SEVERN TRENT SERVICES

Instrumentation Products

MicroChem®2
Series 4000

- **Series 4000 Transmitter Analyzer Controller**
- **Series CL4000 Chlorine Probes used with MicroChem®2**
- **Series KC4000 - Chlorine, Chlorine Dioxide, Bromine, Ozone and Iodine**
- **Series EC4000 Conductivity Probes**
- **Series DO4000 - DO Probe**
- **Series PH4000 - pH Probes**
- **Series RX4000 - ORP Probes**

Series 4000 Transmitter and CL4000 Bufferless Probe

Series 4000 Transmitter, CL4000 and pH Probes on Flow Control Panel

Series KC4000 Bare Electrode Cell

Series DO4000, PH4000 and RX4000 Immersion Probe

Series pH4000 Probes

Series EC4000 Conductivity Probes

Series 4000 Transmitter Analyzer Controller

Specifically designed for drinking and wastewater treatment plants and swimming pool applications, the MicroChem®2 is able to measure up to three of the following parameters: pH, ORP, Dissolved Oxygen, Chlorine, Chlorine Dioxide, Bromine, Ozone, Conductivity, 4-20 mA, and Temperature (PT100). The MicroChem®2 family includes 4 groups of instruments:

ANALYZER/TRANSMITTER - The MicroChem®2 is capable of accepting signal(s) from up to three sensors representing a wide variety of measurements.

SIMPLE CONTROLLER - The MicroChem®2 is capable of providing on/off control using low alarms and deadband. This capability is included with the Analyzer/Transmitter software.

CONTROLLER - The MicroChem®2 can provide control of the measured parameter using a standard PID algorithm in conjunction with the sensor input signal, or as a PID Compound Loop controller utilizing the signal from the sensor and an optional 4-20 mA flow signal. Control output is available both as a 4-20 mA control signal and as a time proportional contact output. PID control is avaliable if the 4-20 mA output signal is used. Gain and cycle time are used if the instrument is configured to control using relay contacts. If so, 4-20 mA retransmission signal is avaliable on each configured channel. Optionally, an additional 4-20 mA output is available to retransmit the measured value if a 4-20 mA output signal is used for control.

AVERAGING (TRIPLE) CONTROLLER - The MicroChem®2 receives signals from 2 to 3 identical sensors, computes the average, verifies the correct functionality of the sensors, and applies a PID control algorithm on the averaged signal. The control output is a 4-20 mA signal. A 4-20 mA signal is also available to retransmit the average value. Applications include large tanks and DO aeration basins. This function is included with the controller software.

SWIMMING POOL CONTROLLER - The MicroChem®2 receives signals from pH, ORP and/or chlorine sensors and displays the measured values. It performs specific PID algorithms on pH and chlorine or ORP. The control is performed via a 4-20 mA output signal or with relay contacts. PID control is avaliable if the 4-20 mA output signal is used. Gain and cycle time are used if the instrument is configured to control using relay contacts. If so, 4-20 mA retransmission signal is avaliable on each configured channel. The MicroChem®2 is also able to display and retransmit the sample temperature.

Design Features

- Capable of receiving inputs from up to three (3) sensors and/or 4-20 mA signals.
- Retransmits up to three (3) 4-20 mA signals.
- Measures, indicates and retransmit the sample temperature value.
- Galvanic isolation between inputs and outputs and between all the PC boards.
- Two (2) digital inputs (contacts).
- Up to seven (7) relay outputs, Contact outputs can be individually set as NO or NC via software.
- Modularity & flexibility: Additional channels are easily added and field sensors can be changed to achieve new measurements.
- Simplicity of use is also assured by message driven menus displayed in one of the following software selectable languages: English, French, German, Spanish and Italian.
- Alarms and deadband can be freely changed via software.
- Automatic temperature compensation.
- Password protected menus.
- Alarm and warning messages.
- Output freezing capability.
- Ability to drive a cleaning sequence for the sensor via dedicated software and relay contact outputs.
- Single point calibration procedure available for pH.
- As an Averaging Basin Controller, the instrument has the capability to calculate and retransmit the average value of three inputs, analyze the variation, and activate an alarm if the variation is higher than a fixed value, assuring accurate control.
- The MicroChem®2 Controller is capable of accepting a 4-20mA input signal as a Feed Forward parameter in the PID algorithm.
- Housing suitable for outdoor installations (NEMA 4, IP65 protection)
- Configuration and calibration are performed without opening the instrument cover via a membrane keypad and display.
- The MicroChem®2 Swimming Pool Controller utilizes specific PID algorithms for pH and Chlorine/ORP.
- Self diagnostics
- Sensor sensitivity check during calibration procedure.
- Variety of Measurements; Chlorine (Free & Total, Buffered & Bufferless), pH, ORP, Dissolved Oxygen, Chlorine Dioxide, Ozone, Conductivity, 4-20 mAdc signal, Temperature, Iodine and Bromine.

Technical Data - Series 4000 Analyzer/Transmitter, Controller

INSTRUMENT SPECIFICATIONS:

Display: 2 Line x 16 LCD display with back light

Power supply: 110/220 Vac, ±10%, 50/60 Hz

Housing construction material: Goodlac V0 532 ULSD F17 self extinguishing tested according UL 94 and classified V0 (material ABS plus 17% fiberglass)

Enclosure classification: NEMA 4, IP65 suitable for outdoor mounting

Mounting: Hardware is supplied for the following mounting options:
- wall mounting
- 2" pipe mounting

Analog outputs: one for each installed channel; separately selectable for each channel, as 4-20 mA. Outputs are galvanically isolated from inputs. Load 0-1000 ohms, protected against short circuits.

Relay outputs: Rated 120/240 VAC, 125 VDC @ 8A. Contact output status can be selected as NO or NC separately for each contact.

Serial communication interconnection: RS485 and RS232 serial port.

Storage temperature limits: -40°F to 150 °F (-40°C to 65°C)

Operating temperature limits: 15°F to 130°F (-10°C to 55°C)

Thermal drift: within 0.2% of full scale for a 50°F (10°C) temperature change.

Relative humidity: 95 % non-condensing.

Accuracy: ± 0.2 % of full scale

Transmitter response time: 100 ms

Housing Dimensions: 8.6" x 10" x 4.8" (220mm x 250mm x 120mm)

Weight: 6.6 lbs (3 kg)

Technical Data - Series 4000 Analyzer/Transmitter, Controller

Calibration procedures: for each channel and for each type of measurement a dual point calibration procedure is required. For pH a single point fast calibration procedure is also available. During dual point calibration procedure a sensor sensitivity check is performed.

Measuring range: freely selectable for each channel, within the limits indicated for each parameter:

Parameter	Span Range
KC4000	
pH	0.00 - 14.00
Oxidation Reduction Potential (mV)	-1500 / +1500 mV
Ozone	0.00 - 10.00 ppm
Chlorine, Free or Total	0.00 - 10.00 ppm
Chlorine Dioxide	0.00 - 10.00 ppm
Temperature	0 - 100 °C
KC4000 (continued)	
Bromine	0 - 10 ppm
Iodine	0 - 35 ppm
Conductivity	0 - 99,999 µS (other ranges available)
DO4000	0 - 20 ppm
CL4000	
Free and combined Chlorine	0 - 2 ppm
Free and combined Chlorine	0 - 5 ppm
Free and combined Chlorine	0 - 10 ppm
RX4000	
Oxidation Reduction Potential	-1500 -/+ 1500 mg

Series EC4000 – Conductivity Probes

A conductivity measuring system incorporating the EC4000 conductivity probes, the conductivity amplifier and the MicroChem2 transmitter, provides automatic measurement/control of conductivity.

The probes are suitable for mounting in the KC4000 chlorine cell (12mm diameter), separate acrylic flow cells or supplied in a robust housing for immersion or pipe mounting (dip).

The conductivity probes contain two electrodes across which the electrical conductivity is measured. Different conductivity ranges can be measured by using probes with different electrode surface areas.

The probes are connected to a conductivity amplifier where the amplified signal is sent as a 4 to 20mA signal to the Microchem 2 transmitter/controller.

Choose either: a) the 12mm diameter probe which fits into a specially designed acrylic flow cell and b) 25mm (1 inch) industrial housed dip probe which is fully water proof and can be used as an immersion probe or fits in low pressure pipe fittings (using a Tee piece adaptor).

Technical Data - EC4000 - Conductivity

Sample Temperature	0 to 50°C (32°F to 122°F)
Accuracy	Better than 1%
Reproducibility	Better than 1%
Recommended Siting	tanks or pipes
Pressure	Dip probes 0 to 8 bar (0 to 120psi)
	12mm probes in flow cell 0.1 to 2 bar (1 to 30 psi)
Dimensions	
Dip probes:	150 x 25.9mm (d) (6"x1" approx) 12mm diameter: 120 x 12mm (d) (4" x ½" approx)
Flow cell:	380mm (h)x 80mm (w) x 55mm (d) 18" x 3" x 2 ½" approx
Sample inlet and outlet: Flow cell: 5/16" OD, 3/16" ID	

Probe type	Range
EC4000 Low Range Conductivity dip probe	0.05 - 500 µS/cm
EC4000 Standard Range Conductivity dip probe	10 - 10,000 µS/cm
EC4000 High Range Conductivity dip probe	10 - 99,999 µS/cm
EC4000 Conductivity Probe - 12mm Version	10 - 10000 µS/cm

Note: Each conductivlty probe must be used in conjunction with the amplifier box and with MicroChem2 analyzers/controllers with software version 2.8 or above.

Flow Control Panel - Recommended for use with CL4000 probes.

The Flow Control Panel is fully assembled with all flow components; and the instrument set at the proper voltage, with a power cord and plug (120V only) mounted on a polypropylene back board that is 16.25" H x 23" W x 0.6" thick. It provides an easy way to install the MicroChem2, CL4000 bufferless probes and various sample flow control components. The flow control components include a pressure reducing valve that can accept pressures up to 300 psig and a pressure gauge; a flow meter with a rate valve; CL4000 and/or pH4000 flow cells; tubing and tube fittings.

The PRV has a range of 0-25 psig and will accept pressures up to 300psig. The gauge has a range of 0-15 PSI for ease of setting the desired pressure. The flowmeter has a range of 0-10 GPH which feeds the CL4000 and pH4000 series acrylic flow cells.

A second flow cell may be installed in series for measuring either pH, ORP, or Conductivity simultaneously.

The panel provides for a neat, aesthetically pleasing presentation of the instrument and accessories. Please refer to the photo on the cover.

Simply insert the CL4000 and/or 12mm probe in the appropriate flow cell, connect the probe(s) cables to the instrument, plug in the power cord, run sample water and the instrument is ready to go.

A flow control kit is also available, which consists of the PRV, gauge and flow cell mentioned above.

Series CL4000 Chlorine Probes used with MicroChem®2

The Cl4000 chlorine probes, in conjunction with the microprocessor based MicroChem®2 transmitter/ controller, form a simple and reliable system for measuring residual chlorine (free and/or combined) WITHOUT the addition of reagent.

The system is primarily used for measuring chlorine in clean water, such as in swimming pools, drinking water treatment plants and cooling systems.

The chlorine probes are 3-electrode amperometric cells covered with a permeable membrane.

The probe exterior is manufactured from durable PVC and stainless steel and has a diameter of 25mm (1 inch). The probes are engineered to fit in a specially designed flow cell which incorporates a built in valve.

The 3-electrode probes have significantly lower pH dependence and can be used without the need for pH compensation.

All the Cl4000 probes are designed to run bufferless.

The probes have no moving parts and are designed to require minimal maintenance. Typically the membranes are replaced annually.

CL4000 probes will measure free chlorine and/or combined chlorine resulting in a total chlorine value.

Technical Data - Series CL4000 - Chlorine Probes

Probe Types and Ranges
Free Cl2 or combined chlorine, (3 electrode), ranges available 0-2, 0-5 and 0-10 ppm
Temperature Compensation: internal
Reproducibility: 5 %

Accuracy: ±5% of range

Applications:
Drinking/clean water and swimming pool applications. There should be no surfactants in the sample.

Sample Inlet Pressure:
1 to 15 psig, sufficiant to produce 0.5 L/min

Sample temperature: 32° to 104°F (0° to 40°C)

Material of Construction
Working and Counter Electrodes:
gold and stainless steel

Reference Electrodes: silver/silver chloride

Probe outer: PVC, stainless steel

pH: 4 to 9.5 signal change is less than 5% per step change

Sample Flow: 30 liters per hour (8 GPH)

Sample inlet and outlet connection:
5/16 OD x 1/4 ID (8 mm x 6 mm) tubing

Outline and mounting dimensions:
Flow through cell:
14.6" (h) x 2" (l) x 2.4" (d) 370mm x 50mm x 60mm
Probe:
2"diam x 9"(l) 25mm diam x 230mm (l)

Weight: Flow through cell and probe: 1lb (450g)

Series KC4000 Measuring Cell

The MicroChem®2 measuring cell Series KC4000, in conjunction with the microprocessor based MicroChem®2 transmitter/controller, forms a simple and reliable system for measuring residual chlorine (free and total), chlorine dioxide, iodine, bromine, ozone and temperature. Optional pH and ORP measurements are also available.

The system is primarily used for measuring chlorine, chlorine dioxide or ozone in clean water, such as in swimming pools, drinking water treatment plants and cooling systems, but can be also used in wastewater treatment plant applications when provided with the suitable filters (y strainer).

An amperometric cell composed of two concentric electrodes performs the analysis. The sensitivity of the cell is kept constant through the gritting action of a measured amount of Corundum sand placed in the electrode chamber at start up. The amperometric cell is furnished in a plexiglass body internally shaped as a reverse cone.

The cell body can be mounted with the following optional electrodes:

- ORP electrode
- pH electrode
- Conductivity electrode
- Combination of any two

The flow regulator to which the KC cell is mounted maintains a constant flow at the inlet without any valves for samples with pressure varying inside the limits 3 - 60 PSI.

PVC flow regulator housing is suitable to fit a pH, conductivity and ORP electrode (optional) and a temperature sensor (included) of standard dimensions. This system is specially designed for multiple simultaneous measurements such as swimming pool applications. Under normal circumstances, pH correction is not usually required. The correction is only needed when measuring free chlorine in a sample with pH higher than 7.5 or highly variable.

Technical Data - Series KC4000 Measuring Cell

- Residual chlorine (free & total), chlorine dioxide, iodine, bromine, ozone, temperature and conductivity
- Self cleaning electrodes
- Temperature compensation
- Swimming pools
- Wastewater treatment applications
- Potable water

Electrodes: gold measuring electrode, copper counter electrode

Type of measurements: free chlorine, total chlorine (with sample conditioning system), chlorine dioxide, iodine, ozone, pH and ORP, temperature, bromine and conductivity

Temperature compensation: standard, Pt 100 temperature element

Accuracy: chlorine/chlorine dioxide/bromine/iodine/conductivity/ozone: ± 5 % of f.s.

pH: 0.4 % f.s.; for pH higher than 12 accuracy decreases (alkaline error)

Sample inlet pressure: 3 - 60 PSI (0.2 - 4 bar).

Sample temperature: temperature compensation from 36°F to 122°F (2°C to 50°C)

Limit of Detection: 10 ppb

Material of construction:

Electrodes: copper/gold

Cell: plexiglass

Pressure regulator: PVC

Reagent Feed Options:

- Peristaltic Pump
- 120/240 Volts specified at time of order
- 30-liter reagent bottle(s)
  - one bottle shipped for free chlorine applications
  - two bottles shipped for total chlorine applications
- Reagent consumption - 10 liters/month
- Dimensions (reagent panel) 13.28" x 12.00" (337mm x 305mm)

pH: no pH correction needed when pH is inside the limits 4-7.5. The higher the pH the smaller the fluctuations allowed. The cell can be supplied with a complete reagent addition system.

Sample flow: 16 GPH (60 l/h)

Outline and mounting dimensions:
12.6" (h) x 7.9" (l) x 5.9" (d)
(320mm x 200mm x 150mm)

Weight: 6.6 lbs (3 Kg)

Measuring Ranges:

Bromine	0 - 10 ppm	Chlorine	0 - 10 ppm
Iodine	0 - 35 ppm	Chlorine Dioxide	0 - 10 ppm
Ozone	0 - 10 ppm	pH	0 - 14
ORP (mV)	-1500/+1500		
Temperature	0 - +100°C		
Conductivity	0 - 99,999 µS		

Series PH4000 pH and RX4000 ORP Probes

pH4000 Electrode: pH electrodes are 12mm in diameter not temperature compensated and are designed for use with the KC4000 cell (PT100 temperature sensor is provided with the KC4000 housing). They are also used in the pH4000 Immersion probes.

Pipe Insertion Electrode with Built-in Temperature Compensation: A flat surface probe used in conjunction with a saddle tap, 1" insertion assembly and a ball valve is also available. The probe self cleans using the sample-flow.

pH4000 Electrode with Built-in Temperature Compensation: Electrodes feature a built-in PT100 within the 12mm epoxy body for temperature compensation. The primary use for these electrodes are to run along side the CI4000 chlorine electrode and have been designed to be used with the acrylic flow through cell (P/N 23432).

pH4000 and RX4000 Immersion Probes: The pH4000 Immersion Probes are available with gel electrolyte for general applications. They are supplied in a durable PVC immersion housing with a built-in PT100. They can be inserted directly into tanks, channels, or the specially designed flow cell (P/N 1T811B012U03, UK P/N 01-4041) which is piped in-line. Optionally the probes can be provided with nozzle devices for water or chemical jet cleaning

For applications that may contain fouling or fat/grease substances an optional cleaning nozzle accessory is available for automatic cleaning.

Technical Data - Series 4000 pH Probes and ORP Probes

- Temperature compensated measurement
- Simple to install and requires infrequent maintenance
- Optional cleaning nozzle for automatic cleaning
- Gel filled probes for typical drinking water and waste water applications

pH4000 and RX4000 Probes & Immersion Probes

Measuring range: 0 to 14 pH, -1500 to 1500mV (ORP)

Reference gel electrode: Ag/AgCl, KCL gel, ceramic porous diaphragm

Accuracy: 0.4% f.s; for pH higher than 12 accuracy decreases (alkaline errors)

Temperature compensation: PT100

Wetted parts: PVC, Pyrex® glass

Mounting bracket: PVC

Sample temperature: 32 to 120°F (0 to 50°C)

Overall Length available: 15.75", (400mm)

Signal cable: 3 or 10 meters defined at time of order

Flow-through cells

Flow-through cells for immersion probes

Wetted parts: P/C, hard rubber

Application: non pressurized sampling lines

Hydraulic connections: 1/2 G suitable for 1/2" NPT Optional cleaning system

Feeding line: PVC hose, 5 m

Nozzle consumption: with a 28 PSI water pressure, water consumption is approximately 250 l/h

pH4000 Electrode with built in temperature compenstation probes

Measuring Range: 0 to 14 pH

Ambient/sample Temp: 0°C - 50°C (32°F - 122°F)

Pressure: 0 to 2 bar (0 to 30 psi)

Overall length: 120 x 12 mm (d) (4" x 1/2" approx)

Flow-through acrylic cell for pH4000 temperature compensated probes

Dimensions: 14.6" (h) x 2" (l) x 2.4" (d) 3 (70 mm x 56 mm x 60 mm)

Sample inlet and outlet connections: 5/16" OD, 1/4" ID (6 mm x 8 mm) tubing

Hydraulic connections: 1/4 NPT

Series DO4000 - DO Sensor

The Series DO4000 sensor, in conjunction with the MicroChem®2 Series 4000 transmitter is a simple and reliable Dissolved Oxygen measuring system. The immersion probes are designed for direct insertion into tanks, open channels and basins. A flow-through cell version allows measurements in continuous non-pressurized sampling systems.

The sensor cartridge is manufactured using a process that permanently encapsulates a solution of sodium chloride (common salt) behind a permanently bonded PTFE membrane. Since the electrolyte solution is common salt, there are no environmental or health & safety risks associated with the sensor. Unlike other systems that require membrane changes and electrolyte replacement, the DO4000 sensor is inexpensive and simple to install.

Dissolved oxygen passing through the membrane causes the electrodes to generate a current that is proportional to the concentration of dissolved oxygen in the sample. The sensor includes a thermistor to compensate the measurement for temperature variations.

The probes rugged design assures mechanical protection for the measuring cell and provides the IP68 ingress protection. The probe may be inserted to depths of 10 FT (3 m). When the measured sample contains suspended particles that may deposit on the membrane or bio fouling which can lower the probe sensitivity, a jet cleaning option is available. During the cleaning sequence the transmitter output is held at the last measurement.

Technical Data - Series DO4000 - DO Sensor

- Highly reliable and replaceable sensor cartridge eliminates membrane changes or electrolyte replacement.
- Large membrane surface provides for a higher gas exchange capability, ensuring reliability.
- Automatic temperature compensation corrects the measurement for temperature variations in the sample.
- Flow-through cell accommodates measurements in continuous non-pressurized sampling systems
- Optional cleaning nozzle
- Immersion and flow-through fittings are optionally supplied with a cleaning nozzle for aggressive coating applications.
- Sensor can be located up to 325 ft (100m) from the MicroChem®2 electronics

Sensor Cartridge: amperometric, with PTFE oxygen permeable membrane, maintenance free

Electrodes: Ag/Zn, with temperature sensor Pt100

Electrolyte: NaCl

Probes length:
320mm

Wetted parts: PPS/Teflon

Maximum immersion depth: 10 ft (3 m)
(IP68 protection)

Sample temperature limits: 32 to 104°F
(0 to 40°C)

Ambient temperature limits: 23 to 132°F
(-5 to +50°C)

Sample minimum linear velocity:
0.2 ft/sec (60 mm/sec)

Measuring Range: 0 - 20 mg/L

Accuracy: ± 1 % of f.s.

Cable for the connection to the transmitter:
7 conductor, 0.2 mm diameter shielded cable, maximum length 100 m, with junction box (customer supplied).

Flow-though cell general specification
Wetted parts: PVC, hard rubber

Hydraulic connections: 1/2" Suitable for 1/2" NPT

Mounting: 2 brackets for wall mounting

Installation: for continuous non-pressurized sampling lines

Cleaning system general specification

Feed water tube: PVC hose, 16 ft (5 m)

Hydraulic connections: 1/4" NPT

Nozzle consumption: with a 28 PSI (2 bar) pressure water consumption is approximately 66 gal (250 l/h).

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