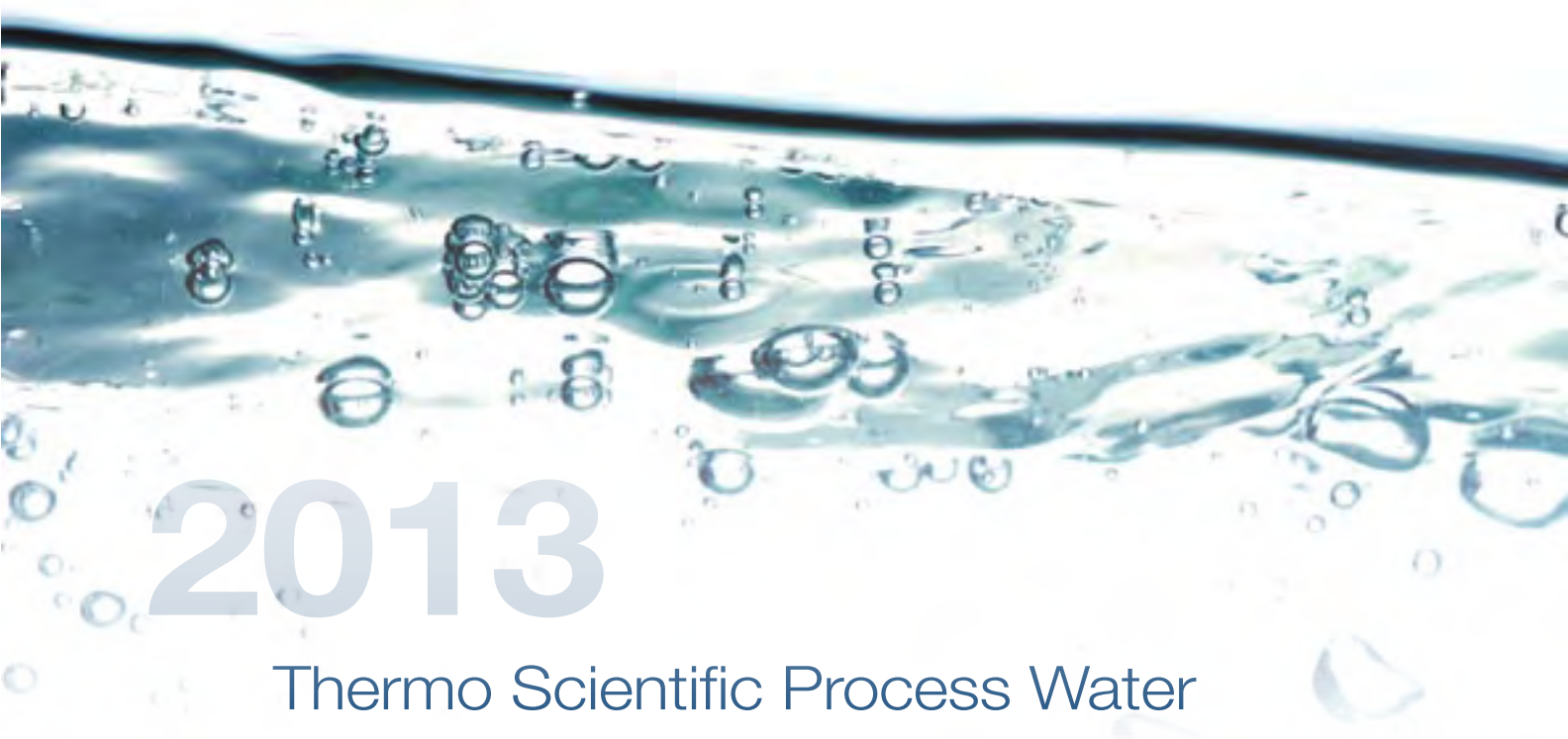
2013 Thermo Scientific Process Water Products Catalog

- Sensors
- Measurement Systems
- Online Analyzers
- Transmitters
- Laboratory Instruments

superior solutions

to meet any process water challenge

Thermo SCIENTIFIC



2013

Thermo Scientific Process Water Products Catalog

Leaders in Sensing Technology

From supplying safe drinking water or reliably controlling wastewater treatment processing to delivering significant value to industrial water treatment providers – our water experts can help you meet your application challenges. Thermo Scientific™ process water analysis measurement products are designed for flexibility, ease of use, and low cost of operation in water treatment, delivering accuracy you can trust with confidence year after year. Select from our digital plug-and-play systems, advanced optical DO sensors, and a broad portfolio of differential and analog measurement capabilities to build virtually any water quality solution.

- **Wastewater Treatment**
- **Drinking Water**
- **Power Generation**
- **Food & Beverage**
- **Chemical Processing**

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Pure Water Analysis

- **Deionized (DI)**
- **Ultra Pure Water (UPW)**

There are many industries that manufacture and use DI/UPW. Some of the most common and their applications include:

- **Power** – steam generation to drive turbines
- **Semiconductor** – wafer production rinse water
- **Pulp and Paper** – steam generation used to boil the wood pulp and to drive turbines generating power
- **Pharmaceutical** – sterile Water for Injection (WFI), cleaning and rinsing, granulation for tablet manufacturing, and steam generation
- **Petrochemical** – steam generation used to heat and boil products, and for power generation

DI and UPW are generally manufactured using two methods, often a combination of both:

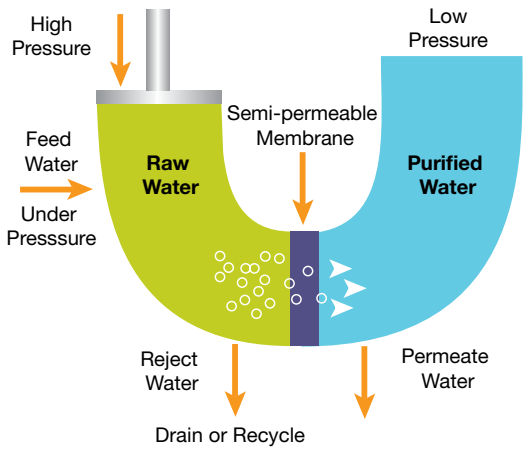
- Reverse osmosis
- Resin columns for stripping out cations (positively charged ions) and anions (negatively charged ions)

A common measurement for gauging efficiency of your RO system is conductivity. This measurement can be made either with resistance or with TDS (Total Dissolved Solids).

Osmosis/Reverse Osmosis

Osmosis is the natural and spontaneous process by which water diffuses through a semi-permeable membrane. To equalize osmotic pressure, water will flow naturally from the volume of low dilution to the volume of high dilution. Osmotic pressure is the amount of pressure required on the high dilution to stop the flow – or reverse it – in a condition where only one side has solute. In the case where one side has solute and the other is comprised of pure water, osmotic pressure is the force needed to stop the flow of water into the solute side and instead filter the water into the side with less solute.

Osmotic pressure can push the dilution volume through the membrane into the low dilution volume, increasing both the low dilution level and concentration of solute in the high dilution side. This is called reverse osmosis (RO), and one of the most common applications of this process is water purification.



Thermo Scientific™ Products for Measuring an RO System:

- Orion™ 2002 Conductivity Cells
- Alpha™ Series Conductivity Cells
- AquaMate™ 7000/8000 Spectrophotometers

Pure Water Analysis

Resin Columns

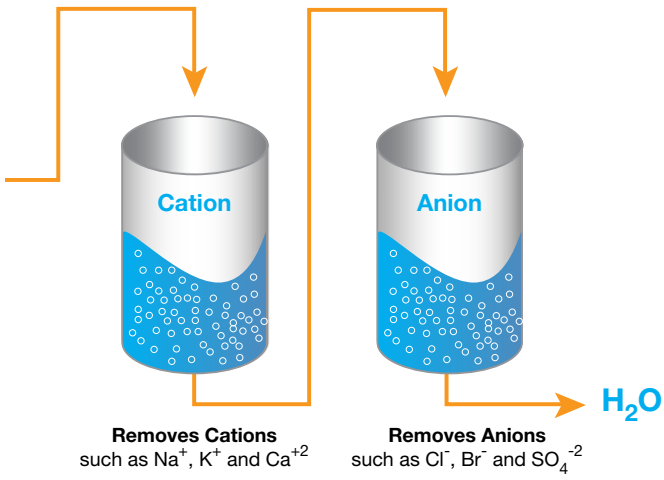
Resin Columns are the best and most common choice for deionizing water. Good resins leave pure water, but a resin column only has a limited life before the resins need to be regenerated. This regeneration process takes time and is expensive. It involves washing resins with large quantities of sulfuric acid (for cation columns) or caustic (for anion columns). The more efficient the column is prior to breakthrough, the less expensive and more environmentally safe it is for the use. Reverse osmosis units are often used ahead of demineralizers because they remove a significant amount of the dissolved salts in the raw water. This extends the run time of the resin beds and lowers the frequency of regeneration.

Cation

Water (usually city water or RO conditioned water) initially passes through a cation resin column, which strips out cations such as sodium, potassium and calcium, and exchanges them for hydrogen ions. When the column is saturated, ions with the weakest bond to the resin escape – a condition called *breakthrough*. When caught in time, it allows the user to switch to a new resin column while regenerating the exhausted column.

Anion

The water leaving the cation column is now free of all cations, having replaced them with hydrogen ion, H+. Anions such as chloride and sulfate are still present, however. The anion column strips these negatively charged ions and replaces them with hydroxide ions, OH-, creating pure H_2O.



Thermo Scientific Products to Monitor Breakthrough:

- Orion 2111XP Sodium Analyzer
- Orion 2111LL Low Level Sodium Analyzer
- Orion 2230 Silica Analyzer
- Orion 2002 Conductivity Cells
- Alpha Series Conductivity Cells
- AquaMate 7000/8000 Spectrophotometers

Power Plant Water Analysis

- **Pure Water**
- **Online Monitoring**

The reliable long-term operation of a modern power plant requires large quantities of ultra pure makeup water, in addition to recycle water that is almost perfectly conditioned. The reason is simple: Mineral deposits and particulate matter in the boiler feed water and steam generator shorten the life of the turbines, resulting in expensive repairs or even replacement.

Accordingly, ensuring ultra high quality water requires the precise measurement of trace impurities at the parts-per-billion level, as well as the tight monitoring and control of conditioning chemicals normally added to avoid corrosion of the turbines, boilers and pipes within the plant.

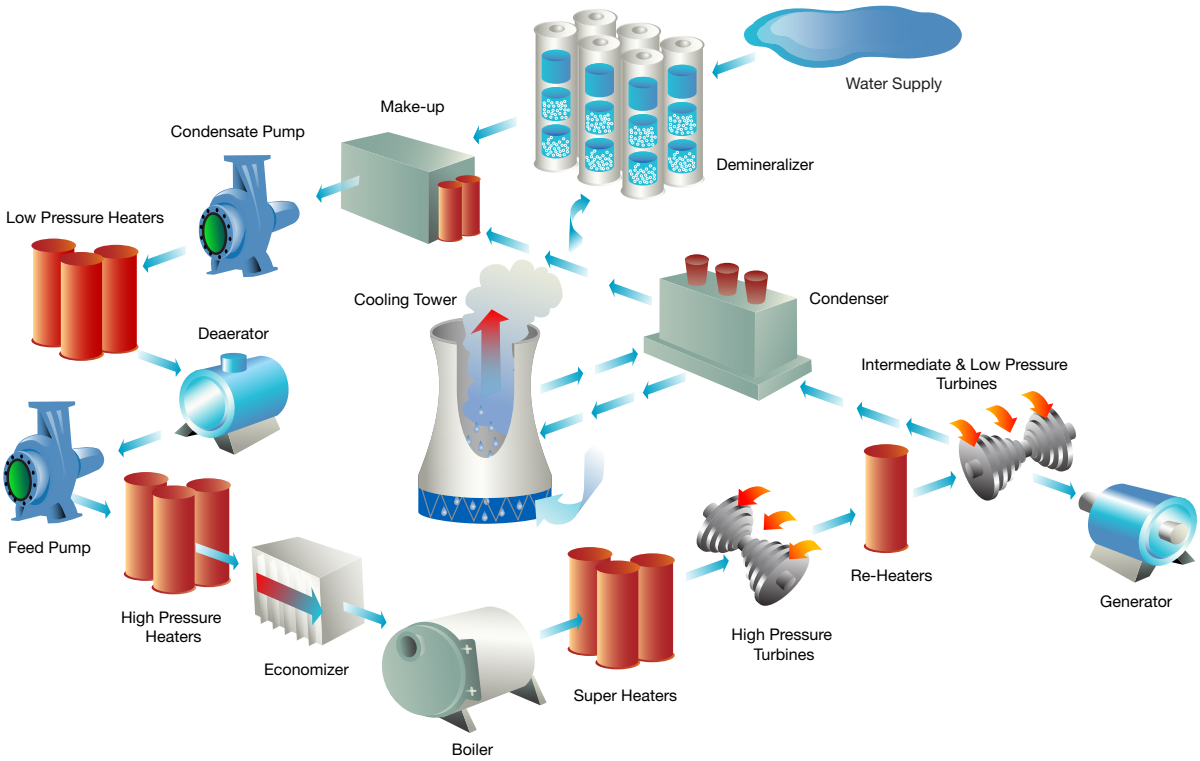
The key to deposition and corrosion prevention is the non-stop, real-time monitoring of trace cations, anions and dissolved gases that can contaminate high-purity water.

Water analysis concerns within the power industry include:

- Boiler water chemistry
- Boiler water and feed water treatment
- Steam carryover and contamination by sodium
- Sodium in condensate
- Deaerator outlet for oxygen concentration
- Sodium and silica breakthrough on demineralizers or calcium hardness breakthrough on softeners
- pH and conductivity at various points

Thermo Scientific sensors and online water analyzers meet your application needs for pure water purification, boiler water control, condensate, and effluent applications. Minimization of trace salt and silica contamination is critical to prevent serious corrosion problems that can cause expensive damage to turbines and other plant components. Control of dissolved gases such as oxygen and ammonia, in proper low concentration ranges, is required to prevent corrosion. pH ranges must be maintained in a narrow window for the same reasons. Proper chemistry control in these critical plant processes will not only prevent costly and unscheduled outages, but will also greatly extend the useful lifetime of the plant.

Power Plant Water Analysis



Thermo Scientific™ Monitors for:

Pure Water Production	Boiler Feed Water	Condensate	Cooling Water Effluent	Deaerator	Boiler Water/Blowdown
• Orion 2111LL Low Level Sodium Analyzer • Orion 2111XP Sodium Analyzer • Orion 2230 Silica Analyzer • Orion™ 2001SC High Purity ROSS™ pH Electrode and Low Level Conductivity Cells • AquaSensors™ DataStick™ AquaTrace™ Dissolved Oxygen System	• Orion 2118XP Oxygen Scavenger Analyzer • Orion 2110XP Ammonia Analyzer • Orion 2111LL Low Level Sodium Analyzer • Orion 2001SC High Purity ROSS Combination Electrode • Low Level Conductivity Cells • AquaSensors DataStick AquaTrace Dissolved Oxygen System	• Orion 2111LL Low Level Sodium Analyzer • Orion 2001SC High Purity ROSS pH Combination Electrode and Low Level Conductivity Cells	• AquaSensors™ AquaChlor™ Free Chlorine Monitoring System • Orion™ Chlorine XP™ Water Quality Analyzer	• Orion 2118XP Oxygen Scavenger Analyzer • Orion 2001SC High Purity ROSS pH Combination Electrode and Low Level Conductivity Cells	• Orion 2230 Silica Analyzer • Orion 2117LL Low Level and Orion 2117XP Chloride Analyzers • Orion 2001SC High Purity ROSS pH Combination Electrode and Low Level Conductivity Cells

Drinking Water Analysis

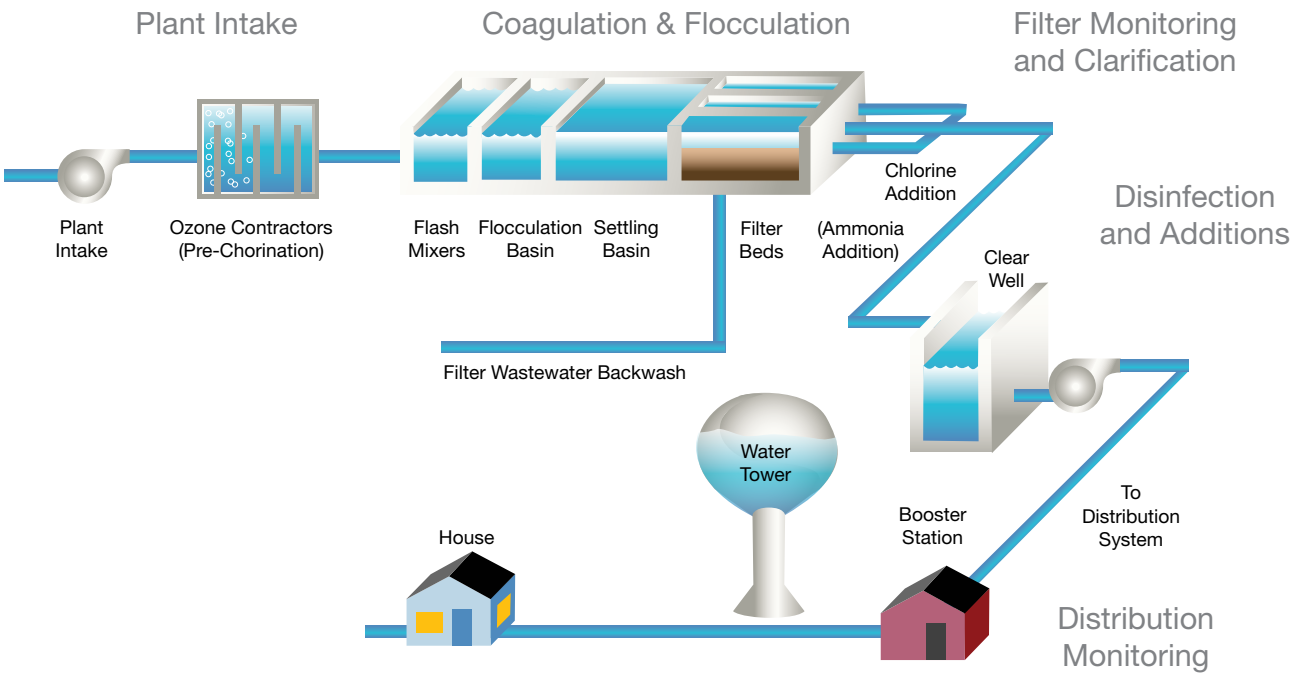
▶ Municipal Drinking Water Treatment

Millions of Americans depend on public and private systems for their high quality drinking water. In fact, there are more than 160,000 public water systems alone that reliably meet the needs of the country every day.

Drinking water safety is a clearly a critical priority. Yet the number of threats to water safety continues to grow daily, and include animal and human waste, improper disposal of chemicals, pesticides, and deep earth injection of hazardous materials. Contamination is also a threat due to improper water treatment and disinfection procedures, as well as from poorly maintained water distribution systems.

The U.S. Environmental Protection Agency, through the Safe Drinking Water Act, has established national health-based standards that address both man-made and naturally occurring contamination. Compliance requires consistent, accurate measurement of water parameters performed in the lab, field and on-line. While many measurements can be made in the lab, key variables such as pH, conductivity, fluoride and chlorine can also be measured on-line in real-time to warn immediately if limits are exceeded.

Drinking Water Analysis



Thermo Scientific™ Products for:

Plant Intake	Coagulation and Flocculation	Filter Monitoring & Clarification	Disinfection and Additions	Distribution Monitoring
• AquaSensors™ DataStick™ pH Measurement System • AquaSensors™ AnalogPlus™ Differential pH Sensors • Alpha pH Sensors • AquaSensors DataStick Wide-Range Turbidity Measurement System • AquaSensors AquaChlor Free Chlorine Measurement System • Orion Chlorine XP Water Quality Analyzer • Orion™ Star™ A Benchtop and Portable Laboratory Meters • Orion AquaMate UV-Vis Benchtop Spectrophotometers	• Orion pHR Process ROSS Electrode • AquaSensors DataStick pH Measurement System • AquaSensors AnalogPlus Differential pH Sensors • Alpha pH Sensors • AquaSensors DataStick Wide-Range Turbidity Measurement System • Orion Star A Benchtop and Portable Laboratory Meters	• AquaSensors™ AquaClear™ Low-Range Turbidimeter • Orion pHR Process ROSS Electrode • AquaSensors DataStick pH Measurement System • AquaSensors AnalogPlus Differential pH Sensors • Alpha pH Sensors • AquaSensors DataStick Wide-Range Turbidity Measurement System • AQUAfast™ AQ4500 Turbidity Meter	• AquaSensors AquaChlor Free Chlorine Monitoring System • Chlorine XP Water Quality Analyzer • Orion 2109XP Fluoride Analyzer • AquaSensors DataStick Dissolved Ozone Measurement System • Orion Star A Benchtop and Portable Laboratory Meters • Orion AquaMate UV-Vis Benchtop Spectrophotometers • AQUAfast AQ3700 and AQ3070 Colorimeters	• AquaSensors AquaChlor Free Chlorine Monitoring System • Orion Chlorine XP Water Quality Analyzer • Orion Star A Portable Laboratory Meters • AQUAfast AQ4500 Turbidity Meter • AQUAfast AQ3700 and AQ3070 Colorimeters

Wastewater Analysis

▶ Municipal/Industrial

Wastewater commonly refers to the liquid wastes collected and transported to treatment facilities via a system of sewers. It is generally divided into two broad classifications: domestic and industrial. The chemical composition of the wastewater is carefully measured both as it enters treatment and before it is released into public rivers, lakes and the oceans. The accuracy of all measurements is critically important. Wastewater is regulated by the U.S. Environmental Protection Agency, as well as state and municipal authorities, with each providing varying standards that must be strictly followed. Companies that fail to comply may be fined thousands of dollars per day until they meet the regulations. **There are five basic processes in wastewater treatment:**

1 | **Pretreatment:** The first step includes the physical separation of solids from the flow by screening, grinding debris and settling out heavy inert grit. Although this results in a very small percentage of solids that must be removed, it is an essential step to avoid problems downstream in the treatment process.

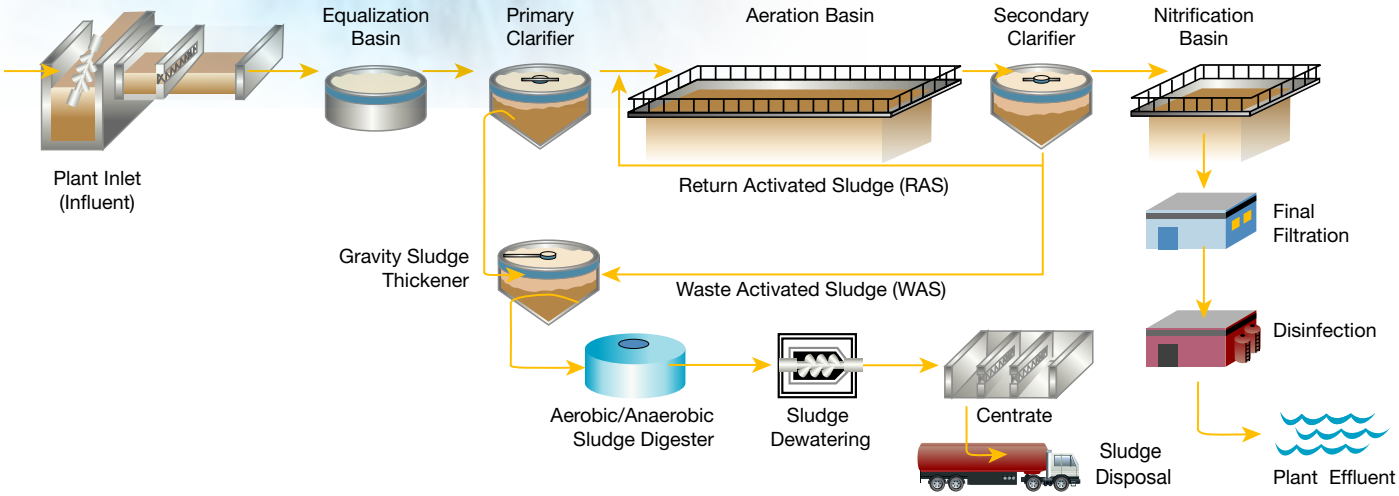
2 | **Primary treatment:** In this stage, gravity settling in primary clarifiers removes some of the total suspended solids.

3 | **Secondary treatment:** Secondary treatment comprises biological processes that use microorganisms to digest the organic material that remains after primary clarification. It stabilizes the raw organic material that could threaten the receiving water. Additional processes in this stage include trickling filters, lagoons and stabilizing ponds, rotating biological contactors (RBCs) and various kinds of activated sludge processes.

4 | **Tertiary treatment:** Tertiary treatment includes numerous options. For instance, polishing ponds for bacteria and BOD removal have been added to secondary trickling filter plants to improve overall removal efficiency plant-wide. If additional treatment is required for a system discharge permit, processes such nitrification/de-nitrification, ammonia stripping and phosphorous precipitation may be implemented.

5 | **Disinfection:** Disinfection is needed to destroy harmful organisms in the wastewater effluent. Disinfecting wastewater is commonly achieved through chlorination, polishing ponds, ozonation and UV radiation.

Wastewater Analysis



Thermo Scientific™ Products for:

Plant Influent

- AquaSensors DataStick Suspended Solids Turbidity Measurement System
- AquaSensors DataStick pH Measurement System
- AquaSensors AnalogPlus pH Sensors
- Alpha pH Sensors
- AquaMate Spectrophotometer
- AQUAfast colorimeters and turbidimeters
- Orion Star A portable meters

Equalization Basin

- AquaSensors™ RDO Pro™ Optical Dissolved Oxygen Sensor
- Orion Star A portable meters

Primary Clarifier

- AquaSensors DataStick Suspended Solids Turbidity Measurement System

Aeration Basin

- AquaSensors DataStick pH Measurement System
- AquaSensors AnalogPlus pH Sensors
- Alpha pH Sensors
- AquaSensors DataStick Dissolved Oxygen Measurement System
- AquaSensors RDO Pro Optical Dissolved Oxygen Sensor
- AquaSensors AnalogPlus Dissolved Oxygen Sensor
- Alpha Dissolved Oxygen Sensors
- Orion Star A portable meters

Secondary Clarifier

- AquaSensors DataStick Suspended Solids Turbidity Measurement System

Nitrification Basin

- AquaSensors DataStick Dissolved Oxygen Measurement System
- AquaSensors RDO Pro Optical Dissolved Oxygen Sensor
- AquaSensors AnalogPlus Dissolved Oxygen Sensor
- Alpha Dissolved Oxygen Sensors
- Orion Star A portable meters
- AquaMate Spectrophotometer
- AQUAfast colorimeters and turbidimeters
- Orion Star A benchtop meters

Disinfection

- AquaSensors DataStick Dissolved Ozone Measurement System
- AquaSensors AnalogPlus Dissolved Ozone Sensor
- Orion Chlorine XP Water Quality Analyzer

Plant Effluent

- AquaSensors DataStick Dissolved Oxygen Measurement System
- AquaSensors RDO Pro Optical Dissolved Oxygen Sensor
- AquaSensors AnalogPlus Dissolved Oxygen Sensor
- Alpha Dissolved Oxygen Sensors
- AquaSensors DataStick Suspended Solids Turbidity Measurement System
- Orion Star A portable meters
- AquaMate Spectrophotometer
- AQUAfast colorimeters and turbidimeters
- Orion Star A benchtop meters

Sludge Disposal

- AquaSensors DataStick pH Measurement System
- AquaSensors AnalogPlus pH Sensors
- Alpha pH Sensors

Aerobic/Anaerobic Sludge Digester

- AquaSensors DataStick Dissolved Oxygen Measurement System
- AquaSensors RDO Pro Optical Dissolved Oxygen Sensor
- AquaSensors AnalogPlus Dissolved Oxygen Sensor
- Alpha Dissolved Oxygen Sensors
- AquaSensors DataStick Suspended Solids Turbidity Measurement System
- Orion Star A portable meters

Waste Activated Sludge

- AquaSensors DataStick Suspended Solids Turbidity Measurement System

The Sensors

We offer a wide selection of sensors that fit into a wide variety of applications.

Highest measurement precision plus **advanced features** for the most demanding applications

Thermo Scientific Orion ROSS Sensors

Available in pH and conductivity parameters, Orion ROSS Sensors are simply the best choice in process sensors, due to:

- Superior measurement stability
- Fast response to temperature fluctuations
- Exceptional accuracy
- Higher level of reproducible results than conventional online sensors

Thermo Scientific AquaSensors DataStick Measurement Systems

AquaSensors DataStick systems are versatile, configurable analytical measurement systems that feature:

- Interchangeable plug-and-play components, tailored to many water quality and process control applications
- Remote configuration, calibration and diagnostics
- Many communication protocols
- Many measurement parameters

A step up in **rugged construction and performance**, with ease-of-use features

Thermo Scientific AquaSensors AnalogPlus Sensors

AnalogPlus sensors are rugged and foul-resistant, ideal for continuous use in demanding process applications.

- Fast and accurate temperature response
- Available in pH, ORP, conductivity, dissolved oxygen and dissolved ozone parameters
- Offered in CPVC for a wide range of applications at an affordable price
- Offered in PEEK for higher temperatures and greater chemical resistance in process applications

Dependable and accurate measurements with solid cost-effective performance

Thermo Scientific Alpha Series Sensors

Whether you're measuring pH, ORP, conductivity or dissolved oxygen, Alpha series sensors deliver accurate and consistent measurements.

- High-quality, double-junction sensors for operation in environments from 0 °C up to 110 °C
- 2-cell and 4-cell conductivity sensors that incorporate automatic temperature compensation in high temperatures up to 200 °C
- Designed for minimal maintenance and quick, stable readings with short response time
- Rugged and long-lasting galvanic electrodes require no warm-up time

Industries/Applications ▶		Drinking Water		Wastewater		Power Generation			Pulp & Paper			General Processing		
Recommended Thermo Scientific Product ▶		Municipal Water Treatment	Bottled Water	Municipal Wastewater Treatment	Industrial Wastewater Treatment	Boiler Water Chemistry	Ultra Pure Water	Cooling Water	Steam Generation	Liquor Tanks	Wash & Bleaching	Petrochem	Electroplating	Food & Beverage Manufacturing
pH	Orion 2001SC High Purity ROSS Electrode						•		•					
	Orion pHR Process ROSS Electrode	•		•										
	AquaSensors DataStick pH Measurement System			•	•			•		•	•	•	•	
	AquaSensors AnalogPlus Differential pH Sensor – 1.0 inch /1.5 inch	•		•	•									
	Alpha EC100GTSO20B pH Sensor	•		•	•			•		•	•		•	
	Alpha EC100GTSO10B pH Sensor	•		•	•			•		•	•		•	
	Alpha EC100GTSO05B pH Sensor	•		•	•			•		•	•		•	
	Alpha ECARGTSO05B pH Sensor													
	Alpha ECARTSOHF05B pH Sensor													
	Alpha ECARTSO05B pH Sensor								•	•	•	•	•	
ORP	AquaSensors DataStick ORP Measurement System			•	•	•		•		•	•		•	
	AquaSensors AnalogPlus Differential ORP Sensor – 1.0 inch /1.5 inch			•	•	•		•		•	•		•	
	Alpha ECHTPTTSO05B ORP Sensor					•		•		•	•			
Conductivity	Orion 2002SS/2002CC Conductivity Cells					•	•	•	•					
	AquaSensors DataStick Conductivity/Resistivity Measurement System	•	•	•	•			•						
	AquaSensors DataStick Toroidal Conductivity Measurement System	•								•	•	•	•	•
	AquaSensors AnalogPlus Conductivity/Resistivity Sensors – 1.0 inch General Purpose	•	•	•	•	•	•							
	Alpha ECCS10-0-01T Conductivity Sensor	•	•	•	•	•	•			•	•	•	•	
	Alpha ECCS10-0-01TS Conductivity Sensor	•	•	•	•	•	•			•	•	•	•	
	Alpha ECCS10-0-01S Conductivity Sensor					•		•	•					
	Alpha ECCS10-0-01SS Conductivity Sensor					•		•	•					
	Alpha ECCS10-0-1S Conductivity Sensor					•		•	•					
	Alpha ECCS10-0-1SSP Conductivity Sensor							•						
	Alpha ECCS10-1-0S Conductivity Sensor	•	•	•	•			•		•	•	•	•	
	Alpha ECCS10-1-0SSP Conductivity Sensor	•	•	•	•			•		•	•	•	•	
Turbidity	AquaSensors DataStick Wide-Range Turbidity Measurement System	•		•	•						•	•		
	AquaSensors DataStick Suspended Solids Turbidity System	•		•	•						•	•		
	AquaSensors DataStick AquaClear Low-Range Turbidimeter	•	•											
Dissolved Oxygen	AquaSensors DataStick Dissolved Oxygen Measurement System			•	•	•	•		•			•		•
	AquaSensors RDO Pro Optical Dissolved Oxygen Sensor			•	•									
	AquaSensors AnalogPlus Dissolved Oxygen Sensor			•	•	•	•		•			•		•
	AquaSensors DataStick AquaTrace Dissolved Oxygen System					•	•							
Dissolved Ozone	AquaSensors DataStick Dissolved Ozone Measurement System	•	•	•										
	AquaSensors AnalogPlus Dissolved Ozone Sensor	•	•											
Chlorine	AquaSensors DataStick AquaChlor Free Chlorine Sensor/ Monitoring System	•	•											
	Orion Chlorine XP Water Quality Analzyer	•	•	•	•		•	•						•
Silica	Orion 2230 Silica Analyzer					•	•							
Sodium	Orion 2111XP Sodium Analyzer					•	•		•					
	Orion 2111LL Low Level Sodium Analyzer					•	•		•					
Chloride	Orion 2117LL Low-Level Chloride Monitor													
	Orion 2117XP Chloride Analyzer					•								
	Orion 2117HL High Level Chloride Analyzer					•		•						
Oxygen Scavenger	Orion 2118XP Oxygen Scavenger Analyzer					•	•		•					
Ammonia	Orion 2110XP Ammonia Analyzer					•	•		•					
Fluoride	Orion 2109XP Fluoride Analyzer	•	•											
Calcium	Orion 2120XP Calcium Hardness Analyzer	•	•	•					•					

About pH Measurements

Why is pH Important?

pH is one of the most common parameters measured in a wide variety of industries such as water and wastewater treatment, environmental monitoring, chemical and life sciences, electronics production and many other industrial applications.

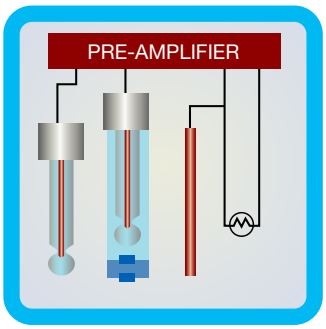
pH Theory

The term *pH* is derived from a combination of "p" for the word power and "H" for the symbol of the element Hydrogen.

pH serves as a convenient way to compare the relative acidity or alkalinity of a solution at a given temperature. For example, pure water has a neutral pH of 7, where the activities of hydrogen and hydroxide ions are equal. If the activity of the hydrogen ion is greater than that of hydroxide ion, the sample is described as acidic. In general, as the level of hydrogen ion activity increases, the pH value decreases. A pH below 7 is known as acidic. Conversely, as the level of hydrogen ion activity decreases, the pH increases. A pH above 7 is known as alkaline, or basic.

Conventional pH Electrode Measurement

pH is always measured across a medium. pH measurement is usually performed with a conventional combination electrode, consisting of two parts: the glass electrode and the reference (Figure 1). The glass electrode contains a silver wire immersed in conductive solution. During measurement, the glass bulb and stem are the only parts that come in contact with the sample. Hence, contamination of the silver wire and conductive solution does not occur. The reference electrode, on the other hand, is constructed simply with a porous junction and a silver wire. This porous junction allows the reference electrolyte to flow from its chamber to the sample, establishing a connection between the two. However, the porosity also allows contaminants to flow into the reference chamber, reacting with the electrolyte and/or silver wire.

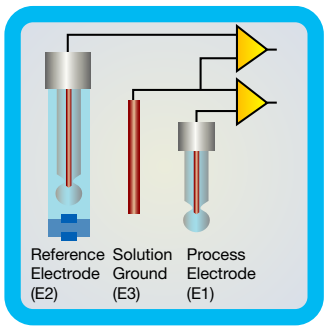


The reference electrode is also susceptible to clogs. In the case of conventional combination electrodes, the entire electrode must be replaced due to a clogged reference electrode.

When contamination and clogging of the electrode occurs, measurement performance is compromised.

Differential pH Electrode Measurement

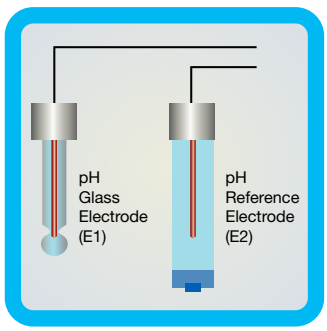
In a differential electrode, the exposed silver wire is replaced with a design built on the benefits of a pH glass electrode (Figure 2). Quadruple junction salt bridges and an electrolyte-filled chamber act as barriers to prevent contaminants from entering the inner chamber, while at the same time, allowing connection between the reference electrolyte and the sample.

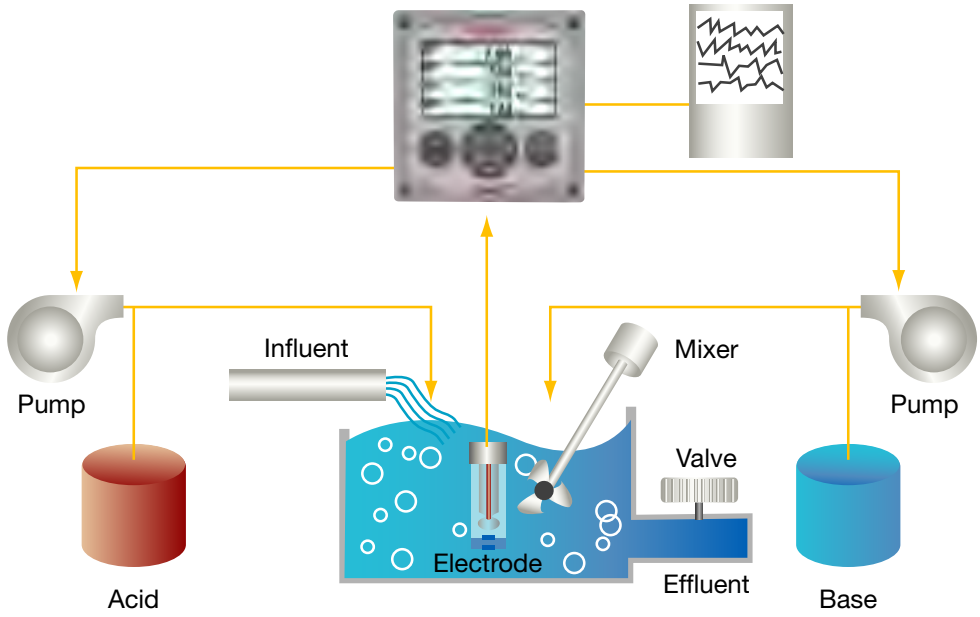


In the event of clogs, the salt bridges and electrolyte are easily replaced, reducing downtime and cost of maintenance. An individual liquid ground is also built into the electrode, effectively eliminating noises from ground loops potential (Figure 3):

(E1 – E3) – (E2 – E3) = E1 – E3

With these design improvements, the differential electrodes enjoy a longer lifespan in harsh environments as compared to conventional electrodes.





Electrode Junctions

For many routine applications, a conventional single junction reference electrode is satisfactory. However, if samples contain proteins, sulfides, heavy metals or any other material that interacts with the silver, unwanted side effects can occur. These effects can lead to erroneous reference signals or to precipitation at the reference junction, leading to a short service life.

A double junction electrode reference design offers a barrier of protection to combat the above reactions, and therefore is recommended for use in most process applications.

Electrode Performance

When a pH electrode comes into contact with a sample, a potential develops on the membrane surface and the electrode's pH value varies with the pH of the solution. This variation in potential is measured in millivolts (mV) by a meter or analyzer and is converted to direct pH values and shown on the meter display. Depending on the concentration of ions in the sample, the mV and pH vary. Electrode performance is dependent on two factors: offset and slope.

Offset in pH electrodes — Theoretically, when placed in pH 7.00 buffer at 25 °C, a pH electrode produces 0 mV which the pH meter reads as 7.00 pH. The difference between 0 mV and the electrode's actual reading is called the offset error which can be as high as ±25 mV.

While in theory the mV value should be zero, in practice this is rarely the case because of liquid difference, bulb composition, wire geometry, and other factors.

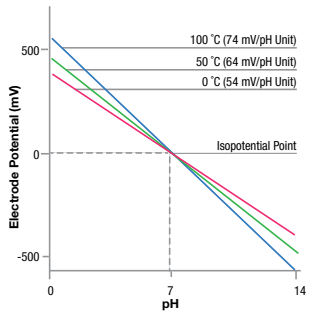
Thermo Scientific advanced micro-processor based transmitters/analyzers provide offset calibration capabilities for consistent and reliable measurements.

pH Slope — A pH electrode produces different mV in different solutions. Therefore, the slope of the electrode can be defined as: **Slope = mV/pH unit**

A perfect pH electrode, at 25 °C, produces a slope of 59.16 mV per pH unit. For example, an electrode with 0 mV offset should read mV value of 177.48 mV when placed in a pH 4.01 solution. The slope is then calculated as: 177.48 mV/3 pH = 59.16 mv/pH. The difference between this perfect slope reading and the electrode's actual reading is called the slope error. These theoretical values are not always achieved, even with new electrodes. The slope of a new pH electrode should fall between 92% and 102% of 59.16 mV.

Temperature Compensation

The most common cause of error in pH measurements is temperature variation within the buffer, the sample and internal elements of the electrode, and the environment. Compensation for electrode slope changes can be achieved by using automatic temperature compensation. Thermo Scientific pH transmitters and analyzers calculate the electrode slope based on the measured temperature of the pH buffers. The transmitter or analyzer will automatically adjust the pH buffer value to the actual pH of the buffer at the measured temperature.



Thermo Scientific pH Sensors

Thermo Scientific ROSS pH sensors offer superior benefits compared to conventional combination pH electrodes

- **Cost Savings, Reduced Downtime and Maintenance Costs** – Soiled salt bridge and buffer reference solution can easily be replaced at a fraction of the cost of a new combination electrode
- **Automatic Temperature Compensation** – Built-in temperature electrode enables accurate measurement
- **Unique internal reference system** – silver-free, liquid-to-liquid double junction design is clog free for drift-free and accurate measurements
- **Optional Built-In Electronic Amplifier** – Provides a low impedance output from the electrode and allows analyzers to be located up to 3,000 feet away from the electrode

Superior Orion ROSS technology - A legacy in the lab, now brought to the process

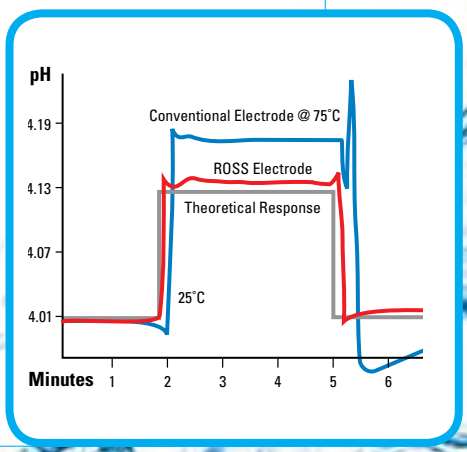
No longer just a lab standard, Orion ROSS pH technology is also available for measuring ultra pure, pure or potable water online, where the highest accuracy is needed.

Pure water samples have relatively low ionic strength and are therefore poor conductors.

If you are measuring online samples that have low ionic strength or that fluctuate in temperature, the ROSS electrode's patented internal reference system provides:

- Superior measurement stability
- Faster response
- Greater accuracy
- More reproducible results than conventional online pH electrodes

The silver-free ROSS reference system has NO dissolved metals. In conventional silver-chloride based reference systems, dissolved metals precipitate. The result is clogged junctions, causing a slow, sluggish response. The ROSS internal reference system features a unique liquid-to-liquid double-junction design. This avoids long-term drift or inaccurate readings. The graph below shows typical results of how ROSS electrodes respond versus conventional pH electrodes. The ROSS electrode responds almost immediately to the correct buffer pH value with the change in temperature.



Thermo Scientific 2001SC Orion High Purity ROSS pH Electrode

The Orion 2001SC high purity ROSS pH electrode is a combination electrode engineered specifically for online applications when the highest accuracy and precision are required. The pH sensing and reference electrodes are combined into a single electrode best suited for high purity measurements.

- Unmatched drift-free patented ROSS reference system, with precision of 0.02 pH
- Reliable, reproducible results in high purity samples
- Fastest response for online pH electrodes

Cat. No.	2001SC
pH Range	0 to 14 pH
Temperature Range	0 to 100 °C
Drift	Less than 0.05 pH units for 30 days
Slope	92 to 102% (54.4 to 60.3 mV/dec)
Internal Reference	ROSS
Junction	Ceramic frit
Size	L – 125 mm
	D – 12 mm
Cable	Detachable coaxial, 1 meter

[**CLICK HERE** — for detailed specifications]

Download our Success Story about the use of the 2001SC at a power generation plant.

Thermo Scientific Orion pHR Process ROSS Electrode

The Orion pHR Process ROSS electrode is designed to provide fast, accurate online pH measurements in a variety of applications. Drift-free measurement capability increases long-term accuracy and stability. The minimal maintenance requirements and long-term product reliability provide very low cost of ownership and add to your plant's bottom line.

- Field-proven ROSS drift-free reference system provides long lifetime
- Accurate and reproducible results in high purity samples
- Double junction design prevents contamination
- Exceptional pH response to extreme temperature changes

Cat. No.	See data sheet for ordering information
Pressure Range	0 to 100 psig
Temperature Range	-5 °C to 95 °C
pH Measurement Range	0 to 14 pH
Temperature Response	90% in 2 minutes for a 10 °C temperature change
Resolution	0.01 pH
Accuracy	0.1 pH
pH Measurement Response	95% in 30 seconds in a pH range of ±3
Precision	0.05 pH – 0.5 °C

[**CLICK HERE** — for detailed specifications]

Measurement System

Thermo Scientific Measurement Systems — AquaSensors DataStick

The Thermo Scientific AquaSensors DataStick product is a versatile, configurable analytical measurement system. The systems provide truly customizable, unrivaled solutions to many water quality and process control applications, offering interchangeable plug-and-play components, remote configuration, calibration and diagnostics, and support for a variety of communications protocols.

A Leap in Sensor Innovation

AquaSensors DataStick measurement systems began with a revolutionary idea – simplify analytical measurements by designing digital sensors that connect directly to PLCs, HMIs and PC-based SCADA systems. The patented DataStick measurement system features pre-calibrated, plug-in sensor heads that provide 14-bit data and can be calibrated, configured or diagnosed directly from a PLC or computer system. This evolution in analytical measurement is available in a complete line of plug-and-play modular sensor configurations for the measurement of pH, ORP (Redox), contacting and toroidal conductivity, resistivity – as well as dissolved oxygen, drinking water turbidity, high-level turbidity, suspended solids, dissolved ozone and free chlorine.

DataStick Means Integral Communications

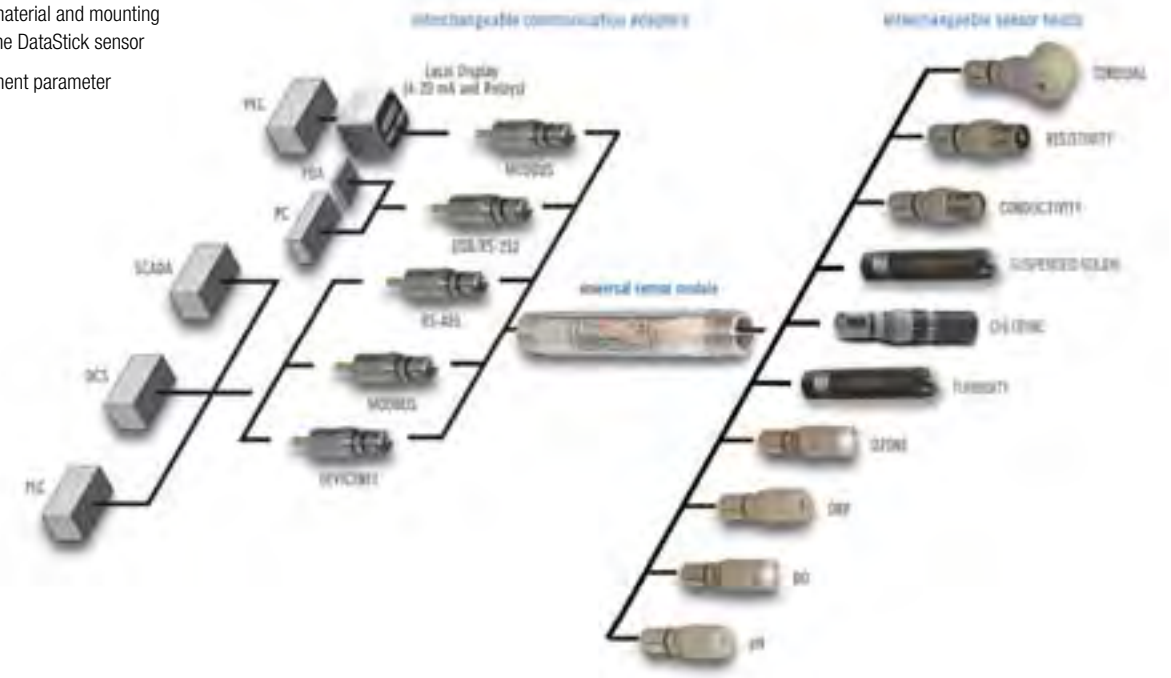
The modular DataStick system provides unparalleled flexibility. Configure a communication protocol and measurement parameter by simply connecting the appropriate sensor head and communication module. A wide variety of integrated network protocols are supported directly from the DataStick measurement system including Ethernet/IP, Modbus® RTU, DeviceNet™, CANopen, USB and RS232. The DataStick system consumes very little power and can be used in portable applications with USB connections to laptop computers. Multiple DataStick systems can be accessed directly using a standard web browser, terminal program, AquaComm for Windows™, or PLC programs.

There are three steps to configure an AquaSensors DataStick measurement system:

1 | Select a preferred communication protocol

2 | Choose the body material and mounting requirements for the DataStick sensor

3 | Select a measurement parameter and sensor head



STEP **1**

Select Preferred Communication Protocol

The AquaSensors product line offers a full range of communication protocols to meet your process control requirements. All protocols can be replaced with the same or different configuration via simple plug-and-play installation. If a protocol of interest is not listed here, others may be considered. Contact your Thermo Scientific representative for more information.

Communications Adapter Selection Matrix

Body Material	Communications	Cable Length	Cable Termination
316 stainless steel	RS-232 ASCII	10 feet	Stripped wires
PEEK®	Modbus RTU	30 feet	Custom
	Modbus RS-232	Custom	
	Ethernet		
	DeviceNet		
	USB		
	CANopen		

STEP **2**

Select DataStick Body Material and Mounting Requirements

Choose the preferred material of construction and process mounting preference. The DataStick sensor body is designed as a universal module that allows for configurable mix-n-match between the communications adaptor and sensor head, and resembles conventional sensors with 1-in. NPT process threads for “convertible” immersion or in-line mounting. Other special mounts are available.

DataStick Selection Matrix

Body Material	Mounting
316 stainless steel	1 inch NPT front/back
CPVC	1 inch NPT back w/smooth front
PEEK	2.0 & 2.5 inch Tri-Clamp
	Custom mounting

STEP **3**

Select Measurement Sensor Head

Choose a DataStick sensor based on the measurement parameter. Sensors are rugged and foul-resistant, and can be connected to a PLC for seamless integration with industrial control systems. Use any computer to display data. You can calibrate and customize the measurement without an intermediate analyzer electronics box. Sensor heads are pre-calibrated and can be replaced or exchanged with any other type of sensor without taking the system off-line.

Sensor Head Specifications

Catalog No.		**Contact customer service or your sales rep to configure a DataStick system**
Measurement Parameters		pH, ORP, contacting and toroidal conductivity, resistivity, dissolved oxygen, drinking water turbidity, high level turbidity, suspended solids, dissolved oxygen and free chlorine
Operational Environment	**PEEK Sensor Head**	**Temperature Range:** -5 °C to 95 °C
		Maximum Pressure: 100 psig @95 °C
		Maximum Flow Rate: 10 ft/second
	CPVC Sensor Head	**Temperature Range:** -5 °C to 75 °C
		Maximum Pressure: 85 psig@75 °C
		Maximum Flow Rate: 10 ft/second
Construction		**Process Electrodes:** Platinum
		Ground Rod: Titanium (standard), 316 stainless steel or Hastelloy®
		O-rings: Viton®
		Sensor Head Material: PEEK or CPVC
		DataStick Material: 316 stainless steel, PEEK or PCVC
		Weight: 1.2 lbs. (PEEK or CPVC); 2.6 lbs (316 stainless steel)
Units of Measure		**Measurement Units:** mV
		Temperature Units: °C, °F
Approvals & Ratings		CE certified; cULus listed; Haz Loc Class 1, Div. 2, Groups A, B, C, D

Thermo Scientific AquaSensors pH Sensors

Thermo Scientific DataStick pH Sensor

AquaSensors DataStick measurement system for universal plug-n-play. Connect this pH sensor directly to a PLC for seamless integration with industrial control systems.

- Differential pH measurement
- Pre-calibrated (no field calibration required)
- Plug-n-play sensor heads
- Replaceable quad junction salt bridges
- Built-in electronics are completely encapsulated and O-ring sealed for protection from moisture and humidity

Contact customer service or your sales rep to configure a DataStick system	
Measurement System Performance	
Range	0 to 14 pH
Resolution	0.01 pH
Accuracy	0.1% of reading
Step Response Time	90% in 30 seconds

LEARN MORE now about DataSticks

Thermo Scientific AquaSensors AnalogPlus Differential pH Sensors

The AquaSensors AnalogPlus differential pH sensors deliver exceptional performance for continuous, demanding process applications.

- 1 inch or 1.5 inch NPT mounting
- CPVC or PEEK body material
- Replaceable salt bridge extends sensor life
- Offered with NTC300 or PT1000 temperature elements
- Built-in electronics are completely encapsulated and O-ring sealed for protection from moisture and humidity

Cat No.	**See data sheet for ordering information**

Measurement System Performance	**Range:** 0 to 14 pH **Resolution:** 0.01 pH **Accuracy:** 0.1% of reading **Step Response Time:** 90% in 30 seconds
Operational Environment	PEEK Sensor Head **Temperature Range:** -5 °C to 95 °C **Maximum Pressure:** 100 psig @ 95 °C **Maximum Flow Rate:** 10 ft/second CPVC Sensor Head **Temperature Range:** -5 °C to 75 °C **Maximum Pressure:** 85 psig @ 75 °C **Maximum Flow Rate:** 10 ft/second
Process Connection	1-inch NPT
Temperature Element	NTC300 or PT1000
Construction	**Process Electrodes:** "G," "HF," low temperature, pure water or high temperature glass **Ground Rod:** Titanium (standard), 316 stainless steel or Hastelloy C **O-rings:** Viton **Sensor Material:** PEEK or CPVC **Weight:** 0.5 lbs (PEEK or CPVC)
Approvals	Meets CE requirements for heavy industrial use

[**CLICK HERE —** for detailed specifications]

Thermo Scientific Alpha pH Sensors

Thermo Scientific Alpha Series pH Sensors

Alpha Series pH sensors are a low-cost option to help you meet your process requirements. Field-proven and reliable, Alpha sensors offer consistent performance at a value price point.

- High-quality, double-junction pH electrodes operate in environment from 0 °C up to 110 °C
- Provided with integral low-noise semiconductor cables (unless otherwise stated)
- Teflon® annular junction for broad application compatibility
- Tough Ryton® body material can stand up to demanding applications
- Solution ground option to help with electrically noisy applications

Model No.	EC100GTSO20B	EC100GTSO10B	EC100GTSO05B	ECARGTSO05B	ECARTSOHF05B	ECARTSO05B
pH range	0 to 14				0 to 14, HF resistant	0 to 14
Reference	Annular PTFE, double junction					
Reference Electrolyte	Saturated KCl, polymerized gel					
Operating Temperature	0 to 80 °C / 32 to 176 °F				0 to 80 °C / 32 to 176 °F	
Pressure Tolerance	6 bars (87 psi)				6 bars (87 psi)	
Temperature Sensor	PT100			—		
Potential Matching Pin/Liquid Ground	Platinum				—	
Material	PPS (Ryton)					
Thread	¾" NPT					
Connector	BNC					
Dimensions – Length	151 mm (excludes cable)					
Dimensions – Diameter	26 mm (external)					
Weight	950 g	850 g	650 g	430 g		

About ORP Measurement

Oxidation-Reduction Potential (ORP) or Redox Potential measurements are used to monitor chemical reactions, to quantify ion activity, or to determine the oxidizing or reducing properties of a solution. ORP is a measurement of the electrical potential of a redox reaction and serves as a yardstick to judge how much oxidation or reduction takes place under existing conditions.

ORP electrodes measure the voltage across a circuit formed by the measuring metal half cell and the reference half cell. When the ORP electrode is placed in the presence of oxidizing or reducing agents, electrons are constantly transferred back and forth on its measuring surface, generating a tiny voltage. The ORP measurement can be made using the mV mode of a pH meter.

Major areas of usage include the treatment of industrial wastes, study of biological systems, oxidation of cyanide, bleaching of pulp, manufacture of bleach and reduction of chromate wastes.

Thermo Scientific ORP DataStick Sensor

Connect this ORP sensor directly to a PLC for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement without an intermediate analyzer electronics box. Sensor heads are pre-calibrated and can be replaced or exchanged with any other type of sensor without taking the system down. Save space, time and money

- Differential ORP measurement
- Pre-calibrated (no field calibration required)
- Plug & play sensor heads
- Replaceable quad junction salt bridges

Contact customer service or your sales rep to configure a DataStick system	
Measurement System Performance	
Range	-2100 mV to +2100 mV
Resolution	0.1 mV
Accuracy	0.1% of reading
Step Response Time	90% in 30 seconds

LEARN MORE now about DataSticks

Thermo Scientific AquaSensors AnalogPlus Differential ORP Sensors

AnalogPlus differential ORP sensors are ideal for continuous use in challenging applications, including wastewater treatment, metal finishing, bleaching pulp and disinfection control.

- 1 inch or 1.5 inch NPT mounting
- Replaceable salt bridge extends sensor life
- Offered with NTC300 or PT1000 temperature element
- Electrode protection options

Cat No.	**See data sheet for ordering information**

Measurement System Performance	**Range:** -2100 mV to +2100 mV **Resolution:** 0.1 mV **Accuracy:** 0.1% of reading **Step Response Time:** 90% in 30 seconds
Operational Environment	PEEK Sensor Head **Temperature Range:** -5 °C to 95 °C **Maximum Pressure:** 100 psig @ 95 °C **Maximum Flow Rate:** 10 ft/second CPVC Sensor Head **Temperature Range:** -5 °C to 75 °C **Maximum Pressure:** 85 psig @ 75 °C **Maximum Flow Rate:** 10 ft/second
Process Connection	1-inch NPT
Temperature Element	NTC300 or PT1000
Construction	**Process Electrodes:** Platinum **Ground Rod:** Titanium (standard), 316 stainless steel or Hastelloy **O-rings:** Viton **Sensor Material:** PEEK or CPVC **Weight:** 0.5 lbs (PEEK or CPVC)
Approvals	Meets CE requirements for heavy industrial use

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Alpha Series ORP Sensor

Alpha ORP sensors are a low-cost option to help you meet your process requirements. Field-proven and reliable, Alpha sensors offer consistent performance at a value price point.

- High-quality, double-junction ORP electrodes operate in environment from 0 °C up to 110 °C.
- Provided with integral low-noise semiconductor cables (unless otherwise stated)

Order Code	**EC100GTSO20B**

Classification		pH
pH Range		0 to 14
Reference		Annular PTFE, double junction
Reference Electrolyte		Saturated KCl, polymerized gel
Operating Temperature		0 to 80 °C / 32 to 176 °F
Pressure Tolerance		6 bars (87 psi)
Temperature Sensor		PT100
Potential Matching Pin/Liquid Ground		Platinum
Material PPS		PPS (Ryton)
Thread		¾" NPT
Connector		BNC
Dimensions	Length	151 mm (excludes cable)
	Diameter	26 mm (external)
Weight		430 g

About Conductivity

Electrical Conductivity (EC) meters measure the capacity of ions in an aqueous solution to carry electrical current. Since the ranges in aqueous solutions are usually small, the basic units of measurements are milliSiemens/cm (mS/cm) and microSiemens (µS/cm).

Conductivity is used widely to determine the level of impurities in water supplies for domestic consumption as well as industrial use.

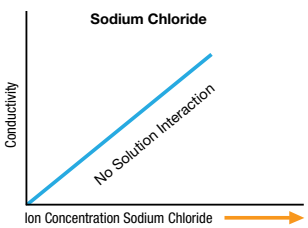
Solutions with Associated Conductivity

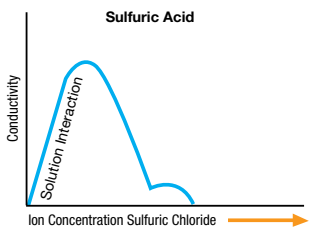
Solution	Conductivity
Absolute pure water	0.055 µS/cm
Power plant boiler water	1.0 µS/cm
Good city water	50 µS/cm
Ocean water	53 mS/cm
Distilled water	0.5 µS/cm
Dionized water	0.1-10 µS/cm
Demineralized water	0-80 µS/cm
Drinking water	0.5 -1 mS/cm
Wastewater	0.9 - mS/cm
Seawater	53 mS/cm
10% NaOH	355 mS/cm
10% H_2SO_4	432 mS/cm
31% HNO_3	865 mS/cm

The Principle of Conductivity Measurement

The principle by which instruments measure conductivity is simple: Two plates are placed in the sample, a potential is applied across the plates (normally a sine wave voltage), and the current is measured. Conductivity (G), the inverse of Resistivity (R), is determined from the voltage and current values according to Ohm's law: **G=I/R=I (amps) / E (volts)**

Since the charge on ions in solution facilitates the conductance of electrical current, the conductivity of a solution is proportional to its ion concentration. In some situations, however, conductivity may not correlate directly to concentration. The graphs below illustrate the relationship between conductivity and ion concentration for two common solutions. Notice that the graph is linear for sodium chloride solution, but not for highly concentrated sulfuric acid. Ionic interactions can alter the linear relationship between conductivity and concentration in some highly concentrated solutions.





Conductivity Temperature Compensation

Conductivity measurements are temperature dependent. The degree to which temperature affects conductivity varies from solution to solution and can be calculated.

All meters have either fixed or adjustable automatic temperature compensation referenced to a standard temperature – usually 25 °C. Most meters with fixed temperature compensation use a temperature coefficient of 2% per °C (the approximate temperature coefficient of NaCl solutions at 25 °C). Meters with adjustable temperature compensation let you adjust the coefficient to more closely match the coefficient of your measured solution.

Conductivity Cells

Most conductivity meters have a 2-cell electrode available in either dip or flow-through styles. The electrode surface is usually platinum, titanium, gold-plated nickel, or graphite. The 4-cell electrode uses a reference voltage to compensate for any polarization or fouling of the electrode plates. The reference voltage ensures that measurements indicate actual conductivity independent of electrode condition, resulting in higher accuracy for measuring pure water.

Thermo Scientific Orion Conductivity Cells

Our industrial line of conductivity probes and monitors is designed for durability, reliability and high performance results in a wide range of conductivity applications, ranging from ultra pure water to final water treatment.

Thermo Scientific Orion 2002SS Conductivity Cell

The Orion 2002SS two-electrode conductivity cell is a stainless steel sensor, with a cell constant of 0.1 cm^{-1}. This sensor, with its low cell constant value, is designed to provide high accuracy in low conductivity, ultra pure water and pure water samples in a process environment. Built with 316 stainless steel, this high purity sensor provides months of accurate measurements with virtually no maintenance between calibrations.

Thermo Scientific Orion 2002CC Conductivity Cell

The 2002CC four-electrode conductivity cell is an epoxy body sensor, with a cell constant of 0.475 cm^{-1}. This sensor is ideal for high and standard conductivity samples across a variety of industrial applications. The four-electrode design compensates for electrode fouling, cable and connector resistance, and polarization errors. The epoxy/graphite material is extremely durable and chemically resistant.

Cat. No.	**2002SS/2002SS10M**	2002CC/2002CC10M
Description	Stainless steel 2-electrode conductivity cell with either 5 or 10 meter cable, includes 1 x 60 mL bottle of 100 µS/cm standard	Epoxy/graphite 4-electrode conductivity cell with either 5 or 10 meter cable, includes 1 x 60 mL bottle each of 100 µS/cm, 1413µS/cm, 12.9 mS/cm and 111.9 mS/cm conductivity standards
Body Material	Stainless steel	Epoxy
Electrode Type	2-electrode cell	4-electrode cell
Electrode Material	Stainless steel	Graphite
Measuring Range	0.01 µS/cm to 300 µS/cm	10 µS/cm to 200 mS/cm
Nominal Cell Constant	0.1 cm^{-1}	0.475 cm^{-1}
Automatic Temp. Compensation	Yes	Yes

[**CLICK HERE** — for detailed specifications]

[**CLICK HERE** — for detailed specifications]

Thermo Scientific AquaSensors DataStick Conductivity/Resistivity Measurement System

Thermo Scientific AquaSensors DataStick Toroidal Conductivity Measurement System

Connect these conductivity sensors directly to a PLC for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement without an intermediate analyzer electronics box. Sensor heads can be replaced or exchanged with any other type of sensor without taking the system down. Save space, time and money.

- High performance construction
- High resolution measurement
- Pre-calibrated (no field calibration required)
- Rugged, foul resistant membrane
- Direct data reporting (24-bit)

Contact customer service or your sales rep to configure a DataStick system	
Conductivity/Resistivity Measurement System Performance	
Range	**0.01 Cell:** 18.2 MΩ/cm to 50 µS/cm **0.1 Cell:** 0 to 500 µS/cm **1.0 Cell:** 0 to 5000 µS/cm
Resolution	4.5 significant digits
Accuracy	0.1% of reading
Step Response Time	90% in 30 seconds

Toroidal Conductivity Measurement System Performance	
Range	0 to 2,000,000 µS/cm (2 S/cm)
Resolution	4.5 significant digits
Accuracy	0.1% of reading
Step Response Time	90% in 30 seconds

LEARN MORE now about DataSticks

Thermo Scientific AquaSensors AnalogPlus Conductivity/Resistivity Sensors

The AquaSensors AnalogPlus conductivity sensors have a two-electrode design for continuous use in very demanding industrial applications.

- 1-inch or 1.5-inch NPT mounting
- Provide exceptional chemical resistance and mechanical strength
- Integral temperature sensor compensates measured values for changes in process temperature

Cat. No.	**See data sheet for ordering information**
Measurement System Performance	**Range:** **0.01 Cell:** 18.2 MΩ/cm to 50 µS/cm **0.1 Cell:** 0 to 500 µS/cm **1.0 Cell:** 0 to 5000 µS/cm **Resolution:** 4.5 significant digits **Accuracy:** 0.1% of reading **Step Response Time:** 90% in 30 seconds
Operational Environment	PEEK Sensor Head **Temperature Range:** -5 °C to 95 °C **Maximum Pressure:** 150 psig @ 95 °C **Maximum Flow Rate:** 10 ft/second
	CPVC Sensor Head **Temperature Range:** -5 °C to 75 °C **Maximum Pressure:** 150 psig @ 75 °C **Maximum Flow Rate:** 10 ft/sec (3 m/sec)
Process Connection	**See DataStick section on pgs. 20-21**
Temperature Element	NTC300 or PT1000
Construction	**Cell Constants:** 0.01 for resistivity, 0.1 and 1.0 for conductivity **Electrode Material:** Titanium or 316 stainless steel **O-rings:** Viton **Sensor Material:** PEEK or CPVC **Weight:** 0.5 lbs (PEEK or CPVC)
Approvals	Meets CE requirements for heavy industrial use

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Alpha Conductivity Sensors

Thermo Scientific Alpha Series Conductivity Sensors

Alpha conductivity sensors are a low-cost option to help you meet your process requirements. Field-proven and reliable, Alpha sensors offer consistent performance at a value price point.

- 2-cell conductivity electrodes incorporate 3-wire PT100 for automatic temperature compensation
- Durable, low-maintenance electrodes in titanium or 316SS give consistent performances in high temperatures up to 200 °C
- Wide variety of options to fit almost any application.
- Available in both nylon and stainless steel 1/2" process fittings
- Provided with integral low-noise semiconductor cables

Model No.	ECCS10-0-01T	ECCS10-0-01TS	ECCS10-0-01S	ECCS10-0-01SS	ECCS10-0-1S	ECCS10-0-1SSP	ECCS10-1-0S	ECCS10-1-0SSP
Conductivity Range	0.055 to 20 µS/cm				0.5 to 200 µS/cm		0.01 to 100 mS/cm	0.01 to 200 mS/cm
Cell Constant, K	0.01, 2-cell				0.1, 2-cell		1.0, 2-cell	
Temperature Sensor	PT100, 3-wire							
Pressure Rating at 25 ˚C	3.4 bars (50 psi)	5.5 bars (80 psi)	3.4 bars (50 psi)	5.5 bars (80 psi)	3.4 bars (50 psi)	6.8 bars (100 psi)	3.4 bars (50 psi)	6.8 bars (100 psi)
Operating Temperature	-5 to 50 °C / 23 to 122 °F	-5 to 80 °C / 23 to 176 °F	-5 to 50 °C / 23 to 122 °F	-5 to 80 °C / 23 to 176 °F	-5 to 50 °C / 23 to 122 °F	-5 to 150 °C / 23 to 302 °F	-5 to 50 °C / 23 to 122 °F	-5 to 120 °C / 23 to 248 °F
Material	Titanium		SS316					
Fitting Material	nylon plastic	stainless steel	nylon plastic	stainless steel	nylon plastic	stainless steel	nylon plastic	stainless steel
Thread	1/2" NPT							
Dimensions Length	168 mm (excludes cable)							
Dimensions Diameter	12.8 mm (external)							
Weight	600 g	680 g	680 g	660 g	560 g	660 g	590 g	660 g

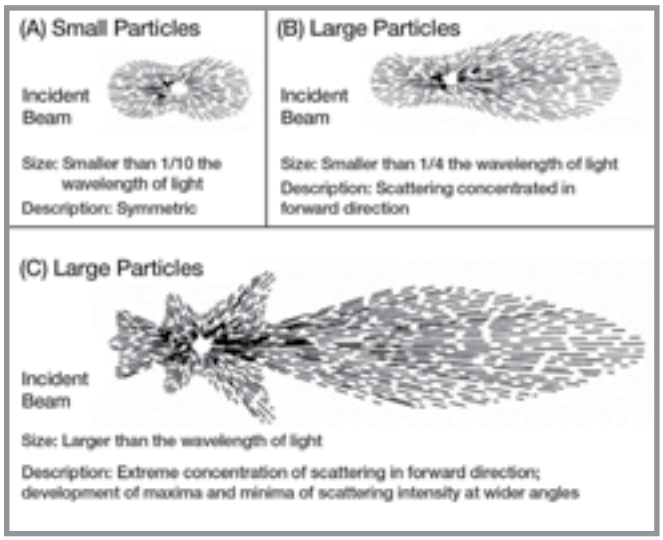
About Turbidity Measurement

Turbidity, measured in Nephelometric Turbidity Units (NTU), refers to the concentration of undissolved, suspended particles present in a liquid. It can be defined as "the expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through the sample." Turbidity is a measure of sample clarity, not color. The cloudier a sample, the higher the turbidity reading. High turbidity is caused by particles such as silt, clay microorganisms, and organic matter. By definition, turbidity is not a direct measure of these particles, but how these particles scatter light.

Particle Effects

There is no absolute difference between dissolved and undissolved matter. The amount of scattered light is not the same in all directions and the spatial distribution pattern varies with particle size. The figure below depicts how small and large particles show different lines of equal light intensity.

Scattering distribution patterns show that when particles are equal to or larger than the wavelength of the incident light beam (1 micron), there is a higher amount of forward scattered light. As the particle size becomes smaller, the pattern becomes somewhat peanut-shaped. However, particles smaller than 0.05 microns in diameter (colloids) scatter light equally in all directions.



Factors that Influence Light Scattering:

1] **Particle color** – the ability to absorb or reflect the incident light beam

2] **Particle shape** – the ability of the suspended solids to provide a constant spatial distribution pattern.

3] **Difference between the particle's refractive indexes and the sample fluid** – the ability to scatter the light; intensity of the scattered light increases as this difference increases

The Critical Role of Turbidity Measurement in Water Treatment

Turbidity is an important parameter in many manufacturing operations, such as food and beverage and water treatment plants. In drinking water applications, the turbidity of water may indicate the presence of bacteria, pathogens or particles that can shelter harmful organisms from the disinfectant process; in industrial applications, turbidity is a parameter to measure the effectiveness of water treatment in various manufacturing processes.

The United States Environmental Protection Agency (EPA) and local governments have set standards specifying the allowable turbidity in drinking water. In U.S. systems that use conventional or direct filtration methods, turbidity cannot be higher than 1.0 NTU at the plant outlet, and all samples for turbidity must be less than or equal to 0.3 NTU for at least 95 percent of the samples in any month. Systems that use filtration other than the conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU. Many drinking water utilities strive to achieve levels as low as 0.1 NTU.

Thermo Scientific AquaSensors DataStick Suspended Solids Turbidity System

Connect this Suspended Solids (TSS) sensor directly to a PLC for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement without an intermediate analyzer electronics box. This versatile system is ideal for monitoring all solids concentrations throughout a wastewater treatment plant.

- 0 to 20,000 mg/L measurement range
- Fouling correction optics
- Rugged construction
- Local and remote configuration and diagnostics
- Temperature measurement included
- Versatile mounting

Contact customer service or your sales rep to configure a DataStick system	
Measurement System Performance	
Range	0 to 10,000 mg/L (diatomaceous earth)
Resolution	1 mg/L
Accuracy	±1% of reading
Step Response Time	90% in 15 seconds

LEARN MORE now about DataSticks

Thermo Scientific AquaSensors DataStick Wide-Range Turbidity Measurement System

Connect this wide-range turbidity sensor directly to a PLC for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement without an intermediate analyzer electronics box. The wide-range turbidity sensor head is pre-calibrated for turbidity and temperature.

The DataStick Wide-Range Turbidity Measurement System can be plugged into any DataStick communications adapter for interactive measurement, calibration, configuration and diagnostics.

- 0 to 4000 NTU measurement range
- Conforms to ISO 7027
- Temperature measurement included
- Rugged, foul-resistant construction
- Local and remote configuration and diagnostics

LEARN MORE now about DataSticks

Contact customer service or your sales rep to configure a DataStick system

Measurement System Performance	**Range:** 0 to 4000 NTU **Resolution:** 0.1 NTU **Accuracy:** 1% of reading **Step Response Time:** 90% in 15 seconds
Operational Environment	**Temperature Range:** -5 °C to 50 °C **Maximum Pressure:** 65 psig @ 50 °C **Maximum Flow Rate:** 10 ft/second
Construction	**Windows:** Quartz **Optical Topology:** Detection at 90° and 180° to source **O-rings:** Viton **Sensor Head Material:** Polycarbonate **DataStick Material:** 316 stainless steel, PEEK or PCVC **Weight:** 1.2 lbs.
Units of Measure	**Turbidity Mode:** NTU **Temperature Units:** °C, °F
Measurement Modes	Turbidity 90°/180°, narrow beam, IR light **Temperature:** Automatic from -5 °C to 50 °C
Approvals & Ratings	CE certified; cULus listed; Haz Loc Class 1, Div. 2, Groups A, B, C, D

[**CLICK HERE** — for detailed specifications]

Thermo Scientific AquaSensors DataStick AquaClear Low-Range Turbidimeter

The AquaClear drinking water turbidimeter system delivers very accurate turbidity measurement in drinking water applications. Connect this system directly to a PLC for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement. Report data with standard current outputs and set alarms with optional relays. Save on calibration cost with smaller volumes of Formazin standard.

The AquaClear turbidimeter is part of the AquaSensors DataStick family of products. The DataStick uses a pre-calibrated plug-in, optical detector and is simply inserted into a sample chamber specifically designed to prepare water for turbidity measurements. The chamber removes bubbles from the water so that solid particles can be accurately detected.

- Simple to operate
- Meets or exceeds USEPA method 180.1
- Pre-calibrated measurement
- Plug & play sensor heads
- Optional AquaPro display

Cat. No.	See data sheet for ordering information

Measurement System Performance	**Range:** 0 to 200 NTU **Resolution:** : 0.001 NTU **Accuracy:** ±2% of reading or ±0.015 NTU whichever is greater. ±5% of reading above 40 NTU
Operational Environment	**Water Temperature Range:** -5 °C to 50 °C Air **Temperature Range:** -20 °C to 60 °C **Maximum Flow Rate:** 500 mL/min (7.9 gal/hr) **Minimum Flow Rate:** 250 mL/min (4 gal/hr)
Power Requirements	**Voltage Range:** 24 VDC or 100-240 VAC **Maximum Power:** 8 W with AV38 DataStick & light source **Typical Power:** 6 W with AV38 DataStick & light source
Construction	**Light Source:** White light (tungsten) **Sample Chamber Material:** ABS plastic **Sample Chamber Volume:** 135 mL **Light Source Housing:** Anodized aluminum **Mounting Plate:** 12 x 12 inches, 4 mounting holes **Sensor Head Material:** Quartz glass, anodized aluminum **Weight:** 5.6 lbs.
Units of Measure	**Measurement Units:** NTU **Temperature Units:** °C, °F
Approval & Ratings	CE certified; cULus listed

[**CLICK HERE** — for detailed specifications]

What is Dissolved Oxygen?

Dissolved oxygen (DO) is a measure of the amount of dissolved gaseous oxygen in a solution. Some gases, such as ammonia, carbon dioxide and hydrogen chloride, react chemically with water to form new compounds. However, gases such as nitrogen and oxygen merely dissolve in water without chemically reacting with it, and exist as microscopic bubbles between water molecules.

There are two main ways in which dissolved oxygen occurs naturally in water: From the surrounding atmosphere, where oxygen in the air dissolves readily when mixed into water, up to saturation, during water movements; and via photosynthesis when oxygen is produced by aquatic plants and algae as a by-product of photosynthesis. The amount of oxygen dissolved in water is usually measured in percent saturation, or expressed as a concentration in milligrams per liter water. Accurate measurement of dissolved oxygen is essential in processes where oxygen content affects reaction rates, process efficiency or environmental conditions – biological wastewater treatment and environmental water testing.

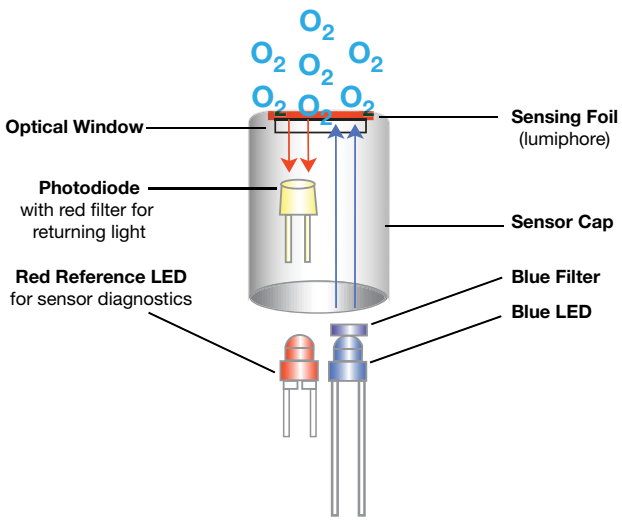
Basic Principle in DO Measurement

In theory, the amount of DO in a solution is dependent on three factors:

1] **Water Temperature** – Solubility of oxygen reduces as temperature increases. Hence, the colder the water, the more DO it contains. Since temperature affects both the solubility and the diffusion rate of oxygen, temperature compensation is necessary for any standardized DO measurements.

2] **Salinity** – The amount of DO increases as salinity level decreases; therefore, freshwater holds more oxygen than saltwater. Since the presence of dissolved salts limits the amount of oxygen that can dissolve in water, the relationship between the partial pressure and concentration of oxygen varies with the salinity of the sample.

3] **Atmospheric Pressure** – There is a direct proportional relationship between the solubility of dissolved oxygen and the surrounding atmospheric pressure. As pressure decreases with increase in altitude, the amount of dissolved oxygen found in water also decreases.



Optical DO Measurement

Optical DO is a new but proven technology for measuring dissolved oxygen. The sensor is made up of a sensing element (lumiphore) that is activated, or excited, when illuminated with a blue light. When activated, the sensor emits red light in an intensity that is inversely proportional to the amount of oxygen present in the water. There is also a time delay between the peak emission of blue light and peak response of fluoresced red light. The amount of delay is inversely proportional to the amount of oxygen present. This time delay can be expressed as a phase shift between the wave patterns of incident blue light and the fluoresced red light.

Thermo Scientific AquaSensors RDO Pro Optical Dissolved Oxygen Sensor

The AquaSensors RDO Pro Optical dissolved oxygen sensor is the latest generation in rugged luminescent dissolved oxygen technology for wastewater monitoring. Connect this advanced sensor directly to a PLC for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement without an intermediate analyzer electronics box. This versatile system is ideal for monitoring all dissolved oxygen levels throughout a wastewater treatment plant.

- 0 to 20 ppm measurement range
- No membranes – only annual field replaceable caps
- High precision & accuracy with fast & stable response
- No conditioning necessary prior to use – fast start up
- Reduced maintenance – long lasting calibration
- Resists photo-bleaching and abrasive process media
- Plug & play design with digital network Interface

Cat. No.	**RD5A43**
Measurement System Performance	**Range:** 0 to 20 ppm, 0 to 20% saturation Resolution: Below 10 ppm; 0.01 ppm, 0.1% sat Above 10 ppm; 0.1 ppm, 0.1% sat **Accuracy:** ±0.1 ppm up to 8 ppm, ±0.2 ppm from 8 to 20 ppm **Step Response Time:** 90% in 30 seconds (at 25 °C) 95% in 37 seconds
Operational Environment	**Temperature Range:** 0 °C to 50 °C (32 °F to 122 °F) **Maximum Pressure:** 300 psig @ 50 °C **Maximum Flow Rate:** No flow required
IP Rating	**Environmental:** IP-67 with cap off, IP-68 with cap installed
Construction	**Sensor Head Material:** Delrin® & Polystyrene **Weight:** 0.93 lbs. **Dimensions:** 8 in. L (203.2 mm) x 1.85 in. (47 mm) diameter **Mounting Requirements:** 1.25 in. NPT (internal thread on back of sensor for adapting to immersion hardware and floats)
Units of Measure	**Measurement Units:** Dynamic Luminescence Quenching **Temperature Units:** °C, °F
Measure Modes	**Dissolved Oxygen:** ppm,% **Temperature:** Automatic from -5 °C to 50 °C
Approvals	CE, FCC, RoHS

[**CLICK HERE** — for detailed specifications]

Thermo Scientific AquaSensors AnalogPlus Dissolved Oxygen Sensor

Based on polarographic sensor design for continuous use in the most demanding industrial applications, this sensor automatically compensates measured values for changes in process temperature and replacement membrane caps for long life.

- 0 to 40 ppm measurement range
- 0.01 ppm resolution
- Sensor electronics are encapsulated and O-ring sealed for protection from moisture and humidity

Cat. No.	**See data sheet for ordering information**
Measurement System Performance	**Range:** 0 to 40 ppm, 0–200% saturation **Resolution:** 0.01 ppm **Accuracy:** 1% of reading **Step Response Time:** 90% in 90 seconds
Operational Environment	**Temperature Range:** -5 °C to 50 °C **Maximum Pressure:** 65 psig @ 50 °C **Maximum Flow Rate:** 10 ft/second
Construction	**Process Electrodes:** Gold cathode, silver anode, silver reference (3 electrode polarographic clark cell) **Membrane:** FEP Teflon **Sensor Material:** PEEK **Weight:** 0.5 lbs.
Approvals	Meets CE requirements for heavy industrial use

[**CLICK HERE** — for detailed specifications]

Thermo Scientific AquaSensors DataStick AquaTrace Dissolved Oxygen System

Our AquaTrace dissolved oxygen sensor will measure accurately in pure water processes. Monitoring at trace oxygen levels in critical processes will allow quick response and minimize costly downtime. Optimum performance is achieved when used in applications where process temperature, flow and pressure are stable.

- Reagent-free amperometric design
- Trace DO system consists of the Trace DO DataStick, flow cell, AV38 local display and is assembled on the panel for simple installation
- Temperature compensated
- Pre-calibrated, plug & play sensors
- Rugged Teflon membrane in replaceable sensor cap
- Remote measurement, calibration, configuration and diagnostics
- Convenient turn-key AquaTrace DO monitoring system offers reliable low DO measurements with a small footprint

Cat. No.	**See data sheet for ordering information**

Performance	**DO Measurement Range:** 0.1 ppb to 20 ppm **Low Range (below 20 ppb):** ±1 ppb or ±2% of reading (whichever is greater) **High Range DO Measurement Accuracy:** ±5% of reading **DO Measurement Response:** <2 hours to 10 ppb **DO Measurement Drift:** 4% max. over 60 days **Temperature Element:** PT1000RTD **Temp. Measurement Resolution:** 0.1 °C **Temp. Measurement Response:** < 475 sec for 90% of change for ±50 °C change
Construction	**Sensor Mounting Threads:** 1" NPT threads at front and back of sensor **Sensor Wetted Materials:** 316 SS, PEEK, Viton, FEP Teflon® **Process Connections:** ¼" tube fittings for process inlet and outlet
Approvals & Ratings	RoHS compliant assembly

[**CLICK HERE** — for detailed specifications]

Thermo Scientific AquaSensors DataStick Dissolved Oxygen Measurement System

Connect this DO sensor directly to a PLC for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement without an intermediate analyzer electronics box. Sensor can be replaced or exchanged with any other type of sensor without taking the system down.

- Clark cell technology
- Pre-calibrated (no field calibration required)
- Rugged, foul resistant membrane
- Direct data reporting (24-bit)

Contact customer service or your sales rep to configure a DataStick system	
Measurement System Performance	
Range	0 to 40 ppm, 0 to 200% saturation
Resolution	0.01 ppm
Accuracy	0.1% of reading
Step Response Time	90% in 90 seconds

LEARN MORE now about DataSticks

sensors: **dissolved oxygen**

What is Dissolved Ozone Measurement?

Ozone is a triatomic form of oxygen (O_3) and exists naturally as a gas. Ozone forms when oxygen comes in contact with ultraviolet (UV) energy. The UV energy splits the oxygen molecule, which then re-attaches to another oxygen molecule. The resulting unstable ozone gas molecule wants to revert back to the stable diatomic oxygen molecule (O_2). In order to do this, it must react with another compound or transfer energy through another source. This makes ozone one of the strongest disinfectants available, and it can be used to destroy the organic compounds that affect the taste and odor of potable water. It does not corrode nor cause scaling. In addition, ozone has a pungent smell at low levels, but it is extremely fast at eliminating microbiological activity in the water at relatively low doses.

Dissolved ozone is useful in many industries for water sanitization and cleaning of food and beverage systems. Environmental concerns have led to increased use of ozone because, unlike chlorine, it does not form hazardous by-products. Its effectiveness is measured by knowing how much ozone has entered the water, how much remains, and the degree to which it has been removed before process use to ensure disinfection.

Continuous observation of trends in these measurements is needed for continuous quality monitoring, and the measurement may be used for closed loop control of ozonation.

Thermo Scientific AquaSensors DataStick Dissolved Ozone Measurement System

Connect this ozone sensor directly to a programmable logic controller for seamless integration with industrial control systems. Use any computer to display data, calibrate and customize the measurement without an intermediate analyzer electronics box. Sensor heads are pre-calibrated and can be replaced or exchanged with any other

- Clark cell technology
- Pre-calibrated (no field calibration required)
- Plug & play sensor heads Rugged, foul resistant membrane

Contact customer service or your sales rep to configure a DataStick system	
Measurement System Performance	
Range	0 to 10 ppm
Resolution	0.01 ppm
Accuracy	2% of reading
Step Response Time	90% in 90 seconds

LEARN MORE now about DataSticks

Thermo Scientific AquaSensors AnalogPlus Dissolved Ozone Sensor

The AnalogPlus dissolved ozone sensor uses three-electrode polarographic Clark cell technology to work continuously in the most challenging industrial applications. When used with the the AV88 universal analyzer/transmitter, the dissolved ozone sensor delivers cost effective process control solutions.

- Polarographic sensor design for continuous use in the most demanding industrial applications
- Replacement membrane caps for long life
- 0 to 40 ppm measurement range
- 0.01 ppm resolution

Cat. No.	**See data sheet for ordering information**
Measurement System Performance	**Range:** 0 ppm – 10 ppm **Resolution:** 0.01 ppm **Accuracy:** 2% **Step Response Time:** 90% in < 90 seconds
Operational Environment	**PEEK Sensor Head** **Temperature Range:** -5 °C to 50 °C **Maximum Pressure:** 65 psig @ 50 °C
Construction	**Three Electrode Polarographic:** Clark cell; gold cathode, silver anode, silver reference **Membrane Cap Assembly (Replaceable):** PFA Teflon **O-rings:** Viton **Sensor Head Material:** PEEK **Weight:** 0.5 lbs.
Approvals	Meets CE requirements for heavy industrial use

[**CLICK HERE —** for detailed specifications]

About Chlorine Measurement

Chlorine and chlorine-release compounds are frequently used as disinfectants in swimming pools, drinking water and other water treatment systems. Routine chlorination kills harmful micro-organisms. In applications where there is human contact with the water, it is essential that the right amount of chlorine is present. Insufficient chlorine will decrease the disinfectant efficiency, while excess chlorine will cause skin and eye irritation and become a health hazard.

Most disinfection methods kill micro-organisms effectively but do not provide any protection against recontamination further along the supply system. Chlorine has the advantage of being both an effective disinfectant, and its residual can protect the supply downstream from the disinfection point.

How does chlorine work?

When chlorine is added to water, it kills microorganisms upon direct contact. Chlorine disinfects water but does not purify it. Chlorine takes time to kill organisms. At temperatures of 180 °C and above, the chlorine should be in contact with the water for at least 30 minutes. If the water is colder than 180 °C, then the contact time must be increased. Therefore, it is necessary to add chlorine to water as it enters a storage tank or a long delivery pipeline to give the chlorine time to disinfect the water before reaching the consumer.

Chlorine residual

When chlorine is added to water, it will attack organic matter and attempt to destroy it. If enough chlorine is added, some will remain in the water after all possible organisms have been destroyed. What is left is called free chlorine. If water is tested and found to contain some free chlorine, it proves that the most dangerous organisms in the water have been removed and it is likely safe to drink. This process is called residual chlorine measurement.

Testing for chlorine residual/free chlorine

A common method used to test for for chlorine residual is DPD (N,N-diethyl-p-phenylenediamine) chemistry using a colorimeter. This method involves a reagent that is mixed with a small sample volume of water. The reagent specifically and selectively reacts with the analyte to form a colored complex with the chlorine. The tinted sample is then analyzed for absorbance value, and the absorbance is compared to a calibration curve. The stronger the color, the higher the concentration of chlorine in the water.

When and Where to Test the Water

Continuous chlorination is most commonly used in piped water supplies. Water is usually tested for chlorine residual at the following points:

- Immediately following the addition of chlorine to the water to ensure the chlorination process is working
- At the outlet of the consumer nearest to the chlorination point to check that residual chlorine levels are within acceptable levels.
- At the furthest points in the network where residual chlorine levels are likely to be at their lowest. If chlorine levels are found to be below minimum levels, it may be necessary to add more chlorine at an intermediate point in the network.

The higher the residual chlorine levels in the supply, the better and longer the chemical will be able to protect the system from contamination. However, high levels of chlorine give the water an odor and bad taste, and can cause health issues. For normal use, residual chlorine levels at the point where water reaches the consumer should be between 0.2 and 0.5 mg/L. The higher level will be close to the disinfection point and the lower level at the far extremities of the supply network.

What is Total Chlorine?

When free chlorine attacks micro-organisms in the water, it becomes combined chlorine and is no longer available as a disinfectant. Total chlorine is simply free chlorine plus combined chlorine.

Thermo Scientific AquaSensors DataStick AquaChlor Free Chlorine Sensor and Monitoring System

The AquaChlor free chlorine sensor will measure accurately in clean water processes between 4 and 9 pH. Best performance is achieved when used in applications where process pH, temperature, flow and pressure are stable.

- The AquaChlor system consists of the free chlorine sensor, the AV38 local display/controller, optional pH DataStick module, and precalibrated hypochlorous acid (HOCl) and hypochlorite ion (OCl-) concentrations to determine free chlorine levels present.
- Reagent-free amperometric design
- Compliant with EPA Method 334.0 for online drinking water monitoring
- Manual or Automatic pH compensation
- Temperature compensated
- Convenient turn-key monitoring system for optimal performance
- Optional AquaPro display

Cat. No.	See data sheet for ordering information

Description	**AquaChlor Systems** Free chlorine measurement system with precalibrated chlorine and optional pH sensor heads, integrated temperature compensation with DataStick module(s), low flow sample chamber, mounting plate and local display/ controller.
Measurement System Performance	**Measurement Range:** 0 to 10 ppm **Resolution:** 0.01 ppm **Minimum Detection Limit:** 0.03 ppm **Accuracy:** ±3% of measured sample (at constant pH 4.0 to 7.2) ±10% of measured sample (at constant pH up to 9.0) **Step Response Time:** 90% in 90 seconds
Operational Environment	**Temperature Range:** 0 °C to 45 °C (32 °F to 113 °F) **Maximum Pressure:** 15 psig @ 45 °C **Sample Flow Rate in Chamber:** 200 to 250 mL/min
Free Chlorine Operation	When chlorine and pH DataSticks are connected to the AV38 local display, HOCl and OCl^- dissociation curves are pH compensated and used to calculate free chlorine present. A stable pH value can also be entered manually.
Construction	**Process Electrodes:** Gold cathode, silver anode **Membrane:** Teflon **O-rings:** Viton **Flow Chamber:** Acrylic **Sensor Head Material:** Noryl **DataStick material:** CPVC **Weight:** 1.2 lbs.
Approvals and Ratings	CE certified; cULus listed; Haz Loc Class 1, Div. 2, Groups A, B, C, D

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Orion Chlorine Analyzer

Real-time chlorine level analysis

Cat. No.	CXP71, CXP72, CXP73
Performance	
Precision/Repeatability	3%
Accuracy/ Stability	±5%
Zero-Point-Adjustment	Self zero before each reading
Cycle Time/Response Time	2 to 10 minutes
Parameters	FC, TC, F&TC, ORP, pH, Temp.
Measuring Range	0 to 10 ppm (Cl); 0-14 (pH); 0-2000mV (ORP); PT-100 (temperature)
Cost of Ownership	
Maintenance	1-2 months for reagent replacement and filter cleaning
Calibration	Every 6 months (pH only)
Power Consumption	Approx. 60VA
Reagent Usage	DPD up to 2 months
Weight	11 lbs (4.5kg)
Dimensions (WxHxD)	67cm x 33cm x 14cm 26" x 13" x 5.5"
Features/ Options	
Enclosure	IP-65 Rated Enclosures (NEMA 4 equivalent)
Local I/O	RS-485 Standard; 2 - 4 to 20 mA Standard 4 - 4 to 20 mA Optional
Display Type	5.5" Graphic monochromatic. Character LCD with background light alarms and status
Servicing/ Maintenance	Self-Cleaning Photocell
Additional Requirements	
Operating, Sample Temperature	32 °F to 212 °F (0 °C to 1000 °C)
Max Inlet Pressure	14.5 psi (1bar)

Thermo Scientific Orion Chlorine XP Online Water Quality Analyzer

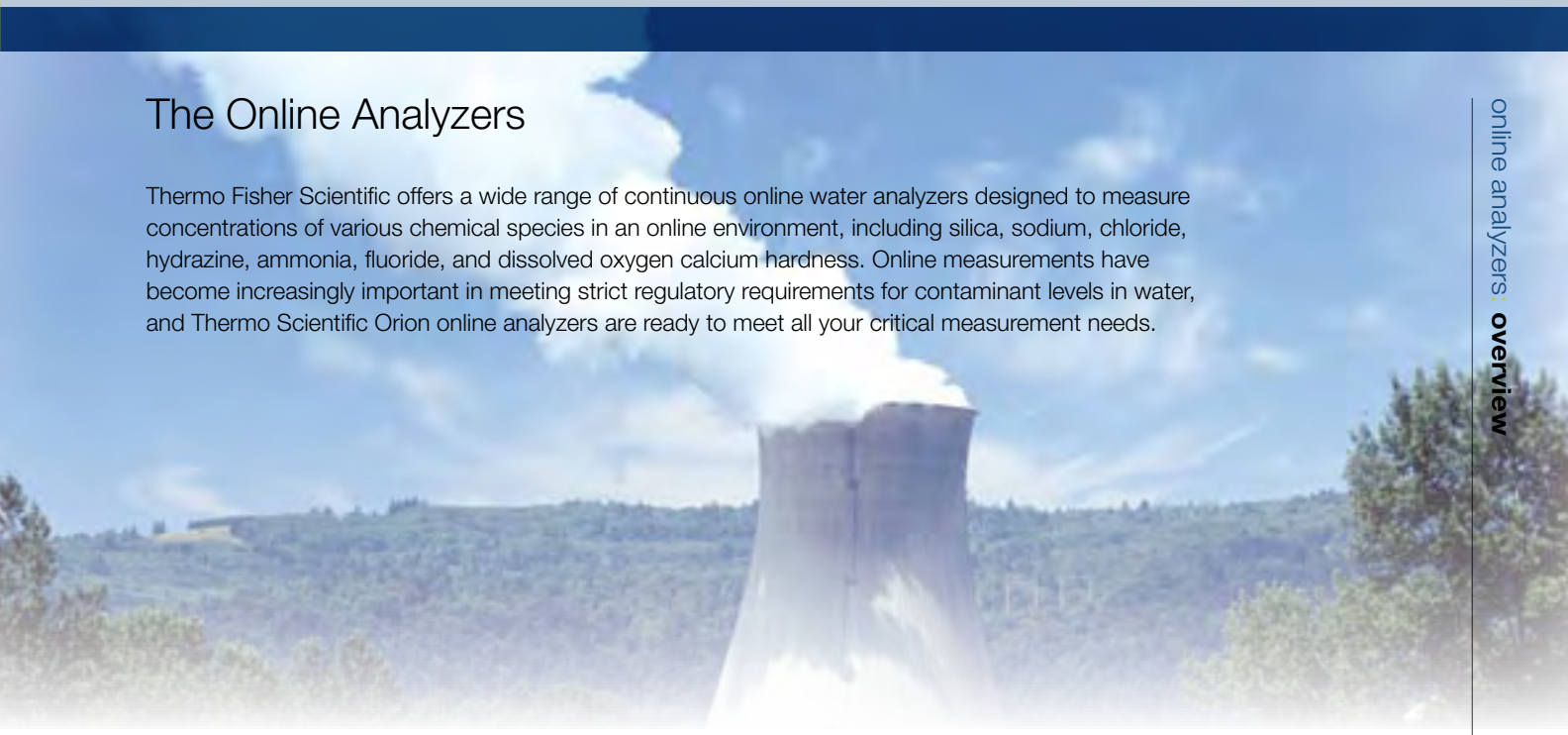
The Orion Chlorine XP online analyzer measures free, total and total combined chlorine with a colorimeter, providing accurate and reliable readings of chlorine in water. It features minimal calibrations and is compatible with all types of disinfectant systems. This DPD-based system uses a very low amount of reagent – providing low cost of ownership.

The Orion XP analyzer can be configured to measure any combination of the following water quality parameters:

- Free chlorine
- Total chlorine
- Both free and total chlorine

In addition, the Chlorine XP offers:

- Intuitive graphical interface
- Simple, quick installation and operation
- Auto calibration and auto self-cleaning
- Longer maintenance intervals compared to other DPD analyzers
- Simple, quick reagent replacement



The Online Analyzers

Thermo Fisher Scientific offers a wide range of continuous online water analyzers designed to measure concentrations of various chemical species in an online environment, including silica, sodium, chloride, hydrazine, ammonia, fluoride, and dissolved oxygen calcium hardness. Online measurements have become increasingly important in meeting strict regulatory requirements for contaminant levels in water, and Thermo Scientific Orion online analyzers are ready to meet all your critical measurement needs.

Thermo Scientific Orion Analyzers

Early online detection of level silica

Thermo Scientific Orion 2230 Silica Analyzer

Our Orion 2230 Silica Analyzer provides continuous and online measurement of reactive silica to protect mission critical systems. Thanks to the optimized design of the Orion 2230 analyzer, reagent consumption is drastically reduced as compared to other systems, thus reducing the overall cost of ownership.

- Low reagent consumption – thanks to a highly optimized, state of the art design.
- Wide range of detection – 0 to 5000 ppb provides a more complete picture of silica intrusion in the process.
- Simple menu navigation – an easy to read and understand menu structure.
- Compact size – smallest total system footprint on the market today, capable of being panel or wall mounted.

[**CLICK HERE** — for detailed specifications]

Cat. No.	**223000**

Description	**Model 2230 Silica Analyzer**
Measuring Range	0 – 5000 ppb auto-ranging or user programmable
Accuracy Error	Less than 5% of reading or ±0.5 ppb, whichever is greater, from 0 to 300 ppb. Less than 10% of reading from 300 to 5000 ppb.
Resolution Error	0.5 ppb in all ranges
Response Time	Less than 15 minutes per analysis
Repeatability Error	Less than ±2% of reading or ±0.5 ppb, whichever is greater from 0 to 300 ppb. Less than ±5% of reading from 300 ppb to 5000 ppb
Limit of Detection	0.5 ppb
Method	Optical absorption at 810 nm

Thermo Scientific Orion Sodium Analyzers

Accuracy and reliablity with years of proven performance

Thermo Scientific Orion 2111XP Sodium Analyzer

Reliable sodium analysis in critical sample streams

Our Orion 2111XP sodium analyzer offers unmatched reliability in analyzing critical sample streams throughout the power/steam generation and industrial water industries.

- The leading sodium analyzers – more have been sold than all other combined
- Available in three application packages: Ammonia, Diisopropylamine (DIPA), and Cation/High Acid
- Provides stable, drift-free measurements that eliminate the need for frequent calibration

Thermo Scientific Orion 2111LL Low Level Sodium Analyzer

Accurate, ultra-low level sodium measurement

Our Orion 2111LL ultra low level sodium analyzer exceeds the demands of high purity water measurements

- Ultra low level detection to 0.001 ppb for trace detection in high purity water and steam generation
- Easy to operate and calibrate
- Provides rapid response to ultra low level changes, real time notification of sodium conditions

Reagent	Ammonia	Diisopropylamine
Range	0.30 ppb to 200 ppm	0.001 ppb to 10 ppm
Resolution	1, 2 or 3 digits	2, 3 or 4 digits
Accuracy (with DKA cal)	±5% or 0.3 ppb	±5% or 0.01 ppb

Cat. No.	**2111XPEN**	**2111LLEN**
Description	Sodium Analyzer With Protective Enclosure Package	Low Level Sodium Analyzer With Protective Enclosure Package

[**CLICK HERE** — for detailed specifications]

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Orion Chloride Analyzers

Accurate, real-time steam cycle and boiler chemistry monitoring and control

Thermo Scientific Orion 2117LL Low-Level Chloride Analyzer

Continuous online measurement of chloride at low parts per billion levels

The Orion 2117LL low level chloride analyzer delivers early detection of chloride ingress from feedwater to help your plant maintain the optimal balance of water purification.

- Detects chloride in real-time – providing accurate and reliable results
- Only real-time monitor on the market capable of reading down to 5 ppb
- Simple operation and minimal maintenance required – no moving parts

Thermo Scientific Orion 2117XP Chloride Analyzer

Real-time chloride detection with long calibration cycles

The Orion 2117XP chloride analyzer detects chloride in real time – providing accurate and reliable results that you can count on.

- Offers early detection of chloride ingress from feedwater, optimizing the plant's balance of water purification with ease
- Continuously displays levels of chloride to help monitor and prevent corrosion that can cause mechanical damage
- Fast and highly accurate calibration enhances productivity

Thermo Scientific Orion 2117HL High Level Chloride Analyzer

Real-time chloride level analysis

The solution for your high chloride measurement needs – the Orion 2117HL high level chloride analyzer offers industry leading performance to measure elevated levels of chloride in real time

- Offers superior electrode technology for stability, combined with a virtually maintenance-free fluidic design
- No reagent required for analysis
- Repeatable and verifiable measurements at a glance using the large display

Reagent	Formic acid	Formic acid	None required
Range	5 ppb to 10 ppm	0.1 ppm to 100 ppm	75 ppm to 1000 ppm
Resolution	2, 3 or 4 digits	2, 3 or 4 digits	2, 3 or 4 digits
Accuracy	10% of reading or ±5 ppb, whichever is greater, within ±5° C of calibration temperature, whichever is greater	(with DKA cal): ±0.1 ppm or 10%, whichever is greater	Accuracy (with DKA cal): ±10%

Cat. No.	**2117LLEN**	**2117XPEN**	**2117HLEN**
Description	Low Level Chloride Monitor with Protective Enclosure Package	Chloride Analyzer with Protective Enclosure Package	

[**CLICK HERE** — for detailed specifications] [**CLICK HERE** — for detailed specifications] [**CLICK HERE** — for detailed specifications]

Thermo Scientific Orion Oxygen Analyzers

Control and optimization of oxygen scavenger systems

Thermo Scientific Orion 2118XP Oxygen Scavenger Analyzer

The new Orion 2118XP oxygen scavenger analyzer offers unmatched results for the control and optimization of oxygen scavenger systems. Control spending and protect your system using the Orion 2118XP – the perfect balance of performance and ease of use.

- Our unique chemistry measures most oxygen scavengers with a simple change in the standard
- Repeatable and verifiable correlation of hydrazine readings to ELIMIN-OX® concentration
- Provides stable, drift-free measurements with minimal maintenance and less frequent calibrations

Reagent	Iodide
Range	Hydrazine: 0 ppb to 200 ppb ELIMIN-OX: 0 ppb to 1000 ppb
Resolution	2, 3 or 4 digits
Accuracy (with DYN cal)	±5% or 2 ppb ELIMIN-OX: ±5% or 30 ppb

Cat. No.	**2118XPEN**
Description	Oxygen Scavenger Analyzer with Protective Enclosure Package

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Orion Ammonia Analyzers

Real-time ammonia results for effective corrosion control

Thermo Scientific Orion 2110XP Ammonia Analyzer

The new Orion 2110XP ammonia analyzer provides continuous, direct and precise measurements for the control and optimization of boiler ammonia levels. Reduce operational costs while producing the highest purity steam with ease of use for results that only the Orion 2110XP can provide. The Orion 2110XP shows the most sensitive changes in ammonia concentration for condensate and feedwater optimization and control.

- Designed for ammonia specificity – its unique chemistry delivers unsurpassed results across a wide range without pH and conductivity "bottom out effects"
- Repeatable and verifiable ammonia measurements using superior ammonia electrode technology
- Maintains sensitivity and accuracy at high and low levels to produce rapid results with the utmost confidence

Reagent	Iodide
Range	Hydrazine: 0 ppb to 200 ppb ELIMIN-OX: 0 ppb to 1000 ppb
Resolution	2, 3 or 4 digits
Accuracy (with DYN cal)	±5% or 2 ppb ELIMIN-OX: ±5% or 30 ppb

Cat. No.	**2110XPEN**
Description	Oxygen Scavenger Analyzer with Protective Enclosure Package

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Orion Fluoride Analyzers

Measurement of fluoride easily, reliably and accurately

Thermo Scientific Orion 2109XP Fluoride Analyzer

As the pioneer of fluoride electrode technology, the Orion 2109XP fluoride analyzer is based on the Standard Test Method for Fluoride Ion in Water (ASTM D 1179-04). The Orion 2109XP provides the highest quality fluoride measurements for drinking water required by the Safe Drinking Water Act (1974) to accurately control fluoride levels between 1.4 and 2.4 ppm. The Orion 2109XP fluoride analyzer offers accuracy, reliability and ease-of-use to best meet the demands for fluoride analysis with complete assurance. The Orion 2109XP maximizes uptime and keeps your plant in perfect operation by offering unmatched versatility and performance.

- Implements recognized EPA method for fluoride analysis using an ion selective electrode (ISE)
- Eliminates problems with turbidity and suspended solids in samples
- Correlates to online IC for QA/QC validation

Reagent	Formic acid
Range	10 ppb to 200 ppm
Resolution	2, 3 or 4 digits
Accuracy (with DYN cal)	±10% or 10 ppb, whichever is greater

Cat. No.	**2109XPEN**
Description	Fluoride Analyzer with Protective Enclosure Package

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Orion Calcium Analyzers

Early detection of breakthrough to maximize water purification process integrity

Thermo Scientific Orion 2120XP Calcium Hardness Analyzer

Many industrial and commercial applications must efficiently and economically produce the highest quality feedwater – for high purity steam for power generation or the best tasting bottled water available to consumers. The Orion 2120XP calcium hardness monitor detects calcium as the major component of hardness in real time – providing accurate and reliable results that you can count on. Limiting the costly effects of improper water purification has never been easier. The monitor continuously displays levels of calcium hardness to prevent against boiler tube scaling, corrosion, water flow restriction and the loss of heat transfer efficiency for power generation applications.

- Provides early detection of breakthrough due to zeolite softening depletion – maximizing your process integrity
- Displays levels of calcium hardness to help prevent boiler tube scaling and corrosion
- Long-life sensor technology offers stability and high performance

Reagent	Formic acid
Range	25 ppb to 500 ppm
Resolution	1, 2 or 3 digits
Accuracy (with DYN cal)	±10% or 10 ppb $CaCO_3$, whichever is greater

Cat. No.	**2120XPEN**
Description	Calcium Hardness Analyzer with Protective Enclosure Package

[**CLICK HERE** — for detailed specifications]

Thermo Fisher Scientific offers a wide selection of single and multi-parameter measurement systems.

Advanced precision measurements and analytics

Thermo Scientific Orion 2100 Series pH/ORP and Conductivity Analyzers

Offered in single channel or dual channel configurations, all with optional digital communications protocols, these analyzers are designed for ease-of-operation and measurement reliability.

- Easy operation and calibration
- Fast, stable measurement
- Flexible temperature compensation
- Expandable platform

Thermo Scientific AquaPro Intelligent Process Analyzer

With up to four parameters, a user-friendly interface and easy-to-understand menus in seven languages, the AquaPro analyzer is a sophisticated, highly flexible analysis platform to meet the needs of complex process applications around the world.

- Multi-channel capability reduces number of transmitters required
- Flexible capacity - up to four sensor inputs (analog or digital)
- High visibility and ease of use with large color display
- Expandable platform - can be used with many different data systems

Precise and reliable measurements

Thermo Scientific AquaSensors AV38 DataStick Analyzer

The dual-channel AquaSensors AV38 DataStick Analyzer is rugged and ideal for heavy industrial use.

- Connects to any DataStick system
- Space-saving ¼ DIN enclosure
- Easy viewing of sensor and temperature data
- Digital protocol options for remote measurement, calibration, configuration and diagnostics

Thermo Scientific AquaSensors AnalogPlus AV88 Universal Analyzer

The rugged, single-channel AquaSensors AV88 DataStick Analyzer is ideal for heavy industrial use.

- Connects to any AnalogPlus sensor using plug-in module
- Space-saving ¼ DIN enclosure
- Easy viewing of sensor and temperature data
- Digital protocol options for remote measurement, calibration, configuration and diagnostics

Reliable, cost-effective general purpose measurements

Thermo Scientific Alpha 2000 Series Controllers/Transmitters

Whether it's pH, ORP, conductivity or dissolved oxygen you are measuring, single-channel Alpha series controllers combine simple operation with exceptional performance and value.

- Reliable and durable construction
- Six-button easy operation
- Versatility for easy customization to your application
- Choice of ½ or ¼ DIN panel mount versions

Thermo Scientific Orion 2100 Series pH/ORP and Conductivity Analyzers

Single, dual or combined pH/ORP and conductivity measurement

Orion 2100 series analyzers for pH/ORP, conductivity/resistivity or a combination of both provide accurate and reliable measurements in the harshest industrial environments.

Offered in single channel or dual channel configurations – all with optional digital communication protocols – these analyzers set a new standard for ease-of-operation and measurement reliability. Our systems incorporate decades of superior Orion sensor technology and deliver rapid results with complete stability. The large bright backlit LCD provides a 3 line parameter display that includes scrolling text for menu driven measurement and calibration prompts. The rugged ½ DIN chemically resistant enclosure offers NEMA 4X IP 65 protection while maintaining a small footprint for ease of installation in a panel (standard mounting) or for pipe mounting.

Multi-level password protection offers the necessary security for data integrity. Supervisor to operator level access protects customized setup parameters and allows for read only access for measurement, calibration and diagnostic logs, thus preventing accidental changes or unintended modifications from occurring.

Security in your measurement results has never been easier. Developed with decades of expertise in ultra pure water analysis, our measurement and temperature compensation algorithms provide the highest level of accuracy across the most difficult high purity measurements. Our system provides cation and ammonia/ETA compensation for customizing to your plant's requirements.

- Flexible temperature compensation inputs are suitable for use with a wide variety of sensors
- Rugged NEMA 4X ½ DIN custom enclosure is suitable for panel mounting (standard) or pipe mounting
- Offers advanced user interface with detailed calibration, measurement and diagnostic menus

Range	0 to 14
Resolution	0.1, 0.01
Relative Accuracy	±0.01
Hold Function	YES
Auto-Buffer Recognition	YES
Solution Compensation	YES

Cat. No.	Description
2102PH	2102PH single channel pH/ORP analyzer only

[**CLICK HERE** — for detailed specifications]

Thermo Scientific AquaPro Multi-Input Intelligent Process Analyzer

Provides accurate, user-friendly in-line monitoring of process applications — from power generation to municipal water and wastewater

Detailed Process Information at a Glance

Displaying the status of up to four parameters simultaneously, AquaPro provides a complete picture of process status on a single instrument. This multi-channel capability reduces both the number of meters required and the time required for installation, maintenance and upgrades.

An Analyzer for Today – and Tomorrow

Users select from seven languages and configure the AquaPro via clear, plain-language menus. Operation is straightforward and intuitive for all parameters – from basic pH measurements to complex free chlorine.

AquaPro provides simple interface to PLC, SCADA and other PC-based control systems and compatibility with all current industry data communication protocols – Modbus RTU over RS485 or RS232, DeviceNet, Profibus, Ethernet/IP, Modbus TCP, and CANopen. It can be easily updated to support any future protocols using our unique modular design. AquaPro is fully compatible with a wide range of liquid analytical sensors – both analog and digital – allowing measurement of many parameters, including:

- pH/ORP
- Conductivity (including resistivity, concentration, salinity and TDS)
- Dissolved oxygen
- Dissolved ozone
- Free chlorine
- Turbidity
- Suspended solids

WATCH *the AquaPro Analyzer in action.*

Cat. No.	Description
xxxxx (call for configuration)	**The AquaPro Multi-Input Intelligent Process Analyzer**

Ambient Operating	-20° to 60 °C (-4° to 140 °F)
Maximum Humidity	95% non-condensing
Electrical	
Power Requirements	AC Power Option: 100-240VAC, 50/60Hz 0.4A Max & 25 °C
Outputs	
Current Loops	Two per measurement input (Max 8) 0/4-20mA (Isolated), .01mA resolution
Relays	Three form C relays, 5A at 250V - Assignable (Standard)
	Three form C relays, 5A at 250V - Assignable (Optional -Slot 4)

[**CLICK HERE —** for detailed specifications]

Thermo Scientific AV88 Single-parameter AnalogPlus Universal Analyzer

Connects to any AnalogPlus sensor using plug-in module to display sensor and temperature data.

- Space saving ¼ DIN enclosure
- Features include two 4 to 20 mA current outputs, and two Form C relays
- Offers digital protocol options for remote measurement, calibration, configuration and diagnostics
- PID controller for use with pH and conductivity AnalogPlus sensor

Cat. No.	See data sheet for ordering information
Mounting Options	**Wall-mount Enclosure:** NEMA 4X **Panel-mount:** ¼ or ½ DIN NEMA 4X panel mount available **Display Only:** with NEMA 4X Gasket
User Interface	**Display:** 2 line by 16 character LCD
Backlight	High contrast green
Keypad	4 directional arrows, MENU, ESCAPE and ENTER
Environment Conditions	**Ambient Operating Temperature Range:** -20 to 65 °C **Maximum Relative Humidity:** 95% non-condensing
Interchangeable Sensor Modules	1-inch long personality module plugs into the AV88 to make it work with any AnalogPlus sensor configured with a PT1000 temperature element
Supported Sensors	pH, ORP, two-electrode conductivity, two-electrode resistivity, toroidal conductivity, dissolved oxygen and dissolved ozone.
Approvals	Meets CE requirements for heavy industrial use

[**CLICK HERE** — for detailed specifications]

Thermo Scientific AV38 DataStick Multi-parameter Local Monitor and Controller

Connects to any DataStick measurement system to display sensor and temperature data.

- Space saving ¼ DIN enclosure
- Features include two 4 to 20 mA current outputs, and two Form C relays
- Offers digital protocol options for remote measurement, calibration, configuration and diagnostics
- PID controller for use with pH and conductivity DataStick sensor

Cat. No.	See data sheet for ordering information
Mounting Options	**Wall-mount Enclosure:** NEMA 4X **Panel-mount:** ¼ or ½ DIN NEMA 4X panel mount available **Display Only:** with NEMA 4X Gasket
User Interface	**Display:** 2 line by 16 character LCD
Backlight	High contrast green
Keypad	4 directional arrows, MENU, ESCAPE and ENTER
Environment Conditions	**Ambient Operating Temperature Range:** -20 to 65 °C **Maximum Relative Humidity:** 95% non-condensing
DataStick Sensor Connections	Supports 1 to 255 Modbus RTU DataStick sensors of any type
Supported Sensors	pH, ORP, two-electrode conductivity, toroidal conductivity, dissolved oxygen (ppm and ppb), dissolved ozone, drinking water and wide-range turbidity, suspended solids and free chlorine
Approvals	Meets CE requirements for heavy industrial use

[**CLICK HERE** — for detailed specifications]

Thermo Scientific Alpha 2000 Series Controllers/Transmitters

The Alpha 2000 Series controllers/transmitters combine simple six-button operation with exceptional performance. Reliable, durable and cost-effective, each controller is built for ease-of-use and versatility, so it is easy to customize your processor according to your application needs. Meters come in ½ DIN wall and panel-mount or ¼ DIN panel-mount versions to suit your installation requirements in most any harsh environment.

Thermo Scientific Alpha pH 2000 Controller/Transmitter

The Alpha pH 2000 controller features a symmetrical mode of operation option for clear, accurate pH/ORP readings in electrically noisy environments. IP65 NEMA 4X casing is weatherproof and corrosion-resistant, protecting the meter against harsh elements.

- Wide pH range of -2.00 to 16.00 pH at 2-decimal accuracy
- ORP mode measures in mV or% concentration, with independent calibration modes
- Quick, easy push-button calibration with auto-buffer recognition. Displays electrode status after each calibration.
- Control and measure pH and ORP simultaneously with master-slave operation by placing two controllers side by side
- Accepts Antimony electrodes – useful in applications involving hydrofluoric (HF) acid

Model No.	Wall-mount	**TSPHCTP2000W**
	Panel-mount	**TSPHCTP2000P**
Cat. No.		**01X275373 / 01X275374**

pH Range		-2.00 to 16.00
ORP Range		-1000 to 1000 mV/0 to 100%
Temperature Compensation		Auto/manual (independent process/CAL temperature)
Set points		Two, switchable
Outputs		Two 0/4 to 20 mA scalable outputs for pH/ORP and temperature, galvanically isolated
Display		LCD backlit
Operating Temp. Range		0 to 40 °C
Dimensions:	Wall-mount	(TSPHCTP2000W) – ½ DIN, 144 x 144 x 110 mm
	Panel-mount	(TSPHCTP2000P) – ¼ DIN, 96 x 96 x 175 mm
Ingress Protection	Wall-mount	(TSPHCTP2000W) – IP66 NEMA 4X
	Panel-mount	(TSPHCTP2000P) – IP54 front panel

Thermo Scientific Alpha COND 2000 Controller/Transmitter

The Alpha COND 2000 controller allows you to measure a broad conductivity range, from ultra pure water to highly conductive samples. This controller accepts 4-cell and 2-cell electrodes, and features programmable temperature coefficients to give you precise temperature compensation. IP65 NEMA 4X casing is weatherproof and corrosion-resistant, protecting the meter against harsh elements.

- Measures seven ranges, from 0 to 2 µS/cm to 0 to 1000 mS/cm
- Readings of up to 3-decimal resolution at ±1% accuracy
- Adjustable temperature coefficients for more precise temperature compensation. Choose between programmable linear temperature compensation from 0.0% to 10.0%, and pure water temperature compensation to correct non-linearity of ultra pure water temperature correction curves.
- Displays electrode status after each calibration
- User-adjustable cell constant values. User can input cell constant corresponding to connecting electrode independently during calibration
- Accepts 2- or 3-wire, PT100 or PT1000 RTD sensors for automatic temperature compensation

Model No.	Wall-mount	**TSCONCTP2000W**
	Panel-mount	**TSCONCTP2000P**
Cat. No.		**01X275376 / 01X275377**

Range		Conductivity Range: 7 ranges: to 2.000 µS/cm; to 20.00 µS/cm; to 200.0 µS/cm; to 2000 µS/cm; to 20.00 mS/cm; to 200.0 mS/cm; to 1000 mS/cm
Temperature Compensation		Auto/manual (normalized at 25 °C)
Set points		Two, switchable
Outputs		Two 0/4 to 20 mA scalable outputs for conductivity and temperature, galvanically isolated
Display		LCD backlit
Operating Temp. Range		0 to 40 °C
Dimensions	Wall-mount	(TSCONCTP2000W) – ½ DIN, 144 x 144 x 110 mm
	Panel-mount	(TSCONCTP2000P) – ¼ DIN, 96 x 96 x 175 mm
Ingress Protection	Wall-mount	(TSCONCTP2000W) – IP66 NEMA 4X
	Panel-mount	(TSCONCTP2000P) – IP54 front panel

Synergy of Laboratory and Online Process Measurements

Laboratory methods across all industrial applications of composition measurement (including pH, conductivity, sodium, dissolved oxygen, and chlorine), are generally accepted as highly accurate and precise due to, 1) the carefully controlled environment, and 2) the ability both to replicate measurement on the same sample and to make comparisons of well-characterized standard samples of known concentration. The laboratory environment maintains careful control of temperature, which typically has the most significant impact on measurement variation.

A process stream is characterized by retrieving an aliquot of the process liquid in a clean container, often referred to as a grab sample. It is typically a larger volume than what is needed for a single measurement, and company SOPs often require the grab sample to be split into smaller portions for repeated analysis. Similarly, company SOPs often require frequent calibration or a check to a standard sample of known concentration. Therefore, the combination of controlled temperature, multiple sample measurement, and calibration to standards results in the best accuracy and precision for a measurement. But this measurement performance does come at a cost: namely, time expenditure. The online process measurement is meant to offer a balance between the high accuracy and precision capability of the laboratory and the need for rapid, near real-time feedback to the process control parameters.

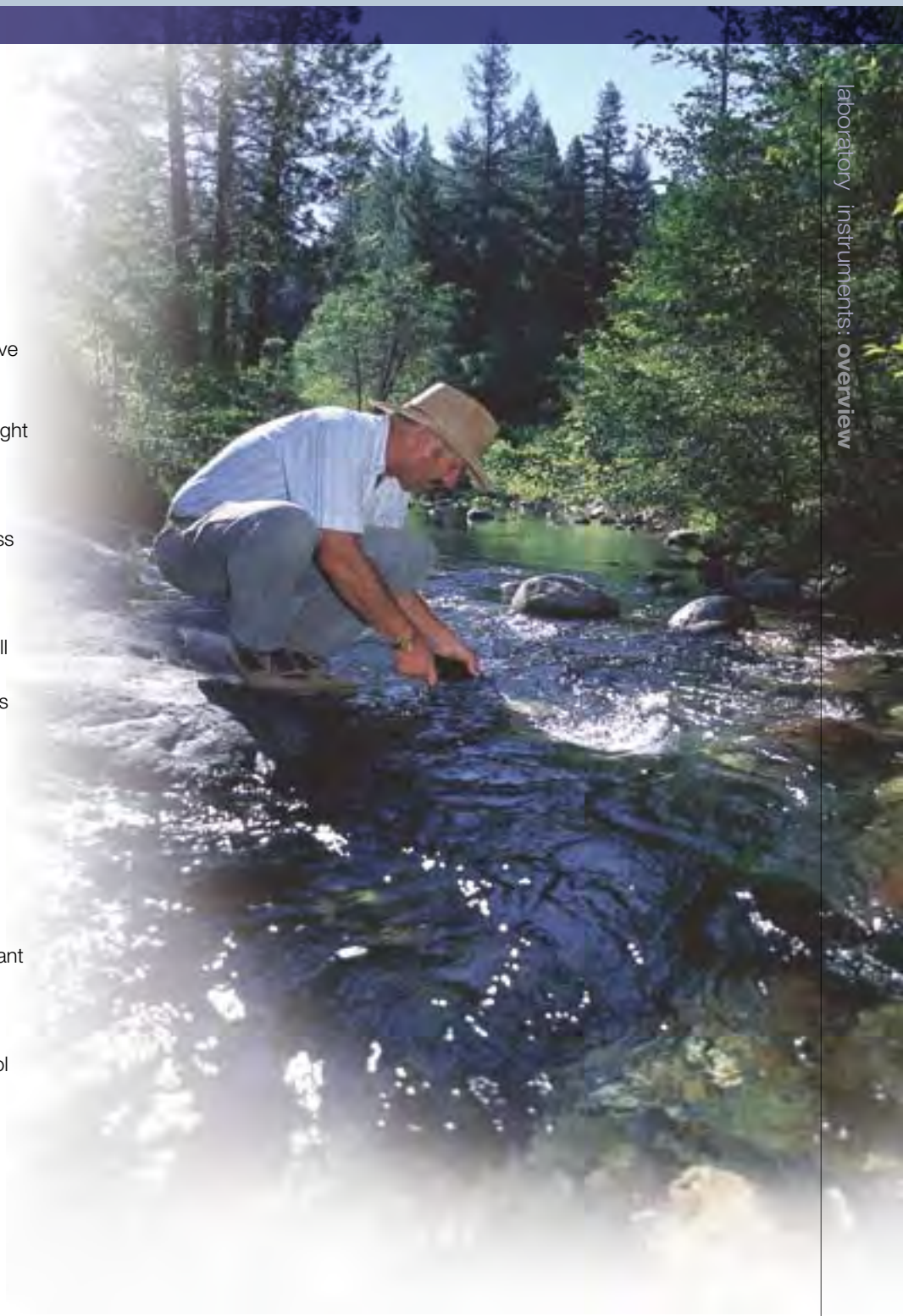
The high level of attention to detail associated with laboratory methods and SOPs assures that these laboratory data are often shared between sites (or points within a production plant) as goals to achieve. Again, through the use of a grab sample and laboratory measurement, different manufacturing (or liquid processing) points (or sites) can be correlated (brought in-line) in order to provide meaningful comparison throughout a complex industrial setting. The use of a grab sample to align or baseline-correct an in-line measurement is a common industrial practice and generally accounts for local environmental or processing conditions. The online measurement should have roughly equivalent measurement performance relating to accuracy, sensitivity and resolution, but with less precision than a laboratory measurement, simply because replicate measurements are not possible.

Oftentimes an online process instrument is operated at a high measurement frequency, but this high data rate should not be mistaken for improved accuracy. These measurements are all from different samples. This high rate of measurement shows real-time variation in a processing system and nothing more – without improving the accuracy of the measurement. An important application for online process instruments is the determination of a failure or breakthrough event within the process streams. These events indicate whether maintenance or diversion of processing streams is necessary. In this application, the high data rate and instrument reliability (regarding stability and drift) will be the critical criteria in the selection and comparison to the laboratory measurement.

Additional synergy between laboratory and online measurements lies in the validation of performance with respect to regulatory compliance requirements. For example, the summary section of the EPA method 334.0 Determination of Residual Chlorine in Drinking Water Using an Online Chlorine Analyzer (reference web link http://water.epa.gov/scitech/drinkingwater/Laboratorycert/upload/met334_0.pdf) states:

> *This method allows the use of any type of online chlorine analyzer (e.g., amperometric, DPD, etc.) for compliance monitoring when used in conjunction with a grab sample reference method that is approved for drinking water compliance monitoring. This method is intended to be used when chlorine residuals (free or total) are in the range of 0.2 mg/L to 4 mg/L.*

The DPD method (ASTM 4500-Cl Chlorine (Residual)) is a long-established method with a number of laboratory and field variations.



Comparing Laboratory and Online Measurements

When performing a laboratory-to-online measurement comparison it is best to implement methods that make use of the same technology. For example, for sodium in pure water using an ion selective electrode, a comparison to ICP-MS is often made; however, differences exist in sample preparation that can result in a slight offset, especially at concentrations near the detection limits. In an ideal situation, three measurement technologies would be best to commission an SOP or process – e.g., performed at time of installation of the process streams and checked on a annual on a biennial basis. The site Quality Management System is the overall driver of the independent confirmation of the accuracy and precision of the process control parameters, as well as the tools used to quantify them on a daily basis.

Best Practices

Knowledge of chemical composition and the information carried by process flows can strongly affect product quality, plant safety and plant profitability. Robust online instrumentation can provide the plant operator with a convenient, low cost and accurate method, with a straightforward relationship to laboratory data from initial commissioning of the process and control parameters.

Orion Star A221

Orion Star A222

Thermo Scientific Orion Star A221 pH Portable Meter

The Orion Star A221 pH Portable Meter lets you get your readings precisely where you need them. The large, backlit graphic LCD display shows pH/mV/RmV and temperature along with electrode status, time, date and calibration points.

- Features plain language screen prompts for guided operation, function keys that update for easy selection and multi language interface
- AUTO-READ™ locks in the stable reading on your screen and ready indicator alerts when continuous readings are stable
- Up to 5-point pH calibration with automatic recognition for USA/NIST and DIN buffers or option to manually enter buffer values
- Non-volatile memory holds up to 1000 data points with time and date stamp
- Easily transfer data and keep meter software up-to-date with the USB and RS232 ports and complimentary data analysis software
- Four AA batteries (included) provide over 800 hours of operation
- Portable, waterproof IP67-rated housing
- 3-year meter replacement warranty

Thermo Scientific Orion Star A222 Conductivity Portable Meter

The Orion Star A222 Conductivity Portable Meter features a large, backlit graphic LCD display shows conductivity/TDS/salinity/resistivity and temperature along with time, date and calibration data.

- Offers function keys that update for easy selection, plain language screen prompts for guided operation, plus a multilanguage interface
- AUTO-READ™ locks in the stable reading on your screen and ready indicator alerts when continuous readings are stable
- Selectable cell constant allows for use with 2- or 4-cell conductivity probes and automatic conductivity measurement ranging
- Non-volatile memory holds up to 1000 data points with time and date stamp
- Easily transfer data and keep meter software up-to-date with the USB and RS232 ports, plus complimentary data analysis software
- Four AA batteries (included) provide over 800 hours of operation
- Portable, waterproof and protected to take anywhere with a IP67-rated housing
- 3-year meter replacement warranty

Range	-2.000 to 20.000 pH	0.001 µS to 3000 mS
Resolution	0.1, 0.01, 0.001	0.001 µS minimum;4 significant figures minimum
Accuracy	±0.002	±0.5% reading ±1 digit for conductances > 3 µS ±0.5% reading ±0.01 µS for conductances ≤ 3 µS
Calibration Points	Up to 5	Up to 5
Temperature	-5 to 105 °C, 23 to 221 °F	-5 to 105 °C, 23 to 221 °F
Measurement Modes	pH, pH relative mV, ORP, temperature	Conductivity, TDS, salinity, resistivity, temperature

Cat. No.	**STARA2215P**	**STARA2225P**
Description	**Orion Star A221 pH Portable Meter Kit** - Orion ROSS Triode 3-in-1 pH/ATC low maintenance gel-filled, epoxy body electrode, 3m cable - Orion pH 4.01 buffer, 10 pouches - Orion pH 7.00 buffer, 10 pouches - Orion pH 10.01 buffer, 10 pouches - Orion ROSS electrode storage solution, 475 mL - Orion electrode rinse solution, 10 pouches - Protective meter armor with built-in stand and electrode holders - Hard field case - Four AA batteries (installed) - Literature CD, printed quick start guide, USB cable	**Orion Star A222 Conductivity Portable Meter Kit** - Orion DuraProbe 4-cell conductivity probe, K=0.475, 3 meter cable - Orion 1413 µS conductivity standard, 10 pouches - Orion electrode rinse solution, 10 pouches - Protective meter armor with built-in stand and electrode holders - Hard field case - Four AA batteries (installed) - Literature CD, printed quick start guide, USB cable

[**CLICK HERE** — to learn more]

Thermo Scientific Orion Star A223 RDO/Dissolved Oxygen Portable Meter

Get the readings that you need where you need them with the Orion Star A223 RDO/Dissolved Oxygen Portable Meter. The large, backlit graphic LCD display shows dissolved oxygen in percent saturation or concentration with temperature and time, date, barometric pressure and salinity correction.

- Offers function keys that update for easy selection, plain language screen prompts for guided operation, plus a multilanguage interface
- AUTO-READ™ locks in the stable reading on your screen and ready indicator alerts when continuous readings are stable
- No need to worry about dissolved oxygen probe compatibility – meter accepts and automatically recognizes Orion polarographic DO probes and Orion RDO optical DO probes
- Non-volatile memory holds up to 1000 data points with time and date stamp
- Easily transfer data and keep meter software up-to-date with the USB and RS232 ports, plus complimentary data analysis software
- Four AA batteries (included) provide over 800 hours of operation
- Portable, waterproof and protected to take anywhere with a IP67-rated housing
- 3-year meter replacement warranty

Concentration - Polarographic	Range: 0 to 90 mg/L Resolution: 0.01, 0.1 Relative Accuracy: ±0.2
% Saturation - Polarographic	Range: 0 to 600% saturation Resolution: 0.1, 1 Relative Accuracy: ±2%
Concentration - RDO	Range: 0 to 50 mg/L Resolution: 0.1, 0.1 Relative Accuracy: ±0.1 mg/L up to 8 mg/L; ±0.2 mg/L from 8 to 20 mg/L; 10% of reading from 20 to 50 mg/L
% Saturation - RDO	Range: 0 to 500% saturation Resolution: 0.1, 1 Relative Accuracy: ±2%
Calibration Features	Water saturated air, air saturated water, manual (Winkler) and zero point
Compatible Probe Types	Polarographic or RDO
Temperature	-5.0 to 105.0 °C, 23.0 to 221.0 °F (0.0 to 50.0 °C, 32.0 to 122.0 °F with RDO)

Cat. No.	**STARA2235P**
Description	**Orion Star A223 RDO/Dissolved Oxygen Portable Meter Kit** - Orion RDO optical/luminescence-based probe with 3m cable, stainless steel guard, calibration sleeve and optical cap - Protective meter armor with built-in stand and electrode holders - Hard field case - Four AA batteries (installed) - Literature CD, printed quick start guide, USB cable

[**CLICK HERE** — to learn more]

Thermo Scientific Orion Benchtop Meters

Thermo Scientific Orion Star A214 pH/ISE Benchtop Meter

The Orion Star A214 pH/ISE Benchtop Meter is the ideal choice for ion selective electrode analysis. Informative display shows pH/mV/RmV/ISE results and temperature along with electrode status, time, date, sample ID, user ID and calibration points. For advanced users, features such as stability and averaging choices provide additional options.

- Up to 5 point pH calibration with automatic recognition for USA/NIST and DIN buffers or option to manually enter buffer values
- Up to 5 point ISE calibration with advanced features such as linear point-to-point slope, nonlinear selectable auto-blank and low-concentration range stability
- pH and ISE calibration editing allows individual points to be corrected or removed without a new calibration
- Non-volatile memory holds up to 2000 data points with time and date stamp
- Stores up to 10 methods for customized procedures to differentiate between tests and/or users
- Easily transfer data and keep meter software up-to-date with the USB and RS232 ports and complimentary data analysis software
- Mix samples with direct meter control of the Orion Star stirrer probe (096019) – no stir plate or bar needed
- Included meter-attached electrode stand and newly-designed electrode holder make it easy to maintain and move electrodes in and out of samples

[**CLICK HERE —** to learn more]

pH Mode	**Range**	-2.000 to 20.000
	Resolution	0.1, 0.01, 0.001
	Relative Accuracy	±0.002
	Calibration Points	Up to 5
	Calibration Editing	Yes
mV/Rel mV/ ORP	**Range**	±2000.0 mV
	Resolution	0.1
	Relative Accuracy	±0.2mV or ±0.05% of reading, whichever is greater
	Calibration Points	1
ISE Mode	**Range**	0 to 19999
	Resolution	up to 3 significant digits
	Relative Accuracy	±0.2 mV or ±0.5% of reading, whichever is greater
	Units	ppm, M, mg/L, %, ppb, none
	Calibration Points	Up to 5
	Calibration Editing	Yes
	Calibration Features	Linear point to point, nonlinear selectable auto-blank, low concentration range stability
Temperature	**Range**	-5 to 105 °C, 23 to 221 °F
	Resolution	0.1
	Relative Accuracy	±0.1
	Offset Calibration	1 point

Cat. No.	Descriptions
STARA2146P	**Orion Star A214 pH/ISE Benchtop Meter Kit for Ammonia** – Orion ROSS Ultra pH refillable, glass body electrode – Orion high-performance ammonia electrode – Orion stainless steel ATC probe – Orion Star stirrer probe – Orion 1000 ppm ammonia standard, 475 mL – Orion low-level ammonia ISA, 475 mL – Orion ammonia electrode storage solution, 475 mL – Meter-attached electrode stand and holder – Universal power adapter – Literature CD, printed quick start guide, USB cable
STARA2147P	**Orion Star A214 pH/ISE Benchtop Meter Kit for Fluoride** – Orion ROSS Ultra pH refillable, glass body electrode – Orion fluoride electrode – Orion stainless steel ATC probe – Orion Star stirrer probe – Orion fluoride standard, 1 ppm with TISAB II, 475 mL – Orion fluoride standard, 2 ppm with TISAB II, 475 mL – Orion fluoride standard, 10 ppm with TISAB II, 475 mL – Orion TISABII solution, 1 gallon – Meter-attached electrode stand and holder – Universal power adapter – Literature CD, printed quick start guide, USB cable
STARA2145P	**Orion Star A214 pH/ISE Benchtop Meter Kit** – Orion ROSS Ultra pH refillable, glass body electrode – Orion stainless steel ATC probe – Orion Star stirrer probe – Orion ROSS pH buffer and storage solution kit (pH 4, 7 and 10 buffers, ROSS storage solution, electrode cleaning solution and electrode storage bottle) – Meter-attached electrode stand and holder – Universal power adapter – Literature CD, printed quick start guide, USB cable

The process ROSS electrode can be used on the Star A214 lab meter with the 91CBNC screw cap to BNC adapter cable. **For information on 2001SC ROSS electrode – CLICK HERE**

WATCH *the Orion Star A meters in action*

Thermo Scientific Orion Star A213 RDO/Dissolved Oxygen Benchtop Meter

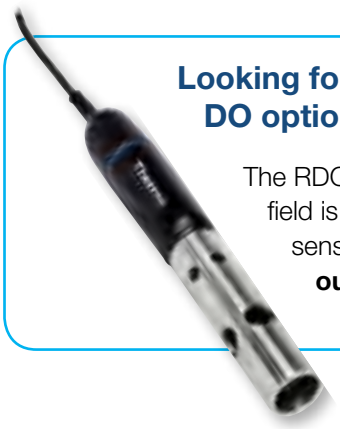
The Orion Star A213 RDO/Dissolved Oxygen (DO) Benchtop Meter is the ideal choice to ensure proper oxygen levels. Get the information you need quickly and easily from the large, backlit graphic LCD display. Informative display shows dissolved oxygen in percent saturation or concentration and temperature along with time, date, sample ID, user ID and calibration information. For advanced users, features such as stability and averaging choices provide additional options.

- Calibrate using water-saturated air, air-saturated water, custom value from a Winkler titration or zero point calibration
- Non-volatile memory holds up to 2000 data points with time and date stamp
- Stores up to 10 methods for customized procedures to differentiate between tests and/or users
- Easily transfer data and keep meter software up-to-date with the USB and RS232 ports and complimentary data analysis software
- For faster BOD readings, control the Orion AUTO-STIR™ polarographic DO probe (086030MD) directly from the meter
- Meter-attached electrode stand and newly-designed electrode holder make it easy to maintain and move electrodes in and out of samples

Concentration – Polarographic	**Range**	0 to 90 mg/L
	Resolution	0.01, 0.1
	Relative Accuracy	±0.2
% Saturation - Polarographic	**Range**	0 to 600% saturation
	Resolution	0.1, 1
	Relative Accuracy	±2%
Concentration - RDO	**Range**	0 to 50 mg/L
	Resolution	0.01, 0.1
	Relative Accuracy	±0.1 mg/L up to 8 mg/L ±0.2 mg/L from 8 to 20 mg/L 10% of reading from 20 to 50 mg/L
% Saturation - RDO	**Range**	0 to 500% saturation
	Resolution	0.1, 1
	Relative Accuracy	±2%
Automatic Barometric Pressure Correction		450.0 to 850.0 mm Hg
Manual Salinity Factor Correction		0 to 45 ppt
Calibration Features		Water-saturated air, air saturated water,manual (Winkler) and zero point
Compatible Probe Types		Polarographic or RDO

Cat. No.	**STARA2136P**
Description	**Orion Star A213 Dissolved Oxygen Benchtop Meter Kit for BOD Analysis** – Orion AUTO-STIR polarographic BOD/DO probe – DO probe maintenance kit – Polarographic DO probe electrolyte solution – Meter-attached electrode stand and holder – Universal power adapter – Literature CD, printed quick start guide, USB cable

[**CLICK HERE** — to learn more]



Looking for an optical DO option in the lab?

The RDO sensor you love in the field is also available in a lab sensor. **Contact us to find out more.**

Thermo Scientific Orion Star A212 Conductivity Benchtop Meter

The Orion Star A212 Conductivity Benchtop Meter is the ideal choice to help meet USP requirements using the meter kit for ultrapure water, or measure standard conductivity levels using the meter kit for natural water.

- Don't miss a reading – AUTO-READ™ locks in the stable reading on your screen, ready indicator alerts when readings are stable and timed reading gathers data in specific time intervals
- Selectable cell constant allows for use with 2- or 4-cell conductivity probes and automatic conductivity measurement ranging
- For accurate results, selectable reading reference temperatures of 5, 10, 15, 20 or 25 ºC with linear, nonlinear nLFn, nonlinear nLFu, or USP/EP curve options
- Choice of practical salinity or natural sea water curves for salinity readings
- Non-volatile memory holds up to 2000 data points with time and date stamp
- Stores up to 10 methods for customized procedures to differentiate between tests and/or users
- Easily transfer data and keep meter software up-to-date with the USB and RS232 ports and complimentary data analysis software
- Mix samples with direct meter control of the Orion Star stirrer probe (096019) – no stir plate or bar needed
- Included meter-attached electrode stand and newly-designed electrode holder make it easy to maintain and move electrodes in and out of samples

Conductivity	**Range**	0.001 µS to 3000 mS
	Resolution	0.001 µS minimum; 4 significant figures minimum
	Relative Accuracy	0.5% reading ±1 digit
	Reference Temperature	5, 10, 15, 20, 25 °C
	Temperature Compensation	Linear (0 to 10.0% °C), nLn, nLFu, USP/EP
	Compatible Cell Constants	0.001 to 199.9
	Calibration Points	Up to 5 points
	Calibration Editing	Yes

Cat. No.	**STARA2126P**
Description	**Orion Star A212 Conductivity Benchtop Meter Kit for Ultrapure Water** – Orion conductivity probe with flow-through cell, K=0.1 – Orion 100 µS conductivity standard, 5 x 60 mL – Meter-attached electrode stand and holder – Universal power adapter – Literature CD, printed quick start guide, USB cable

Cat. No.	**STARA2125P**
Description	**Orion Star A212 Conductivity Benchtop Meter Kit for Natural Water** – Orion DuraProbe 4-cell conductivity probe, K=0.475 – Orion 1413 µS conductivity standard, 5 x 60 mL – Meter-attached electrode stand and holder – Universal power adapter – Literature CD, printed quick start guide, USB cable

WATCH *the Orion Star A meters in action*

[**CLICK HERE** — to learn more]

Thermo Scientific AquaMate 8000 UV-Vis Spectrophotometer

The ideal instrument for extensive, full wavelength measurement options

The AquaMate 8000 UV-Vis Spectrophotometer offers 190 to 1100 nm selectable wavelengths and 1.8 nm spectral bandwidth and delivers unsurpassed data quality throughout the entire UV to near-IR region of the spectrum. A dual-beam optical geometry and high-intensity, instant-on xenon lamp are utilized for accurate measurements and an average five years of maintenance-free operation. Superior signal-to-noise performance and fast wavelength scanning technology allow high-quality spectral data to be acquired quickly and reliably.

- Dual-beam optics utilizing a Xenon Flash lamp for an average of five years of maintenance-free performance
- 1.8 nm spectral bandwidth for optimal resolution
- Enhanced wavelength scanning technology that acquires high-quality spectral data at speeds up to 4,200 nm per minute
- 1-year warranty

Optical Design	Dual beam – internal reference detector
Spectral Bandwidth	1.8 nm
Light Source (Typical Lifetime)	Xenon flash lamp (5 years)
Detector	Dual silicon photodiodes
Wavelength	
Range	190 to 1100 nm
Accuracy	±1.0 nm
Repeatability	±0.5 nm
Slew Speed	11,000 nm/min
Scanning Speed	10 to 4,200 nm/min
Data Interval	0.2, 0.5, 1.0, 2.0, 3.0, 5.0 nm

Cat. No.	**AQ8000P**
Description	**AquaMate 8000 UV-Vis Spectrophotometer** includes methods on USB memory stick, 6-position turret, 3-position turret, 1-position turret, user documentation, dust cover, USB cable, and 110 V, 220 V, 240 V power cords

[**CLICK HERE** — to learn more]

Thermo Scientific Orion AQ4500 Turbidity Meter

All-in one capability, featuring both White and Infrared light sources

Includes a dual source LED to allow readings that comply with reporting requirements for both EPA and ISO 7027 methodologies.

- U.S. EPA approved white light LED method for reporting
- ISO 7027 IR LED method for reporting
- Portable and IP67 waterproof with 100 data-point memory and 2,500 hour average battery life
- Orion AQ4500 Drinking Water and Wastewater Methods approved forl U.S. EPA regulatory reporting
- Computer interface for data transfer using RS232 port

Incident Light Source	Dual Source - White Light LED and IR LED
Measurement Modes	EPA 180.1, ISO nephelometric, ISO absorbance, IR ratiometric, % transmittance, EPA GLI method 2, EBC (European Brewing Chemists), ASBC (American Society of Brewing Chemists)
Measurement Ranges	0 to 4000 NTU EPA 0 to 2000 NTU GLI range 0 to 40 NTU ISO-7027 0 to 150 FNU ISO-ABSB 40 to 4000 FAU IR Ratio 0 to 4000 NTU EBC 0 to 24.5 ASBC 0 to 236
Resolution	0.01 (0 to 9.99 NTU) 0.1 (10 to 99.9) 1 (100 to 4000)
Sample Cell Compatibility	24 mm round
Power	4 AA batteries
Warranty	2 years

Cat. No.	**AQ4500P**
Description	**AQ4500 meter** with 4 AA batteries, primary standard calibration kit, 24 mm turbidity vials, field case, user guide, silicone oil and cloth

[**CLICK HERE** — to learn more]

LEARN MORE

Get more information on colorimetric reagent chemistries

Thermo Scientific Orion AQ3700 Colorimeter

Multi-parameter colorimeter featuring tests for nitrogen, phosphate and COD

This portable meter is the newest addition to the colorimetry line offering over 70 preprogrammed method options.

- Multi-parameter colorimeter with six wavelength options and wavelength auto-selection by preprogrammed method
- IP67 waterproof with 1000 data-point memory and long battery life
- Numerous preprogrammed tests for powder, tablet and liquid reagent chemistries, reaction tubes, COD digestion tubes and acid digestion tubes, including nitrogen and phosphate nutrient testing
- User interface available in selectable languages of English, French, German, Indonesian, Italian, Polish, Portuguese and Spanish

Incident Light Source	6 light emitting diodes (LED)
Wavelengths	430, 530, 560, 580, 610, 660 nm
Wavelength Accuracy	±1nm
Photometric Accuracy	±0.005 Abs
Sample Cell Compatibility	13mm, 16mm and 24 mm round
Power	4 AA batteries
Warranty	2 years

Cat. No.	**AQ3700P**
Description	**AQ3700 meter** with 4 AA batteries, 24 mm vials (4), 16 mm vials (3), 16 mm vial adapter, 13 mm vial adapter, field case, user guide with test methods, tablet tampering stir rod and vial cleaning brush

[**CLICK HERE** — to learn more]

Thermo Scientific Orion AQ3070 Colorimeter

Dedicated chlorine colorimeter measures free and total chlorine for EPA reporting

The AQ3070 colorimeter is designed with expanded ranges for free and total chlorine measurement, and gives a real number to quickly process your results.

- Five-parameter colorimeter with one wavelength
- Portable and IP67 waterproof with long battery life
- Preprogrammed reagent tests for free chlorine, total chlorine, chlorine dioxide, cyanuric acid and pH (5.9 to 8.2)
- US EPA approved methods for free and total chlorine in drinking water, wastewater and chlorine dioxide in drinking water

Incident Light Source	1 light
Wavelengths	525 nm
Wavelength Accuracy	±2nm
Photometric Accuracy	±0.015 Abs
Sample Cell Compatibility	25 mm round
Power	4 AAA batteries
Warranty	2 years

Cat. No.	**AQ3070P**
Description	**AQ3070 meter** with 4 AAA batteries, 25 mm vials (6), 100 free chlorine powder tests, 100 total chlorine powder tests, field case, user guide with test methods, tablet tampering stir rod and vial cleaning brush

[**CLICK HERE** — to learn more]

Services

▶ Thermo Scientific Service Programs and Product Support

Our commitment to service doesn't end after the sale.

We'll structure a Service or Maintenance program to suit your needs.

Whether your instrumentation was purchased recently or years ago, let us be your service provider for your Thermo Scientific Water Analysis products. A professionally maintained product gives you years of problem-free performance, saves you from unplanned downtime and the frustration of troubleshooting unfamiliar technology.

With a global network of expert service providers, Thermo Fisher Scientific provides a high level of after-sales service at your location or in-house at our factory. Our service and maintenance options answer your needs with speed and accuracy.

Extend the life of your instrumentation.

As a leader in liquid analytical technology, we stand by our products. Our parts and products ensure that you will experience years of dependable operation. When you purchase genuine Thermo Scientific parts for your AquaSensors or Orion analyzer system(s), you can be confident that your instrumentation will run longer and more efficiently.

Liquid Analytical Measurement Systems Service and Maintenance Programs:

We are happy to offer our customers several program options. Programs are designed to help keep critical equipment up and running – avoiding expensive repairs and downtime.

Maintenance and Validation Program

- Annual, semi-annual or quarterly options available
- Preventive maintenance
- Corrective maintenance
- Validation of performance
- Replacement of consumables
- Report of service visit and analyzer performance

On-site and Factory Based Training

- On-site training: Available for all AquaSensors or Orion analyzer system(s)
- VIP product training: Train in our state-of-the-art process lab, at our Water Analysis headquarters

Start-up and Installation Assistance

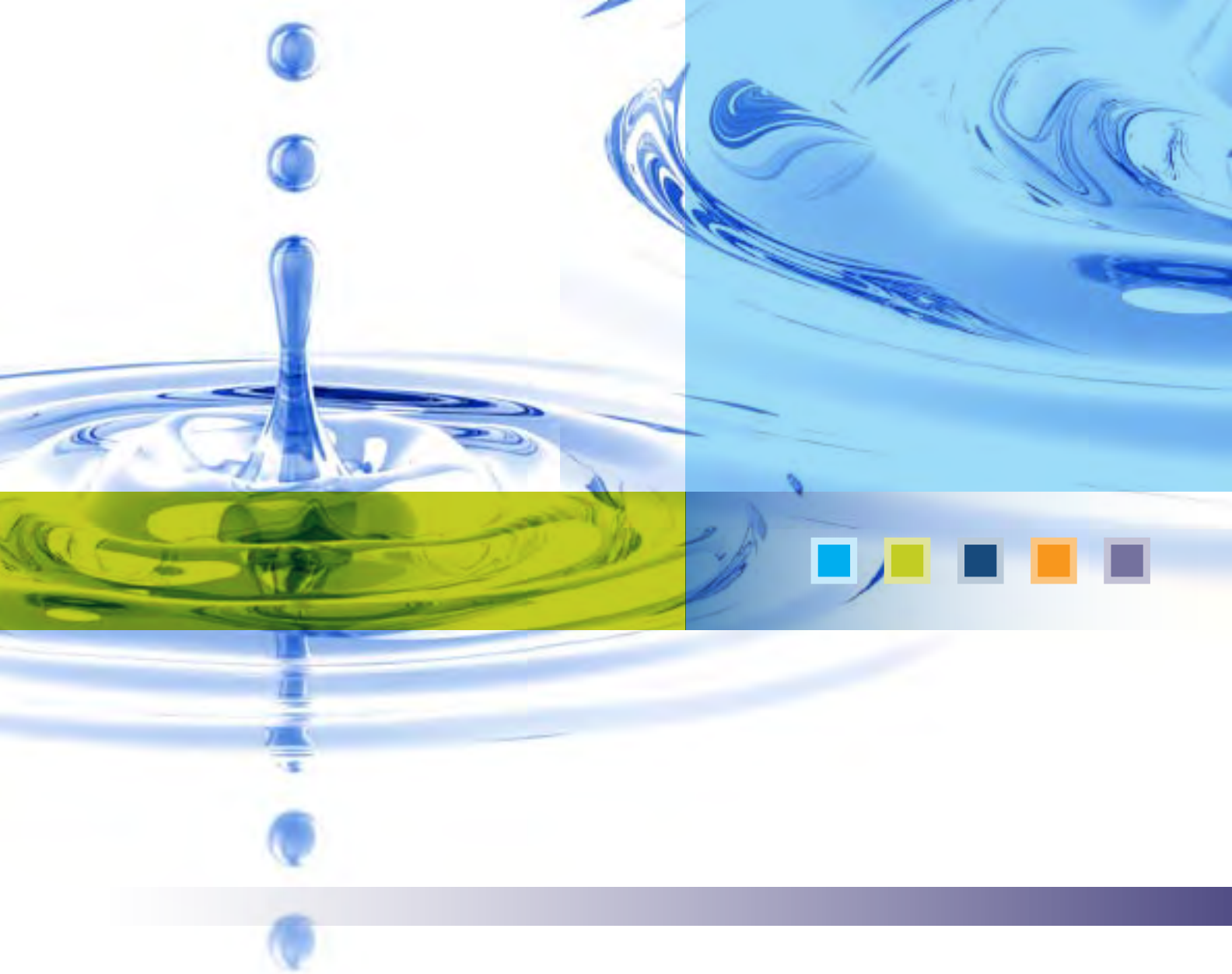
- On-site installation: Our qualified service personnel will verify systems are installed correctly, perform calibrations and ensure that the equipment performs to specification
- Extended warranties offered on new systems

Field Service

- On-site service: Our experienced field service technicians correct any fault associated with any AquaSensors or Orion analyzer system(s)

Genuine Thermo Scientific Spare Parts

- Lengthen the operational life of your process instrumentation
- Ensure compatibility and operational efficiency of equipment
- Parts are engineered and tested to ensure optimal performance and longer operation



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