine.

Applications

- Measurement of disinfection residuals throughout the entire potable water treatment process
- Wastewater residual measurement
- Industrial process water and wastewater
- Cooling water

Standard Features

- Accurately measures free and total Chlorine, Chlorine Dioxide or Potassium Permanganate residuals at ranges from 0 - 0.1 to 0 - 20 g/l.
- Suitable for all poor water quality applications such as wastewater and cooling water (fresh or seawater source).
- Sensitivity and speed of response down to 1 ppb (0.001 mg/l utilizing 3 electrode measurement technology.)
- Bare electrode cell design provides high reliability, long term stability, low maintenance, and minimal chance of fouling.
- Unaffected by varying water quality, changes in turbidity or conductivity.
- Field proven in thousands of installations around the world in a wide variety of ambient conditions.

Key Benefits

- High accuracy measurement of Chlorine, Chlorine Dioxide and Potassium Permanganate Residuals
- Ability to handle poor water quality without fouling
- Fast speed of response for control applications and monitoring rapid water quality changes
- Low sample flow cell design for economical reagent usage
- Wide choice of field selectable measurement ranges
- Separate flow cell and electronic packages for installation flexibility

Optional Features

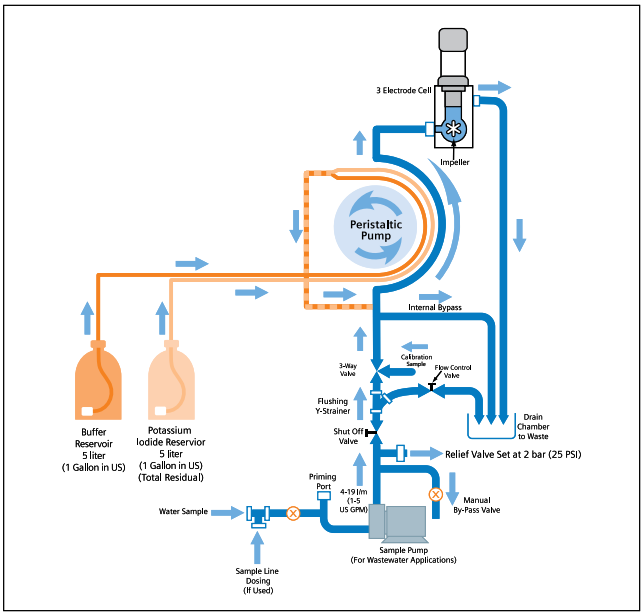
- Choice of peristaltic pump speed - for residual monitoring applications, a 1 rpm pump is used to minimize reagent usage; for use in a control loop, a 2 rpm pump is used to provide a quick response to a process change.
- Sample line dosing - a biocide metering pump can be used with the integral control software to prevent biofouling of the sample line in wastewater applications.
- Circular chart recorders - feature chart ranges scaled to match the selected range of the analyzer.

Modular Design

The Micro/2000® measurement module is used with either an SFC or MFC electronic package. The Micro/2000 measurement module consists of a separate flow cell enclosure for wall mounting and a plug-in electronic module. Typically, the Micro/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 Micro/2000 electronic module to display the correct information. The SFC or MFC electronics provide multiple alarm outputs, a 0/4 - 20 mA residual output signal and a RS 232 or RS 485 digital interface.

Three Electrode Measuring Cell

Utilizing universally accepted and time-proven amperometric measurement technology, the Micro/2000 measurement module uses an innovative 3-electrode measuring cell to provide direct measurement of residuals with a sensitivity of +/- 1 ppb (0.001 mg/l). With its bare electrode design, the Micro/2000 analyzer is not susceptible to the fouling typical in membrane probe analyzers, caused by bacteria, grease or turbidity. Also, unlike membrane probe analyzers, it measures all species of Chlorine residuals including dichloramine. The 3-electrode cell eliminates the need for the constant zero adjustment typical of other analyzers. Reliability and stability are vastly improved while maintenance is drastically reduced. The calibration and accuracy of the analyzer is not affected by changes in turbidity or conductivity, which can be a problem with some other analyzers on the market.



Sample Flow Diagram

Unique Sample Flow System

The sample is delivered to the Micro/2000 measurement module at a rate of 4 - 8 l/m (1-2 US gpm) for potable water applications 11 - 19 l/m (3 - 5 US gpm) for wastewater applications via a suitable sample pump). 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 Micro/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 eliminates the need for back-flushing and flow control orifices that could become fouled. The same pump, also delivers liquid reagents, where required, for pH buffering and total residual measurement, in a fixed proportion to the sample. The small volume of the sample flow, together with inexpensive reagents, dramatically reduces operating costs without sacrificing performance or reliability. A motor driven impeller in the

Modular Design

Measuring Cell

Sample Flow System

SFC Electronics

analyzing cell maintains stable fluid velocity and provides constant grit bombardment for cleaning electrode surfaces, further reducing maintenance requirements.

Automatic Sample Line Dosing

The Micro/2000® measurement module is particularly well suited to wastewater applications. One of the inherent problems in this service is biological growth in the sample line, from the sample pump to the analyzer, due to very low 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 - 20mA output is frozen to prevent upsets to the control or monitoring operations. Analyzer reliability is enhanced and maintenance is reduced.

Technical Data

Type of Measurement
Amperometric. Continuously measures and indicates free or total Chlorine residual, Chlorine Dioxide or Potassium Permanganate residuals in potable water, primary, secondary, or tertiary treated wastewater or cooling water.

Accuracy
0.001 mg/l or 1% of full scale, whichever is greater. For any residual measurement, analyzer accuracy is highly dependent on the accuracy of the standardizing (calibrating) analytical procedures used (standard methods procedures). The Chlorine Dioxide procedures, in particular, can be subject to inherently large errors which will thus impact on the above accuracy statement.

Sensitivity
0.001 mg/l or 1% of full scale, whichever is greater.

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

Stability
Under favorable conditions +/- 1% of full-scale for 1 month.

Residual Measurement Ranges
0 - 0.10, 0 - 0.20, 0 - 0.50, 0 - 1.0, 0 - 2.0, 0 - 5.0, 0 - 10.0, 0 - 20.0, 0 - 50.0 mg/l, 0 - 1, 0 - 2, 0 - 2.5, 0 - 5, 0 - 10, 0 - 20 g/l free or total Chlorine residuals, Chlorine Dioxide, or Potassium Permanganate residual.

Continuous Operating Range
100:1 for each measurement range.

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).

Sample Requirements
Approximately 4 - 19 l/m (1-5 US gpm), depending on application. Recommended fluid velocity is 1.5 m/sec (5 ft/sec). Maximum pressure 4 bar (60 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
A 5 liter (1 gallon in US) bottle of any reagent lasts from 3 - 10 weeks.

- Free chlorine measurement - pH 4 buffer is used where the pH varies. Start-up supply provided.
- Total chlorine measurement - pH 4 buffer and granular KI (potassium iodide) are used. Start-up supply provided. For wastewater applications, 175 ml (6 oz) of detergent additive is supplied.
- Potassium Permanganate or Chlorine Dioxide Measurement - in the presence of free chlorine, ammonium sulfate salt is required and can be supplied as an option.

Salinity
Fresh to sea water.

Piping Connections
13 mm (1/2") female NPT sample line, 9 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
Wall mounted using a supplied DIN mounting rail. Can be mounted on the same rail with an SFC or MFC.

Dimensions (W x H x D)
331 x 329 x 251 mm (13-1/16" x 12-15/16" x 9-13/16").

Shipping Weight

9 kgs (20 lbs)

SFC Electronics

Monitoring and data logging of one Micro/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 485 to connect with the Wallace & Tiernan® OPC-Server or Process Monitoring System and Gateways
- Power Supply: 100 - 240 VAC ±10%, 50 - 60 Hz, 30 VA
  24 VDC ±20%, 15 W
- Protection Category: IP 66 / NEMA 4X
- Dimensions (W x H x D): 270 x 147 x 185 mm (10 - 3/8" x 5 - 13/16" x 7 - 1/4")
- Shipping Weight: 2 kg (4.4 lbs)

MFC Electronics

In addition to the functionality of the SFC unit the MFC unit is designed to include up to five measurements from the range of sensor modules for the MFC/SFC series. So the MFC unit is adaptable to the application needs. Some basic information is provided below:

- Output contacts: 8 configurable alarm contacts / general fault messages as well as inc /dec control outputs.
  Max. 5 A, 250 VAC, 1250 VA; Max. 5 A, 220 VDC, 150 W
- Analog outputs: 4 available 0/4 to 20 mA, configurable.
  Load <1 000 Ohm, accuracy < 0.5% FS. Galvanically isolated up to 50V relative to earth
- Interfaces: RS 485 to connect with the Wallace & Tiernan® OPC-Server, Process Monitoring System and Gateways
- Power Supply: 200 - 240 VAC ±10%, 50 - 60 Hz, 30 VA
  100 - 120 VAC ±10%, 50 - 60 Hz, 30 VA
  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")
- Shipping Weight: 5.5 kg (12.1 lbs.)

Accessories Furnished

Y-strainer, manual throttling valve for sample waterline, pH test papers, and instruction book. In addition, for potable or cooling water, 15 liters (4 US gallons) of pH 4 buffer; for wastewater 15 liters (4 US gallons) of pH4 buffer and 6 oz. detergent. For Chlorine Dioxide or Potassium Permanganate measurement, a 2-month supply of Ammonium Sulfate to screen out free Chlorine interference.

Optional Accessories

Recorders (supplied with 400-24 hour or 100-7 day circular charts and one year's supply of fiber tip pens). Metering pump for sample line dosing system, amperometric titrator for calibration, sample pump (if sample pressure is less than 0.3 bar; 5 psi), and spare reference junction.

Series A-790 Amperometric Titrator

Measures free, combined and total, chlorine residuals as well as potassium permanganate and chlorine 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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