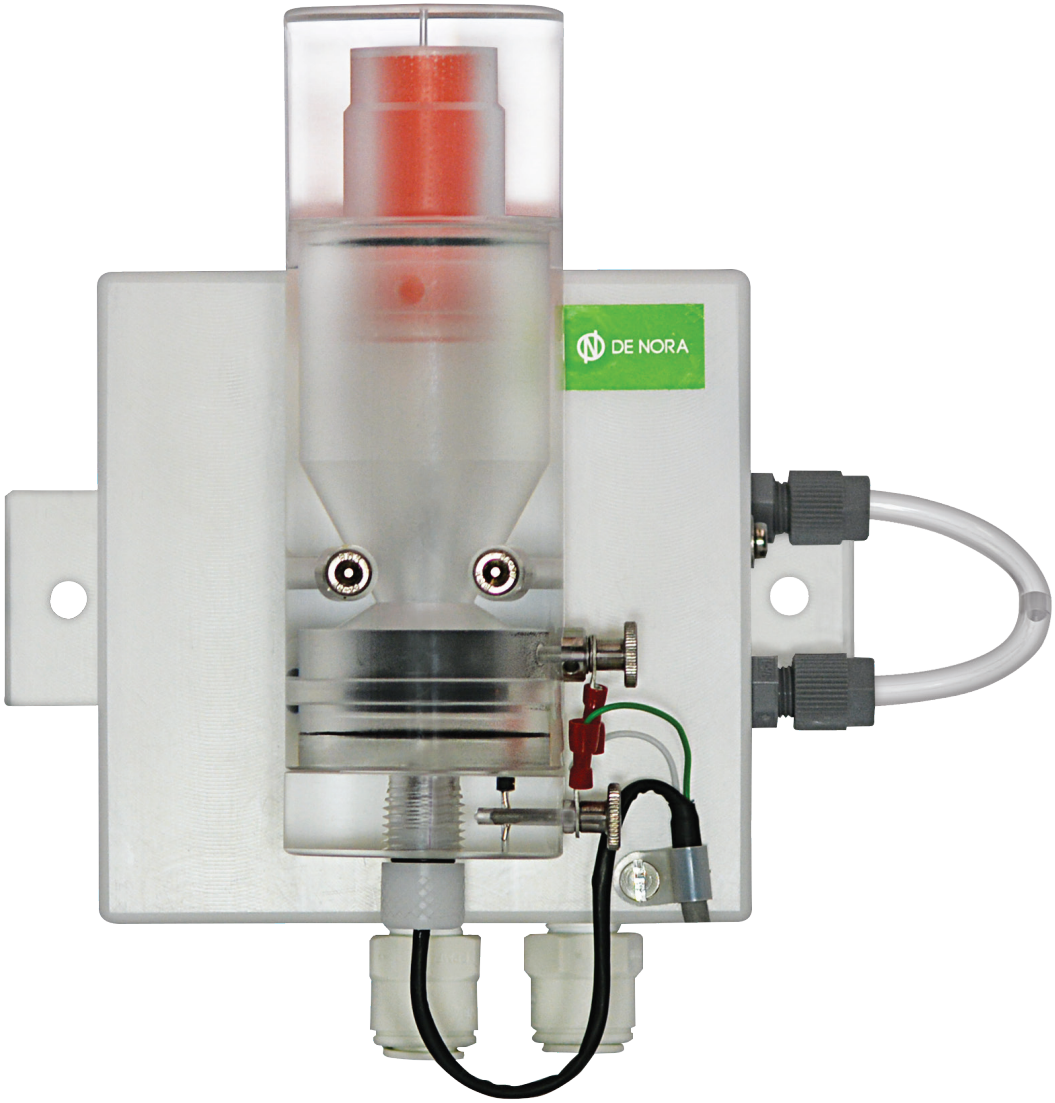
Instruction Manual
MicroChem®3
Series MC4000
Measure Cell

DE NORA

Capital Controls®



These instructions describe the installation, operation and maintenance of the subject equipment. Failure to strictly follow these instructions can lead to an equipment rupture that may cause significant property damage, severe personal injury and even death. If you do not understand these instructions, please contact De Nora Water Technologies, Inc. for clarification before commencing any work. De Nora Water Technologies, Inc. reserves the rights to make engineering refinements that may not be described herein. It is the responsibility of the installer to contact De Nora Water Technologies, Inc. for information that cannot be answered specifically by these instructions.

Any customer request to alter or reduce the design safeguards incorporated into De Nora Water Technologies, Inc. equipment is conditioned on the customer absolving De Nora Water Technologies, Inc. from any consequences of such a decision.

De Nora Water Technologies, Inc. has developed the recommended installation, operating and maintenance procedures with careful attention to safety. In addition to instruction/operating manuals, all instructions given on labels or attached tags should be followed. Regardless of these efforts, it is not possible to eliminate all hazards from the equipment or foresee every possible hazard that may occur. It is the responsibility of the installer to ensure that the recommended installation instructions are followed. It is the responsibility of the user to ensure that the recommended operating and maintenance instructions are followed. De Nora Water Technologies, Inc. cannot be responsible for deviations from the recommended instructions that may result in a hazardous or unsafe condition.

De Nora Water Technologies, Inc. cannot be responsible for the overall system design of which our equipment may be an integral part of or any unauthorized modifications to the equipment made by any party other that De Nora Water Technologies, Inc.

De Nora Water Technologies, Inc. takes all reasonable precautions in packaging the equipment to prevent shipping damage. Carefully inspect each item and report damages immediately to the shipping agent involved for equipment shipped "F.O.B." or to De Nora Water Technologies, Inc. for equipment shipped "F.O.B Jobsite". Do not install damaged equipment.

It is mandatory to carefully read this manual before operating any action of the instrument.

Do not install any equipment if damage is such that faulty operation is likely to result. Carefully inspect all packing material before discarding it, to prevent loss of mounting hardware, accessories, spare parts or instructions.

All instructions given on any attached tag should be followed.

WARNING

To ensure safe operation of the equipment carefully follow use and installation instructions and recommendations illustrated in this manual. Improper use of the equipment may damage the equipment and endanger the safety of the operating personnel.

WARNING

If the equipment is used in a manner NOT specified by De Nora or NOT included in the present document, the protection provided by the equipment may be impaired.

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1 INTRODUCTION

Drinking water, swimming pools and industrial water are usually disinfected with chlorine, chlorine dioxide or hypochlorite. The level of disinfectant in these waters must be carefully controlled, since insufficient disinfection is to be avoided and excessive chlorine concentrations lead to undesirable tastes and piping corrosion. A measuring system incorporation the MC4000 measure cell connected to the Capital Controls® MicroChem®3 instrument provides automatic measurement and control of residual dosage.

The instruction given herein cover general description, installation, operation and maintenance of the Series MC4000 measure cell and accessories.

1.1 General Description

The application of a chlorine/chlorine dioxide measuring system serves the combined function of measuring and indicating the disinfection concentration in a sample.

This chlorine/chlorine dioxide measuring system essentially consists of a sensing device and a instrument, capable of displaying the measured value and producing a 4-20 mA signal proportional to the measured value.

The instrument is part of the Capital Controls® MicroChem®3 Series, which is capable of supporting up to three of the following measurements in all possible combinations: Chlorine Dioxide, Residual Chlorine, ORP, Temperature and pH.

The sensor is an amperometric cell consisting of two concentric electrodes. The inner spiral is the gold measure electrode, the copper cylinder is the counter-electrode. The sample water flows into the electrode chamber through nozzles that are located in the copper cylinder. A measured amount of a special Corundum sand placed into the cell is circulated by the water and acts as an abrasive on the electrodes, keeping them sensitive. Each measure cell has a built-in pressure regulator which maintains a constant flow at the inlet to the cell, with pressures varying inside the limits of .5 to 4.0 bar (7.5 to 60 psi). The cell can also optionally support pH and/or ORP electrodes.

1.1.1 Glossary

Symbol	Meaning
	**WARNING – Refer to the manual for instructions**
	**CAUTION – Risk of electric shock**

1.2 Safety

The recommended operating procedures have been designed with careful attention to safety.

Observe the following safety precautions:

a. Observe all safety warnings marked on the equipment. These warnings identify areas of immediate hazard, which could result in personal injury, or loss of life.

b. Do not use this equipment for any purpose other than described in this manual.

c. Disconnect power prior to making any terminal connections within the enclosure.

d. Use the recommended connection procedures described in Section 2 of this manual.

This equipment should only be installed by suitably qualified personnel.

1.3 Standard accessories included in shipment

- Signal cable: (1 m) long
- Corundum sand, (100 g bottle with dosing spoon) P/N 614L1425
- 3/8" O.D. Polyethylene flexible hose for the sample inlet P/N 1D109C1025 (3 m)

1.4 Optional Accessories

- 12 mm probe holder kit
- Pressure regulating valve
- Water flow switch
- Dechlorinating filter

1.5 Technical Data/Specifications

Quality Management System:	The design & manufacturing process of De Nora Water Technologies Services are certified to ISO9001
Range:	0 - 10 ppm
Type of measurement:	Amperometric method, free chlorine, chlorine dioxide
Temperature Compensation:	PT100 Temperature element
Accuracy:	± 5% of range
Sample Pressure:	.5 to 4.0 bar (7.5 to 60 psi) For pressure over 4.0 bar (60 psi) – install a pressure reducing valve Up to 10.4 bar (150 psi) with optional PRV installed on flow panel
Sample Temperature:	2°C to 65°C (35.6°F to 149°F)
Sample Flow:	50 liters per hour (13.2 gph)
Sample Supply:	Continuous. When sample interruption is required, provisions must be made to keep the electrodes wet.
Sample pH:	Sample must be between 4.0 and 7.5 pH. The higher the pH – the more stable it must be kept.
Electrodes:	Two Electrodes: Gold (Working), Copper (Counter)
Dimensions:	269 mm (h) x 160 mm (l) x 143 mm (d) (10-9/16" (h) x 6-5/16" (l) x5-5/8" (d))
Sample Inlet Connection:	3/8" O.D. Quick disconnect tube connector
Drain Connection:	3/8" O.D. Quick disconnect tube connector

1.6 Principle of Operation

The MC4000 measuring cell is an electrochemical cell and it is polarized because of the normal potential of the two different metal electrodes. When an oxidizing substance (chlorine/chlorine dioxide) is present in the sample between the electrodes, the measuring (gold) electrode is depolarized and the counter electrode (copper electrode) dissolves as Cu++. The cell generates a signal (current), which is proportional to the chlorine/chlorine dioxide concentration in the sample. The signal is compensated for temperature variations via software in the MicroChem®3 instrument through a PT100 thermistor, that also reads temperature.

The sample water enters into the cell, in which a differential pressure regulator maintains a constant water flow even in presence of input pressure fluctuations between 0.5 and 4.0 bar (7.5 to 60 psi). The sample water enters the electrodes chamber tangentially and the gritting action of the sand keeps the electrodes sensitive.

The presence of the sand allows long periods of operation without requiring cell maintenance. The cell widens upwards allowing the sand to drop into the hydraulic low-pressure section and circulate down in the electrode chamber. An integrated filter prevents the loss of sand through the overflow that may occur in cases of excessive air bubbling through the cell.

Optionally, a kit may be ordered to mount 1 or 2 additional 12 mm probes in the rear of the measuring cell.

2 Installation

2.1 Inspection

De Nora Water Technologies takes all possible precautions in packing each item to prevent damage during shipment. However it is advisable to carefully inspect each item and, if damage has occurred, report it immediately. Damage claims should be reported to the shipping agent involved for the equipment.

Do not install any equipment if damage is such that faulty operation can occur. Carefully inspect all packing material before it is discarded, to prevent loss of mounting hardware, accessories, spare parts or instructions.

2.2 General

Perform the following checks before proceeding to the installation, to make sure that the items will be free of malfunctions and damages:

1. Ensure that the cell construction material is suitable to the sample chemical composition. (See Technical Data/Specifications)
2. Ensure that the process and environmental temperature are within specified limits. (See Technical Data/Specifications)
3. Select the installation place in order to comply the following requirements:
    a. The measure cell is designed for indoor installation. In cold weather applications the measure cell must be protected from freezing conditions.
    b. Measure cells are designed to have sample water continuously supplied. In cases where sample supply is to be interrupted, provisions must be made to supply alternate chlorinated water to the measure cell.
    c. Residual analyzers should be located as close as possible to the sample source to reduce the sample lag time.
    d. Sample source location should be selected to provide a relevant measurement for process control.
    e. The installation location should be convenient and accessible for maintenance operations.
    f. The installation site should be free from vibrations and as far away as possible from rotating or electrical commutation devices.
    g. The measuring cell should not be exposed to direct sunlight.
    h. The sample water should contain minimal air bubbles. If air bubbles are frequent and large in diameter, they may disturb the analyzers reading.

2.3 Measure Cell Mounting

The measuring cell must be mounted to a ridged surface or wall. Attach the wall mount bracket to the backside of the measure cell with the two mounting supplied screws. The measure cell can then be mounted using two 5 mm (#10) bolts (hardware not supplied). The measure cell should be mounted level to maintain proper sample flow. Reference Figures 1 &2 for more information.

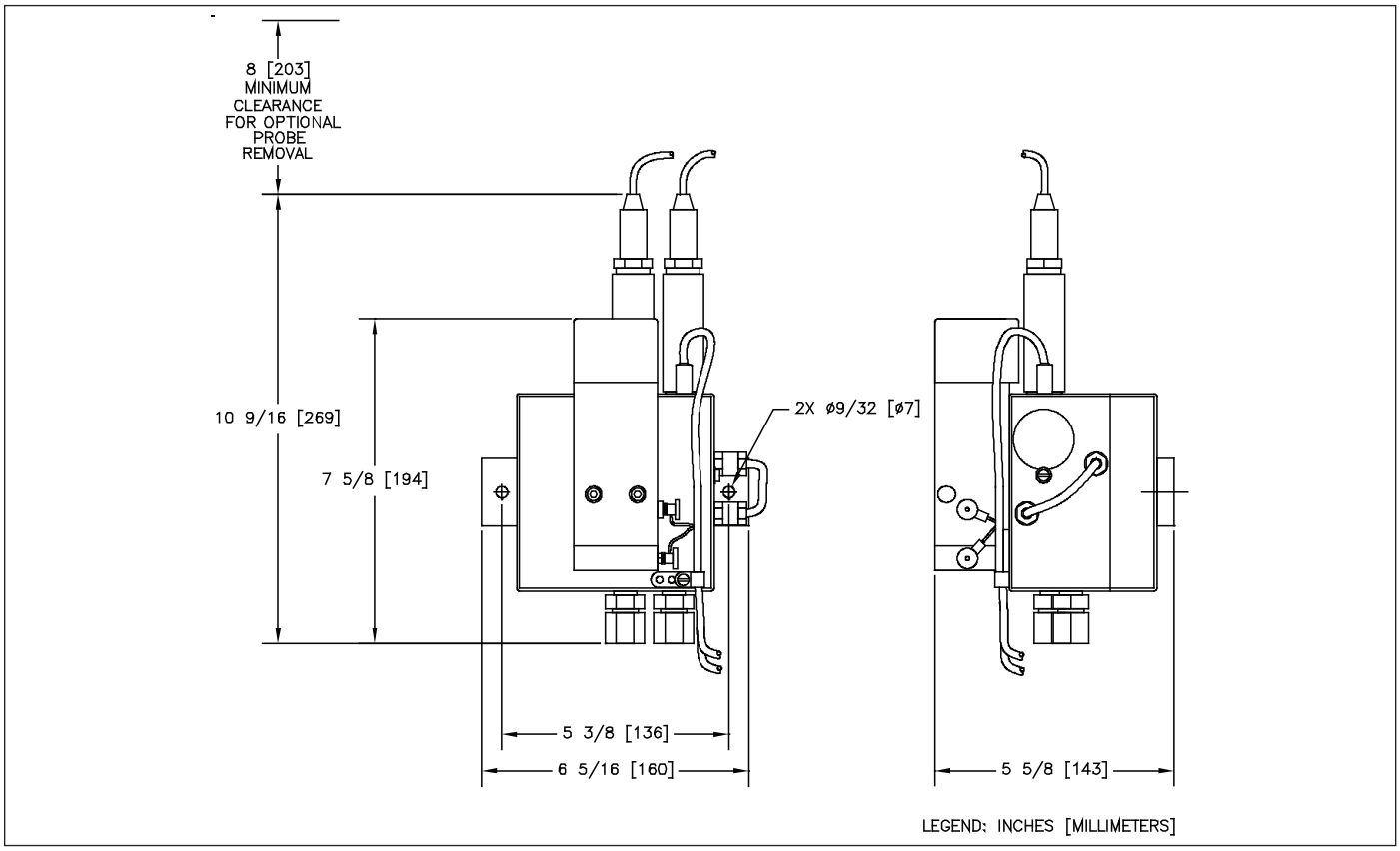


Figure 1 – Cell Outline Dimensions

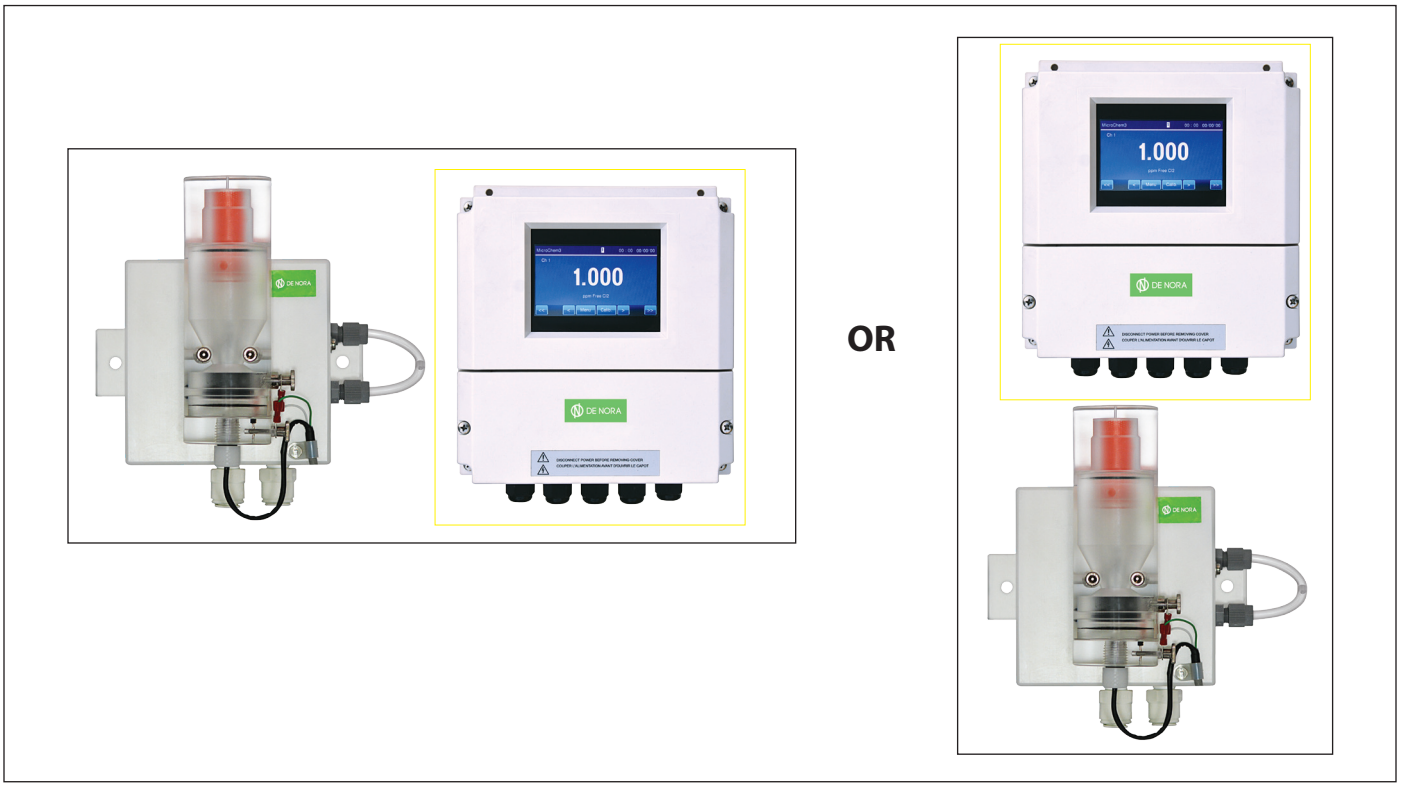


Figure 2 – Suggested Installation

2.3.1 Optional 12 mm probe holder installation (See Figure 3)

A 12 mm probe holder can be purchased for use with an additional pH or ORP probe.

To install:

- Thread the PG 13.5 gland into the probe extension tube and tighten lightly.
- Place the supplied O-ring around the male threads of the probe adaptor.
- Remove one of the two existing PG 13.5 plugs from the top of the measure cell.
- Screw the adaptor into the top of the measure cell, snug the connection to seat the O-ring.

The 12 mm probe holder installation is now complete.

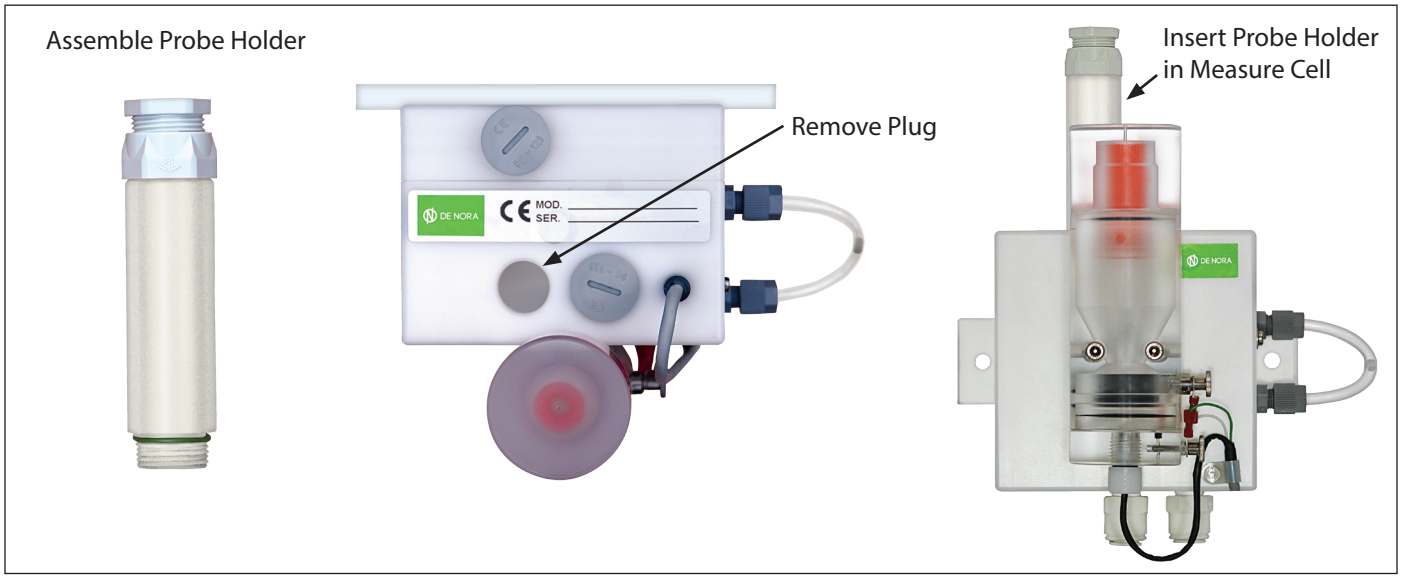


Figure 3 – Optional 12 mm Probe Installation

2.3.2 12 mm Probe installation (See Figure 4)

- Insert the probe into the probe adaptor at the rear of the measure cell.
- Gently secure the PG gland, do not overtighten.

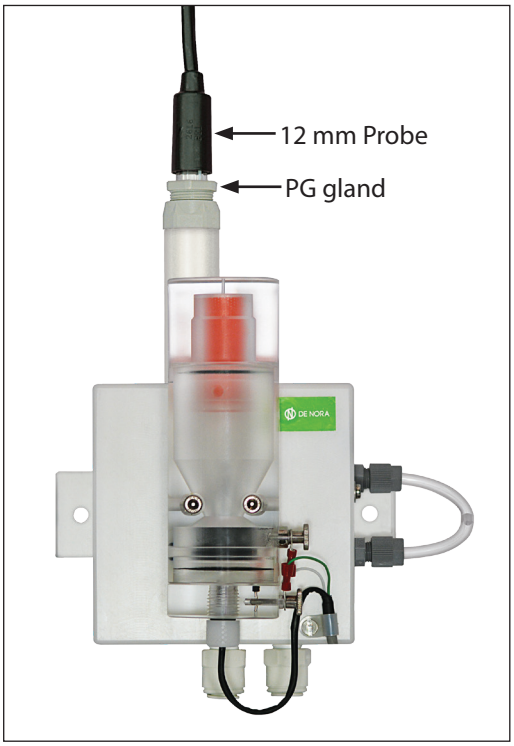


Figure 4 – 12 mm Probe Mounting

2.4 Plumbing Connections (See Figure 5)

2.4.1 General

Sufficient sample water pressure must be available so that the water transfer time is as short as possible, to reduce system lag time.

For sample pressures over 4 bar (60 psi) install a pressure reducing valve set to 2 bar (30 psi). The minimum sample pressure for reliable operation is .5 bar (7.5 psi).

2.4.2 Sample Inlet

Three meters of 3/8" O.D. tubing has been supplied with the flow cell panel to connect the water supply and drain. Cut the tube to length as necessary to fit the site installation needs. Push tubing into the sample inlet connection fitting. If it becomes necessary to release the tube from the fitting simply push on the fittings collar and pull back on the tubing. One additional fitting is supplied to allow for tube connection to the site plumbing. Install the fitting in the site plumbing and push the sample tube into the fitting to complete the sample line connection.

2.4.3 Drain

Using the 3/8" O.D. tubing supplied with the measure cell, connect to the drain fitting to the bottom of the cell. Insert the drain hose approximately 10 - 15 cm(4" - 6") in a non-metal drain pipe. In this way the hose can be easily removed to collect samples necessary for periodic calibration.

2.4.4 Optional Pressure Reducing Valve

For applications where the incoming sample is greater than 4 bar (60 psi) the use of a PRV is required. De Nora Water Technologies offers a PRV kit for this purpose. The kit contains the tubing fittings necessary to insert the valve in series with the incoming sample tube. Mount the PRV using two screws into the mounting bracket (hardware not supplied). Using the extra 3/8" tube supplied with the measure cell, connect the outlet on the right side of the PRV to the water flow switch (if this option was ordered) or directly into the bottom of the measure cell. The incoming sample line is then connected to the PRV inlet fitting on the left side of the regulator. Note that the PRV kit is universal to fit different applications so you may have extra unused tube connectors.

2.4.5 Optional Water Flow Switch

For applications where it is desirable to have an alarm signal generated when the incoming sample water stops flowing, an optional flow switch kit can be installed. De Nora Water Technologies offers a switch kit for this purpose. The kit contains the mounting hardware and tubing fittings necessary to insert the valve in series with the incoming 3/8" sample tube.

2.4.5.1 Switch Mounting

Two plastic clips are provided to attach the switch a rigid surface. Secure the clips to the mounting surface using two #10 screws spaced 74 mm (2.9") apart. Mount the switch in a vertical position near the measure cell sample inlet fitting. Orient the switch wires facing upward and carefully snap the switch into the two plastic clips.

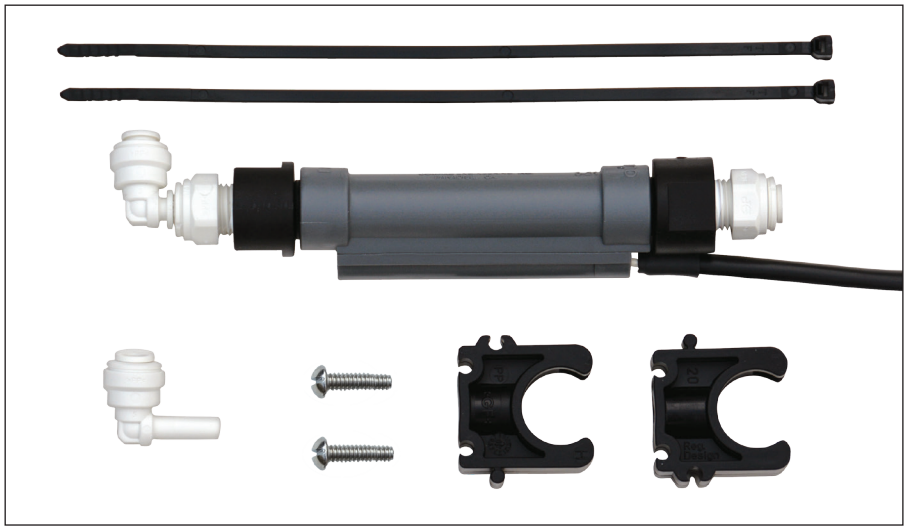
2.4.5.2 Switch Wiring

The switch needs to be connected to one of the digital inputs of the MicroChem®3 and the software configured to a sample flow alarm. Refer to the MicroChem®3 manual 210.6500 for complete wiring and configuration information.

2.4.5.3 Switch Plumbing

Connect the water outlet (upper connection) of the switch directly into the sample inlet fitting on the measure cell. The upper (outlet) fitting is the one adjacent to where the wires exit the switch. The inlet sample connection depends on whether you have the optional PRV. If a PRV is used, the outlet of the PRV is connected to the inlet (lower connection) of the switch. For applications without a PRV, connect the incoming sample line directly to the switch.

Note: The PRV kit is universal to fit different applications so you may have extra unused tube connectors.



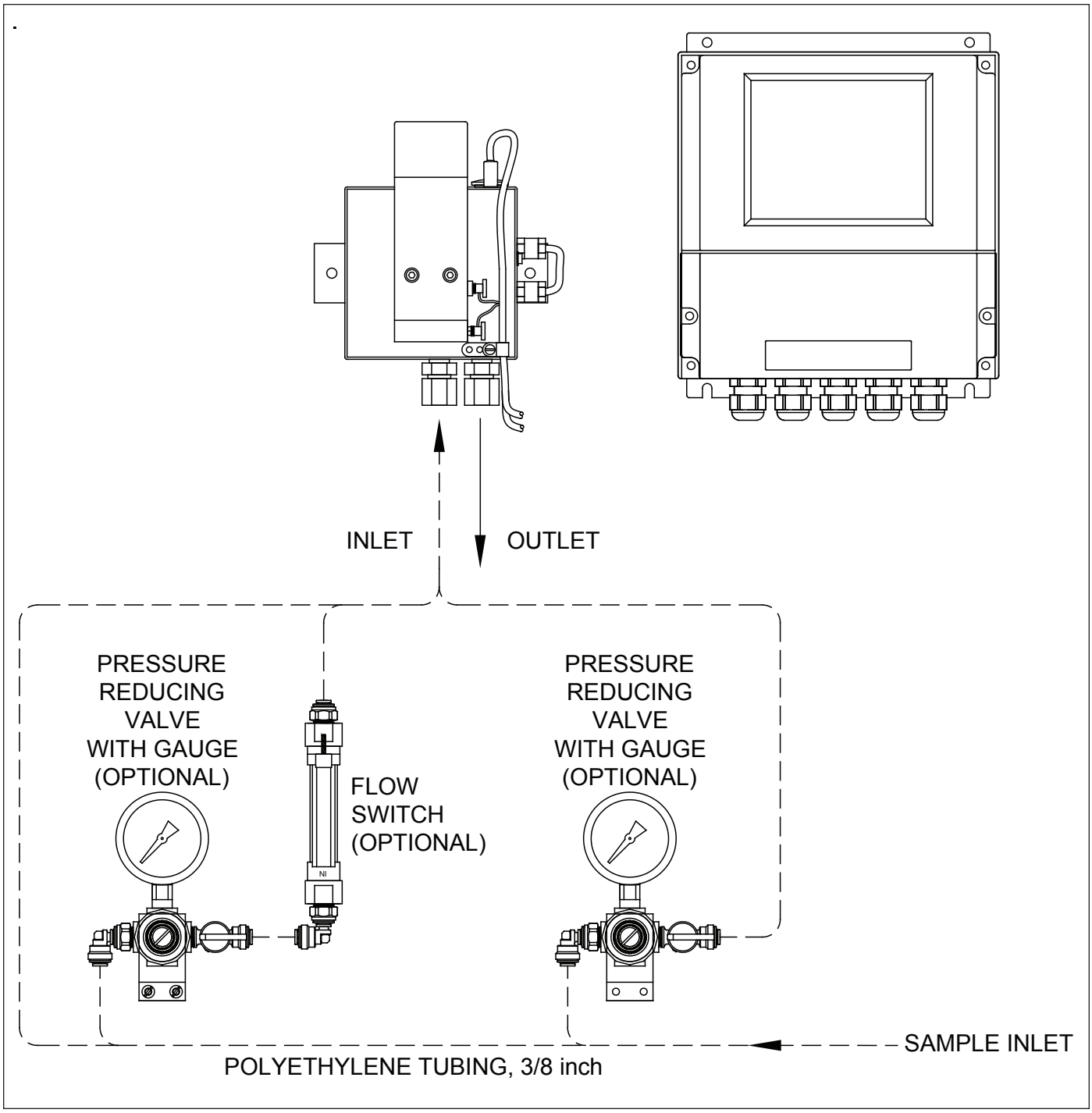


Figure 5 – Plumbing Connections

Notes:

1. The pressure-reducing valve is to be set at 2 to 3 bar (30 to 44 psi) when water is flowing.
2. If a dechlorinating filter is used for calibration purposes, it is inserted in series with the sample inlet tubing. Remove the filter when zero/low calibration procedure is complete.

2.5 Measure Cell Electrical Connections (See Figure 6)

Refer to Instruction Manual 210.6500 for complete information on making electrical connections to the MicroChem®3 and for system programing instructions.

Electrical Shock Hazard

Remove power prior to removing wiring cover.

2.5.1 Measure Cell

The measure cell is connected to the MicroChem®3 with the cable(s) that are attached to the cell. Route the wire up through the gland in the bottom of the MicroChem®3. The wires are labeled with the applicable terminal designation, the same as the respective terminal on the channel card terminal strip. Terminals D and F are the raw current signals from the electrodes. Terminals B and C are the temperature probe connections and the J terminal is the wire shield connection. Push the wires into the corresponding terminal on the channel card. If it becomes necessary to remove a wire from the terminal strip use a small straight blade screwdriver and depress the orange tab above the wire and pull back on the wire to release. When finished tighten the gland connector to ensure a watertight connection between the cable and instrument. Configure the jumpers above the terminal strip for the MC4000 measure cell. The MC4000 uses the uses the µA measure configuration as shown in Figure 6. The temperature probe is configured for 2 wires. So the jumper is connected between terminals 1 & 2. See Figure 6 for electrical connection details. Set the channel definition in the MicroChem®3 instrument to MC4000. Reference Instruction Manual #210.6500 for more details.

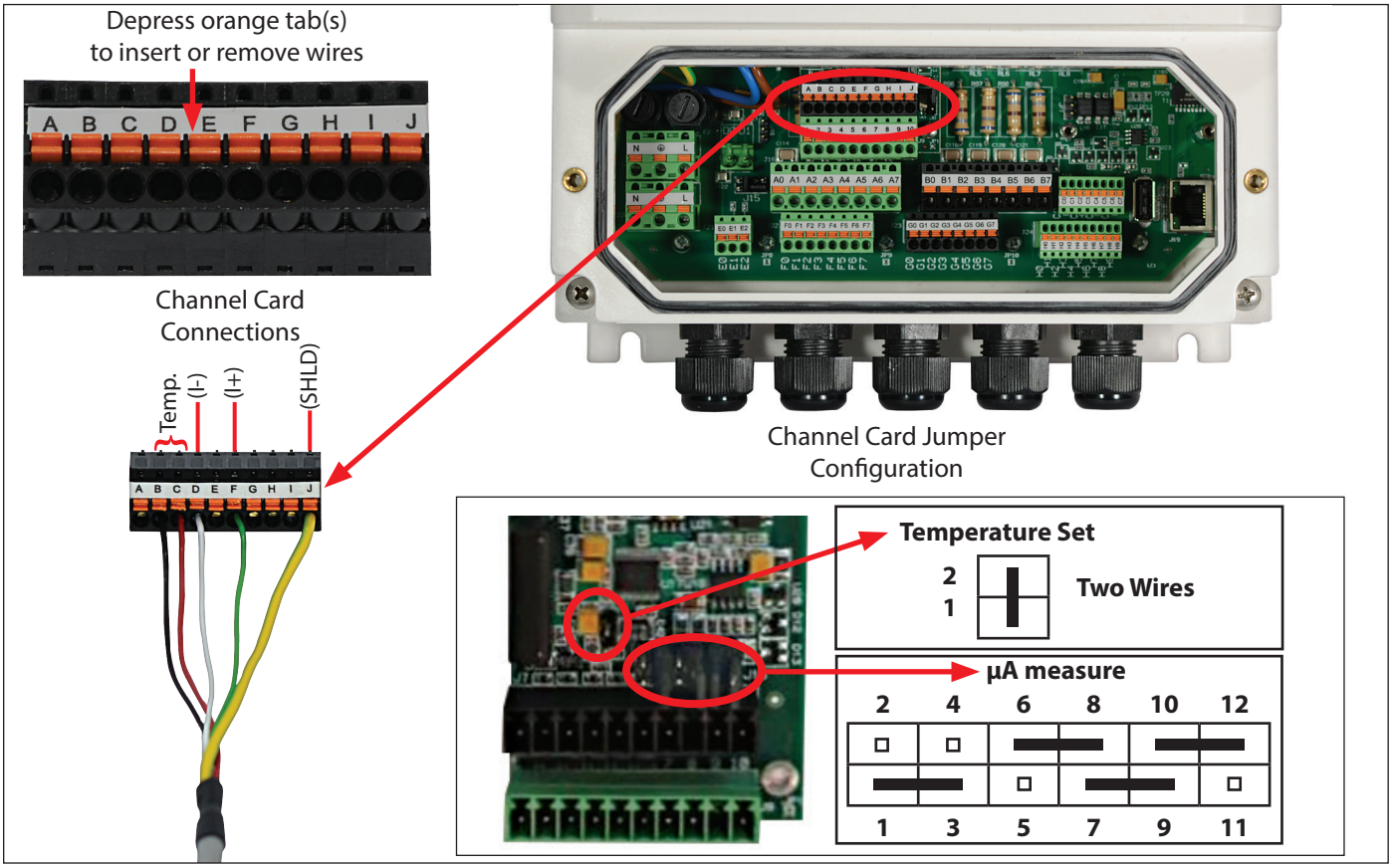


Figure 6 – Measure Cell Connections & Channel Card Configuration

2.5.2 Other Probes

When additional probes, like pH, are added to the flow cell refer to the appropriate instruction manual for complete wiring instructions.

2.5.3 Wire Duct

Wire duct is provided on the flow cell panel. The top cover can be removed and extra probe wires can be inserted to neaten up the installation between the flow cell and MicroChem®3. Once wiring is complete, snap the cover back on to the wire duct.

3 START-UP

1. Check that the measure cell is mounted securely and all plumbing connections have been made.
2. Check that all electrical connections have been made between the measure cell and the MicroChem®3 instrument.
3. Turn on sample flow to the measure cell and wait until the water flows steadily from the drain tube.
4. Stop the sample water flow. Open the cell body cover, pulling it up with a twisting motion. Pour one level spoon of the supplied Corundum sand (P/N 614L1425) into the water in the cell. Replace the cover and restart the sample water.
5. The water sample must be continuously supplied with oxidant for proper operation. If the system requires occasional cutoff, provisions must be made to keep electrodes wet.
6. Apply power to the MicroChem®3 instrument. Confirm the channel card jumpers are set for MC4000. Confirm the channel card jumpers are set for µA and the temperature selection jumper is set to 3 wires. Refer to Figure 6 for more information.
7. The cell is now ready for operation. Wait 24 hours before starting calibration since the electrode surfaces require time for stabilization. The analyzer is designed to run continuously, without interruption of water sample or power.
8. After stabilization a calibration must be performed. Please find instructions related to the procedure in Section 4 of this manual and the MicroChem®3 instruction manual, 210.6500.
9. For each additional probe connected, configure the instrument channel hardware and software for that probe. Refer to the MicroChem®3 instruction manual, 210.6500, for additional start-up information.

WARNING

A calibration must be performed at the start up using the MicroChem®3 instrument.
Please find the instructions related to the calibration procedure in this manual.
For complete MicroChem®3 configuration information consult manual 210.6500.

Repeat the start-up procedure when cleaning or replacing the electrodes.
Note: Always make sure the required amount of Corundum sand is in the body.

WARNING

- Never ADD Corundum sand to the cell, but always CHANGE it completely.
- Make a visual inspection of the cell, if you see no sand swirling in the cell, flush the cell completely and add new Corundum sand as outlined in Section 3 Start-Up.

4 CALIBRATION

The calibration procedure is necessary to convert the sensors raw measurements into concentration values and to compensate for background differences in the sample water composition. Calibration is accomplished by independently analyzing the sample water concentration and then entering the result into the MicroChem®3 instrument. Calibration is necessary at startup of the instrument and at periodical intervals during normal operation.

4.1 Calibration Screens

Measure cells require a stabilization time after they have been installed or serviced. Allow 24 hours for the cell to polarize and the output to become stable. During this time the instrument must be powered and normal process sample water flowing through the measure cell.

Calibration is accomplished by pressing the "Calib." button on the MicroChem®3 instrument. Doing this will produce the below listed menu screen.

Select the channel number that is connected to the MC4000 measure cell.

The above listed screen will now be displayed. The two available calibration points are the "Calib. Low" and "Calib. High". The low calibration point is where the zero or low concentration value is entered. The High calibration point is where the span or high concentration value is entered. The two points can be freely chosen, provided they are distant enough from one another and inside the selected measuring range. When both parameters are entered the instrument will generate a calibration curve allowing the correct residual concentration to be displayed.

4.2 Calibration Procedure

Using the calibration screens, follow the below listed steps to calibrate the measure cell to the MicroChem®3 instrument.

4.2.1 Zero or Calib. Low Procedure

a. To zero the instrument, supply sample water to the measure cell from a point prior to adding the disinfecting agent. In the case of chlorine if a non-chlorinated sample is not available, a dechlorinating filter can be inserted into the sample line to remove chlorine during the low calibration procedure. Let the instrument stabilize (this can take up to 15-20 minutes).

b. Once residual display is stable, take a sample from the incoming process water. Immediately after taking the sample depress the "Calib. Low" button on the display.

   A keypad will appear on the screen and the instrument will store the measure cell output. (See Note 1)

c. Perform an analysis to determine the residual concentration.

d. Enter the results of the sample water analysis into the displayed keypad. Depress the green "OK" button to input the value. (See Note 2)

e. To save the results of the calibration, depress the exit button. When prompted to "Save changes?" Select "Yes".

f. Remove the zero sample water or dechlorinating filter.

g. Return the normal process water to the measure cell. The calibration low procedure is now complete.

4.2.2 Span or Calib. High Procedure

a. Apply normal process water to the measure cell. Allow the residual readings to stabilize on the display.

b. Once residual display is stable, take a sample from the incoming process water. Immediately after taking the sample depress the "Calib. High" button. A keypad will appear on the screen and the instrument will store the measure cell output. (See Note 1)

c. Perform an analysis of the water sample to determine the residual concentration.

d. Enter the results of the sample water analysis into the displayed keypad. Depress the green "OK" button to input the value.

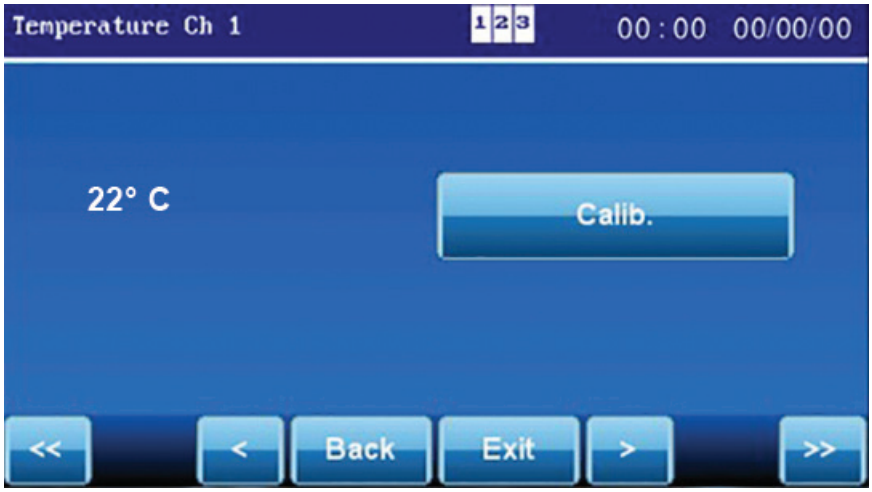
e. To save the results of the calibration, press the exit button. When prompted to "Save changes?" Select "Yes". The system will return to the normal display mode with the residual concentration displayed. The calibration high procedure is now complete.

Notes:

1. By pushing the Calib. Low or High button immediately after sample collection the instrument will read the measure cell output at the time of sample collection and store it electronically. Performing the calibration in this way prevents the possibility of the measure cell output changing while the sample analysis is being done. The result is an accurate calibration using the measure cell output taken at the same time the water sample was collected for analysis.
2. When entering the zero or low calibration value enter the value obtained when the sample is analyzed. Do not simply enter the value of 0.00. The low calibration value does not need to be exactly zero, it just needs to be below the span calibration point so that a proper calibration slope can be generated by the instrument.
3. Low and high calibration points can be performed independently of each other. The order of performing the calibrations is not important.

4.2.3 Temperature Calibration

To calibrate the temperature reading depress the "Temperature Ch X" button for the appropriate channel. The below listed screen will appear.



Pressing the "Calib" Button will bring up a keypad that will allow the new temperature to be entered. Measure the sample temperature and enter the result with the keypad. Depress the Green "OK" button to input and save the value. Press the exit button to return to the normal display mode.

5 MAINTENANCE

5.1 Recommended Preventative Maintenance Schedule

NOTE: Preventative maintenance kits for analyzers are available from the factory. Each kit contains all the parts that are required for complete maintenance. All O-rings and gaskets that have been disturbed during the disassembly must be replaced during reassembly in order to insure safe, trouble free operation. Failure to replace these parts could result in a shortened operation period.

Analyzers should be inspected and serviced at the below listed intervals.

Maintenance kits (see parts list) should be installed once per year.

Weekly

a. Check calibration of the analyzer by analyzing the incoming water sample and noting the residual reading at the time of the sample removal.

b. If the reading on the analyzer does not match the measured sample, perform a zero and span calibration on the instrument.

Monthly

a. Check calibration of the analyzer by analyzing the incoming water sample and noting the residual reading at the time of sample removal.

b. If the reading on the analyzer does not match the measured sample, perform a zero and span calibration on the instrument.

Yearly

The analyzer should be serviced at a minimum of once per year by cleaning of the measuring cell and installation of a preventive maintenance kit. More frequent servicing may be required if the incoming water sample is dirty or abrasive. Consult parts lists for applicable kit part number(s) for your particular analyzer configuration.

a. Perform service with a Preventative Maintenance Kit per Section 5.2 of this manual.

b. Perform a zero and span calibration per the calibration section of the instruction manual.

5.2 Cleaning or replacement of electrodes

If the cell sensitivity is reduced, it is an indication that cleaning the electrodes or replacing the copper cell is necessary.

A calibration must be performed after cleaning or replacing the electrodes using the MicroChem®3 instrument. Please find the instructions related to the calibration procedure in this manual. For complete MicroChem®3 configuration information consult manual 210.6500.

WARNING

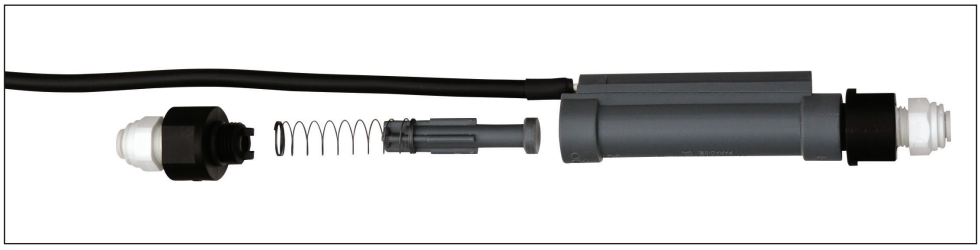
1. Stop sample flow.
2. Remove both signal leads at the cell.
3. Pull the gold electrode fitting in the cell downward, thereby exposing the entire electrode chamber.
4. The Corundum sand escapes with the water contained in the cell, and will have to be replaced.
5. To remove all the sand, loosen the gold electrode fitting and open the water sample. Refill the chamber and then remove the fitting to drain.
6. Otherwise, when it's possible, pull out the cell cover, and flush the open cell with a squirt bottle filled with clean water.
7. Sand prevents good O-ring sealing and must be completely removed from measure cell.
8. Stop the water flow.
9. Gently clean the gold electrode with a Q-tip and a detergent that does not leave a residue, such as Bon Ami Cleanser. Rinse the electrode with clean water.
10. Remove the knurled nut on the cell body. Remove the holding screw from the copper electrode.
11. Now the copper electrode can be removed by pulling down on cell to remove form plastic body.
12. Check the condition of the copper electrode. Excessive grooving or wear to the copper electrode indicates replacement is necessary. The electrode should be cleaned to produce a uniform shiny copper appearance. A non-chlorinated cleanser or a mild abrasive such as a Scotch-Brite® pad can be used to clean the copper electrode.
13. Reinstall the copper electrode and holding screw.
14. Reinstall the gold electrode assembly and add the correct quantity of sand.
15. Reconnect signal leads to the cell.
16. Restore sample flow.
17. Recalibrate analyzer after 24 hour stabilization time.

5.3.1 Sample Tubing

If the sample tubing becomes damaged or discolored, it can easily be replaced. Push back on the fitting and pull tube out. Cut new tube as needed using old piece as a size guide.

5.3.2 Optional Water Flow Switch

The switch contains and internal mechanism that may require cleaning when used in some applications. The switch can be flushed with clean water or opened at the outlet fitting and the internal parts wiped clean with a soft cloth. Be careful not to damage or lose the internal spring. (See Photo below.)



6 TROUBLE SHOOTING PROCEDURE

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
No indication	No power supply to the instrument	Verify power to instrument. Check or replace fuses.
Reading on Display is not in agreement with the chlorine level present in the sample	Bad calibration	Recalibrate
	The connection between the sensor and the instrument is not correct	Make correct connections
	The electrodes may be tarnished	Clean the electrode surfaces
	Incorrect channel definition selected	Reprogram channel definition to MC4000
Reading on Display is fluctuating or erratic	Not properly calibrated	Recalibrate
	Chlorine level is fluctuating	Check the process
	Sample flow rate is too low or variable	Adjust sample inlet pressure to resolve flow problems
	Too much or too little Corundum sand	Clean cell electrodes and add correct quantity of Corundum sand
No 4-20 mA Residual Signal	4-20 mA output software configuration not set	Refer to Instruction Manual 210.6500 and assign 4-20 mA output to appropriate Channel Card
	Broken or loose electrical connections	Replace or make secure connections
	Circuit Board problem	Replace Channel Card

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