

# Analyzers and Controllers

## MFC Multi-function Controller

The MFC multi-function controller is the most accurate, reliable and versatile instrument for analysis and control of disinfection processes in drinking water, process water and wastewater applications. With the ability to analyze multiple water quality parameters, the MFC controller provides the most complete picture of critical disinfection chemistry in a single device. To ensure optimum use of chemicals and lower risk of over or under feeding, the MFC controller utilizes intelligent and disinfection-specific control schemes. With an extensive array of communications capabilities such as Profibus®, Profinet® and Modbus® protocols, the MFC system can be easily incorporated into plant-wide control systems.

### Multiple measurements in a single device

The MFC controller simultaneously supports up to four water quality measurements in a single flow cell providing the most complete overview of the disinfection process. The most typical configuration includes chlorine, pH, ORP, conductivity as well as temperature. While the chlorine, pH and temperature measurements are required by State regulatory agencies for reporting purposes, adding ORP and conductivity adds insight into the work value of chlorine and detects changes in the water supply characteristics respectively. Not only does the MFC controller measure multiple water quality parameters, but it also displays trending data to help visualize, diagnose, predict and simplify calibration in the field.

### Versatile, intelligent control

The versatility of the MFC controller begins with built-in control capabilities specifically designed for disinfection processes. Two control loops are provided to ensure precise dosing of the disinfectant while controlling an additional process such as maintaining pH. This is especially useful for achieving optimum efficacy in chlorine-based disinfection where the pH of the water has a large impact on performance. Adding to its versatility, the MFC controller comes pre-programmed with four different disinfection control schemes to fit your application exactly.

#### Key Benefits:

- Accurate, reliable and versatile analysis and control
- Minimizes cost and risk of disinfection process
- Intelligent and fully configurable control schemes
- Supports Profibus®, Profinet®, Modbus® protocols
- Simple to operate and maintain



Intelligent features built into the MFC system include fully programmable and assignable relays and multiple operating conditions, all configured conveniently from the front panel. Eight fully programmable relays with LED indication provide the ultimate flexibility in configuring the instrument. The relays are also freely assignable so that both single and bundled alarms can be incorporated conveniently. For example, a bundled alarm relay may be used to alert the operator if any of the configured measurement parameters fall outside of the desired control range by way of a special audible alarm. The bundled alarm can, therefore, save additional relays for other important tasks.

## Product Sheet

When process conditions change, requiring a change in the control scheme, such as temporarily operating at higher chlorine residual, the controller responds automatically. The MFC controller is easily programmed for a second set of operating conditions that include control and alarm points via one of its many digital inputs. Once the input is deactivated, control is returned to the original setting. How cool is that?

## The MFC system is available with the following functionality

### Sensor selection

The portfolio of measurements includes the following parameters, and where appropriate, the supporting measurement modules are depicted.

- Free chlorine (Depolox® 5, Micro/2000® & Membrane)
- Total chlorine (Micro/2000® & Membrane)
- Chlorine dioxide (Depolox® 5, Micro/2000® & Membrane)
- Ozone (Depolox® 5, Micro/2000® & Membrane)
- Potassium permanganate (Depolox® 5 & Micro/2000®)
- pH value (Strantrol® pH sensor and standard sensor)
- Redox (ORP) (Strantrol® ORP sensor and standard sensor)
- Fluoride
- Chlorine-sulfite (Deox/2000®)
- Conductivity
- Temperature
- Standard sensors / measurement with a milliamp signal

The application and water quality will determine what measurement module best suits the application.

- The Depolox® 5 measurement module uses the potentiostatic bare electrode technology that is fast acting to a change in chlorine concentration and therefore well suited for disinfection control. It incorporates continuous hydro-mechanical cleaning of the sensor.
- The Micro/2000® and Deox/2000® measurement modules are also potentiostatic bare electrodes that can incorporate the addition of buffer chemicals. The Micro/2000 and Deox/2000 measurement modules can be used in poor quality water without fouling. The Micro/2000 module offers unmatched accuracy of chlorine measurements down to one part per billion. The Deox/2000 module is utilized for dechlorination chemistry measurements.
- The membrane measurement module utilizes membrane covered electrodes with the VariaSens™ flow cell and is the least affected by water supply chemistry variations.
- Strantrol® flowcell with proprietary HRR® sensing technology provides highest accuracy in ORP measurement designed for industrial applications.

## Extensive communications

The extensive communication capabilities of the MFC control system are tailored to your specific requirements through add-on modules. These include our ChemWeb Server for serial, analog or digital two way communication and Fieldbus gateways such as Profibus®, Profinet® or Modbus® protocols.

## Additional features

The CAN sensor/actuator bus allows easy expansion of the MFC control system's functionality by providing interconnection of two or more MFC devices. The CAN sensor / actuator bus allows for a pH compensated chlorine measurement or a more complex control scheme such as set-point trim control. The connection of fieldbus systems using Profibus® DP, Profinet® and Modbus® TCP protocols are possible via optional fieldbus communication modules.



Depolox® 5 Measurement Module



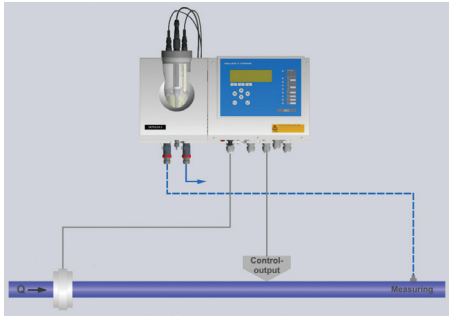
Deox/2000® Measurement Module



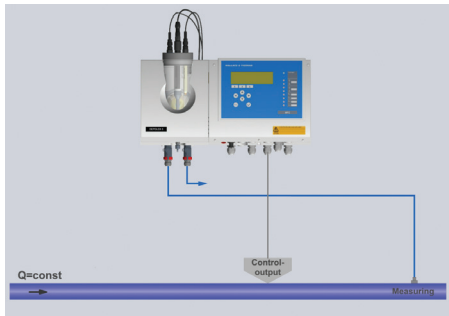
Strantrol® Measurement Module with HRR® Sensor technology

## Control options

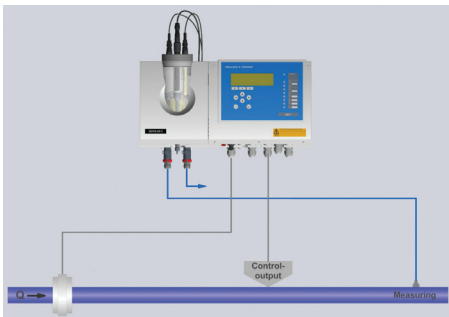
Both flow proportional and compound loop control are available with the MFC controller. With the wide range of MFC control versions available, nearly all conceivable water treatment applications, including single feedback closed-loop control, can be monitored and controlled.



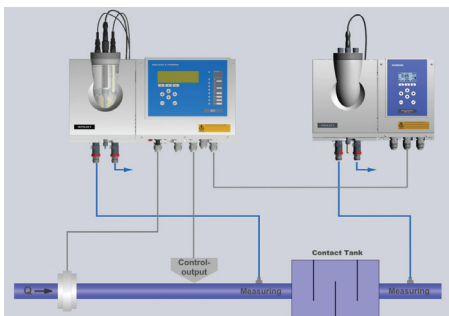
Flow proportional control



Closed-loop control



Compound loop control



Compound loop control with setpoint trim

1. Flow proportional or ratio control adjusts feedrates based on open loop process flow and/or residual variables. This type of control typically uses a 0/4-20 mA signal from a flowmeter enabling proportional to the flow control. The output can be adjusted by changing the dosage factor either through the keypad and menu or through a remote mA/V input.
2. Single feedback or direct residual closed-loop control to maintain a desired setpoint from a measured sensor value.
  - a. The measured signal is compared with an internal setpoint, entered through the keypad or an external setpoint through a remote mA/V input.
  - b. The source of the setpoint can be selected via a digital input.
  - c. Any deviation from the control setpoint initiates a proportional/integral change to the chemical dose rate. This can be used for chlorination or dechlorination. This type of control is ideally suited for applications where the quality of the water varies, but the flow variations of the treated water remain relatively stable.
3. Compound loop control takes a flow signal input enabling fast response to water quality and flow variations while maintaining the desired set point. Within this control mode there is an option to select 'fuzzy logic control'. This control learns from previous corrections and makes the right level of correction to a given situation, thereby avoiding oscillations in the desired set point level.
4. Setpoint-trim control utilizes a second analyzer/sensor to measure residual at the end of the contact chamber and adjust the setpoint of the primary control loop. The first analyzer/sensor is used to measure the residual of the primary loop enabling a fast response to changing conditions. The second analyzer/sensor which is placed after the appropriate contact period is used to adjust the primary set point. This control is ideal for controlling across a contact tank where the chlorine demand may vary.

<b>Technical data:</b>	<b>MFC electronic module</b>
Display:	Back-lit LCD graphic display 8 X LED for alarms / control outputs & 1X Power LED
Measurement inputs:	4 x slots for a choice measurement input cards that can include inputs for: <ul style="list-style-type: none"> <li>▪ Depolox® 5 bare electrode for chlorine, ozone, chlorine dioxide and potassium permanganate</li> <li>▪ Micro/2000® bare electrode for free or total chlorine, ozone, chlorine dioxide and potassium permanganate</li> <li>▪ DEOX/2000® bare electrode for chlorine and sulfite</li> <li>▪ Membrane electrode for free or total chlorine, chlorine dioxide and ozone</li> <li>▪ pH electrode or Strantrol® pH sensor</li> <li>▪ Standard ORP sensor Strantrol® HRR sensor</li> <li>▪ Fluoride</li> <li>▪ Conductivity</li> <li>▪ mA/V input card to incorporate external measurements</li> </ul>
Milliamp input card (for slot 5):	<ul style="list-style-type: none"> <li>▪ 1 x mA input for flowrate as 0 - 20 mA or 4 - 20 mA</li> <li>▪ 1 x mA input for external setpoint or dosing factor as 0 - 20 mA or 4 - 20 mA</li> </ul>
Additional inputs:	<ul style="list-style-type: none"> <li>▪ 1 x temperature input PT1000 (0° - 50° C/ 32° - 122° F) with sensor error display</li> <li>▪ 1 x feedback input for servo motor position (1 kohm, 5 kohm, mA or V)</li> </ul>
Digital inputs:	<ul style="list-style-type: none"> <li>1 x digital input for monitoring sample water</li> <li>1 x external stop</li> <li>1 x freely definable, e.g. controller stop, operating mode switch, external set-point</li> </ul>
Output contacts:	<p>Max. eight freely definable alarm contacts/general fault messages as well as controller outputs for the measured parameters</p> <p>Each output contact is visualized by a signal LED, max. 1250 VA to 250 V DC, max. 150 W to 220 V DC</p>
Special outputs:	Time-controlled contact (timed dosing)
Analog outputs (optional):	4 x 0/4 – 20 mA, freely configurable Load ≤ 1000 Ohm, accuracy < 0.5 % FS Galv. isolated up to 50 V relative to earth
Interfaces:	RS 232 interface (for direct printer or firmware update only) RS 485 to connect to optional ChemWeb server or optional fieldbus gateways such as Profibus DP, Profinet and Modbus TCP protocols
Power supply:	200 – 240 V AC ± 10 %, 50 – 60 Hz, 30 VA 100 – 120 V AC ± 10 %, 50 – 60 Hz, 30 VA 24 V DC ± 20 % 30 W
Ambient temperature:	0 – 50 °C (32 – 122 °F)
Protection:	IP 66
Tests and marks:	Conform to CE (89/336/EEC) EMC tests acc. to EN 61326 Electric safety acc. to EN 61010
Weight (incl. packaging):	5.5 kg (12.1 lbs)
Dimensions (W x H x D):	320 x 270 x 175 mm (12.7 x 10.6 x 6.8 in)

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