YSI

monitoring

source water

Applications, Capabilities & Solutions

for baseline monitoring
and early warning

Choose YSI

Reliable data to help you act quickly, work efficiently, and reduce costs.

Source water can be affected by land use, agricultural practices, and climate change.

Monitoring and treatment takes significant investments in time and money. These investments – and public health – may be jeopardized if source water is contaminated.

Trust YSI's sensors and systems to provide a continuous and comprehensive data record of water quality and quantity, giving you the information you need to make decisions.

We understand the challenges of working in natural environments. Our long-term monitoring systems play a key role in improving water quality and plant efficiency while allowing for early warning and rapid response to events such as algal blooms and floods.

Every environment is unique. Talk with our hands-on applications specialists, who can assist you with your specific monitoring needs.

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Data from YSI instruments gives you insight into source water before it reaches the treatment plant.

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Baseline **monitoring**

Developing a baseline water quality data set allows you to:

- **Characterize water quality and natural fluctuations**
- **Compare to national standards or other environments**
- **Measure the impact of storms or land use**
- **Monitor impact from mixing with other sources**
- **Improve resource management and evaluate effectiveness of long-term management strategies**
- **Develop models**

YSI's flexible systems and integration capabilities can help you develop a continuous monitoring system that's right for you.

Systems include water quality and quantity sensors, floating and fixed platforms, mounting hardware, flexible data collection platforms, and field services.

YSI offers a wide variety of buoy and platform configurations for vertical profiling

Reservoir Monitoring

Whether reservoir management concerns relate to surrounding land use, taste and odor problems, or plant efficiency, having baseline data is a critical component in informed decision-making.

Water quality is constantly changing in time and space. YSI's most comprehensive monitoring system is a vertical profiler that provides continuous water quality data, typically once an hour, throughout the water column.

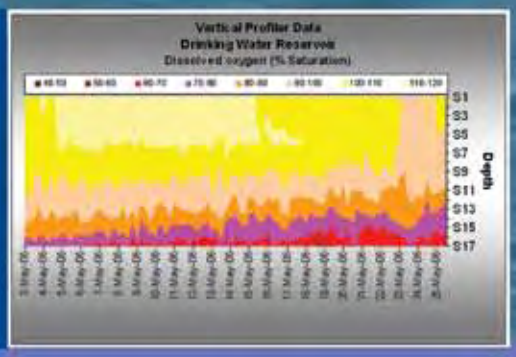
Profiler data can:

- Monitor total algal biomass that can be used to improve filter run times, identify blooms, and monitor vertical migration of algae
- Detect turnover events
- Monitor the impacts of storms and land use on water quality

If the vertical profiler is deployed at a water intake, data can be used for:

- Tracking water quality at various intake depths to ensure the best quality water is entering the plant
- Improving the efficiency in treatment chemical use and deciding which treatment or pre-treatment protocols should be employed
- Monitoring blue-green algal biomass to prevent taste and odor events
- Automating aeration for the treatment of low oxygen conditions, manganese compounds, or to increase vertical mixing

Vertical profiler data display changes in water quality throughout the water column over time. The data at right show a stratified water column and the impacts of an aeration system on dissolved oxygen.



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"We have always wanted a technology such as the Profiler... If we are able to ensure that the algal load in water supplied to the drinking water treatment plant remains low, we can save costs by optimizing the treatment process."

— Terry Bridgman, Field Scientist, Thames Water

Intake Monitoring

Monitor water as it enters the plant with the HydroSAM wall-mounted flow-through system. HydroSAM is a complete water quality sampling and monitoring station, providing continuous data from a compact system that measures parameters such as dissolved oxygen, pH, turbidity, conductivity, chlorophyll, blue-green algae, and temperature.

The HydroSAM lowers costs associated with running traditional on-line analyzers by:

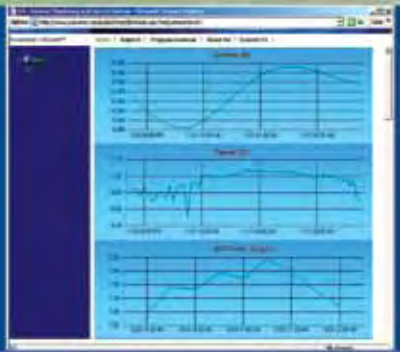
- Reducing on-site time through easy sensor swap-out system
- Ensuring accurate readings and longer maintenance intervals with wiped sensor technology that minimizes biofouling

Next to a water intake, a YSI vertical profiling system moves a YSI water quality sonde up and down the water column, tracking the best depth for extraction

Real-time data collection

Multiparameter water quality sondes can be used alone or as part of a larger monitoring system to provide users with high quality, defensible data. They provide a complete sensor suite that can tolerate long deployments in remote locations.

Acoustic Doppler velocity instruments, such as the SonTek/YSI Argonaut®-SL, quickly and easily provide flow data about controlled water release through dams or flow through canals and aqueducts.



Easily access data from field monitoring equipment with the web-enabled **EcoNet® data management system**.

Early warning

Nutrients, light, and temperature conditions dictate algal growth – and changes in these factors can shift the balance from stable algae populations to an enriched environment that leads to unhealthy blooms.

YSI's systems continuously monitor key water quality parameters and can trigger alarms or actions when parameters, especially dissolved oxygen or algal biomass, cross user-programmable threshold levels.

Our real-time monitoring systems include rugged platforms, mounting hardware, flexible data collection platforms, telemetry, and field services.

Algal Blooms

YSI's chlorophyll sensor monitors total algal biomass in water. This can be useful in detecting natural fluctuations and the onset of algal blooms.

Unhealthy blooms significantly impact dissolved oxygen concentration; the ability to monitor algal biomass allows you to forecast changes in dissolved oxygen and the potential onset of anoxic events.

When used with a blue-green algae sensor, the combined data can provide information on the types of algae present such as taste- and odor-causing blue-greens or filter-clogging diatoms.

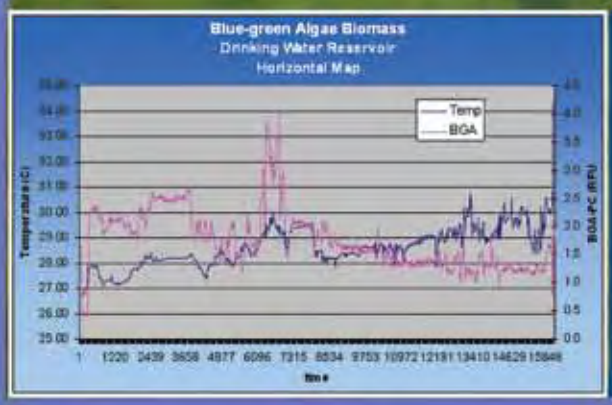
Treatment Chemical Use

Through continuous monitoring of water quality with a YSI sonde, treatment plants can significantly reduce the use of treatment chemicals while improving water quality and plant efficiency.

Monitoring systems located at water intakes provide the data you need to choose the best water to bring into the plant, determine which treatment chemicals or processes to use, and provide continuous feedback on the effectiveness and duration of treatment – reducing operating costs and improving water quality.

Data can be used to:

- Improve chemical use efficiency, resulting in improved water quality and lower operating costs
- Decrease filter run times
- Decrease total organic loading



Algae mapping

The data at left show horizontal mapping of a reservoir from a small boat. Data were collected continuously while the boat moved around the reservoir. Peaks indicate high concentrations of blue-green algae.

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"We're able to study daily, seasonal, and yearly variations, cycles, and trends and also compare those with the effects of weather on algal productivity. All data is being archived for further analysis."

— Dr. Joseph Ramus, Marine Laboratory, Duke University

Nutrient Monitoring

Continuous monitoring with a YSI system, including nutrients (below), provides near real-time data and thus quicker response than spot sampling or lab analysis.

Data from 9600 nitrate analyzer, 6-Series sonde, and EcoNet can:

- Provide instant access to remote monitoring sites
- Provide early warnings about public health concerns such as high nitrogen levels or algal blooms in source water

Taste & Odor Events

Certain water quality conditions trigger blooms of blue-green algae (BGA) which can lead to the production of taste- and odor-causing compounds (geosmin and MIB) and potentially produce cyanotoxins such as microcystins. This is a major water quality concern for drinking water utilities, which may have difficulty detecting these events early enough to take treatment measures to prevent poor quality or hazardous water from reaching the consumer.

The blue-green algae sensor monitors BGA biomass by detecting the fluorescence from unique pigments. Data can be used to:

- Trigger treatment strategies specific to blue-green algae
- Warn recreational users when water is unsafe for swimming or boating

Chlorophyll and blue-green algae sensors

Reduce Disinfection By-products

The interaction of chlorine with naturally occurring organic matter results in production of disinfection by-products such as trihalomethane.

To minimize exposure to this by-product, use chlorophyll and blue-green algae sensors to:

- Monitor organic load in water and select the optimal water for entry into the treatment plant
- Select the appropriate pre-treatment process to reduce organic load before chlorination

Leading Sensor Technology

Reliable, field-proven sensors are the cornerstones of our rugged instruments – and their highly accurate data are the foundation of successful monitoring programs.

Virtually maintenance free: Integrated wipers for optical dissolved oxygen, pH, ORP, turbidity, chlorophyll, and blue-green algae sensors prolong maintenance intervals, lowering operation costs.

Storms & floods

In addition to monitoring for baseline water quality, professionals must be prepared for large-scale events such as storms and floods, which threaten to contaminate drinking water sources.

YSI multiparameter sondes and SonTek/YSI velocity instruments quickly and easily characterize water quality and quantity before, during, and after these events.

Combined Sewer Overflow

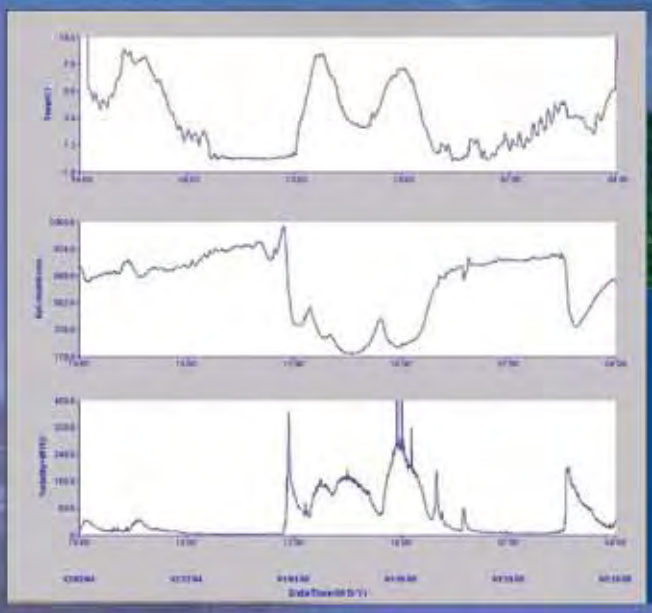
Heavy rainfall or snowmelt can overwhelm the capacity of pipes where rainwater, industrial wastewater, and domestic sewage are combined. The drawback is that untreated water could discharge into nearby streams and rivers.

A 6-Series sonde, such as the 6920 V2, measures temperature, optical dissolved oxygen, and turbidity and provides insight into the impacts of CSOs. Wipers on the instrument's sensors prevent biofouling and ensure data accuracy.

Turbidity Monitoring

During floods and storms, sediment is easily stirred up and transported throughout a water network. Its suspension can affect drinking water quality and present challenges to a treatment plant.

When faced with a decision about where to withdraw drinking water – from primary or secondary sources – use a 6-Series sonde, in conjunction with our profiling system, to obtain a continuous and reliable record of the vertical distribution of turbidity.



Response time is of the essence. Critical data can be delivered via telemetry for timely alerts and notifications when parameters fluctuate beyond standard ranges.

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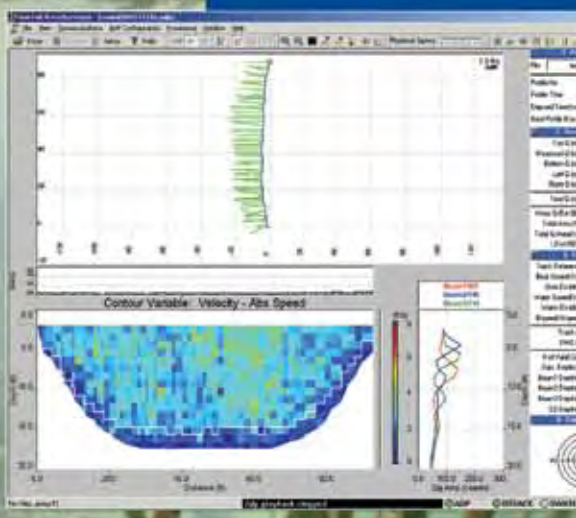
"YSI equipment performance has been excellent. We were able to upgrade our locations to real-time data transmission without a single problem. We're collecting some very valuable data."

— Tom White, Senior Project Manager,
City of Indianapolis Office of Environmental Services

Real-time bathymetric mapping with RiverSurveyor (at left, mounted on a trimaran, being deployed in a river) provides a comprehensive overview of flood impacts.



Flood Defense

Quickly measure discharge volumes in rivers and inflow rates in reservoirs with SonTek/YSI RiverSurveyor® 3D Acoustic Doppler system.

From a moving boat, compute a complete channel cross-section, velocity profile, and total discharge in minutes.

Well Monitoring

Assess contamination in drinking water wells with the Model 30 conductivity meter. This basic handheld instrument quickly samples and calculates salinity levels to determine the relative health of wells that may have been flooded with debris or wastewater.

Stormwater Runoff

Stormwater runoff from parking lots and other water-impervious surfaces can lead to contamination from pollutants such as oil.

YSI offers an integrated package that includes a hydrocarbon sensor and water quality sonde to provide a complete water quality record of the impact of stormwater on source water.

Water **shortages**

Water management under drought conditions, or other shortages, requires resourcefulness and efficiency.

Continuous monitoring with YSI's instruments and systems will help you determine if the decreased volume and flow of water is leading to adverse conditions such as concentrated contaminants.

Flow Rates

Track all available water resources during a drought by measuring velocities of waterways and streams – as shallow as one inch.

The SonTek/YSI FlowTracker® is an easy-to-use handheld instrument which automatically computes discharge using standard USGS/ISO methods. Built-in quality checks make the most efficient use of your time, ensuring your data is accurate the first time.

Algal Blooms

As water levels decrease, nutrients become concentrated, often triggering algal blooms. High algal biomass at intakes can result in several serious issues, including increasing filter run times and the production of taste- and odor-causing compounds from blue-green algae.

Chlorophyll and blue-green algae sensors provide continuous data which can be used to efficiently manage water treatment timing, such as chemical use or aeration, to prevent or minimize the effect of algal blooms.

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By measuring both level and velocity, then indexing to the mean channel velocity, our discharge data improved dramatically."

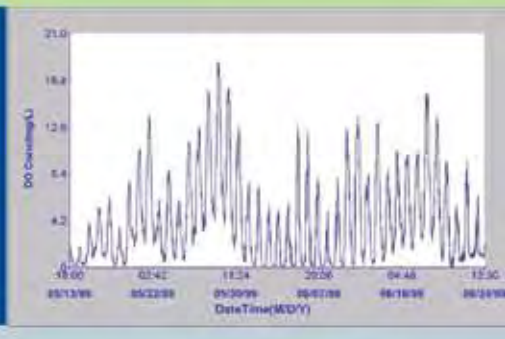
— Keith Ging, Senior Hydrologist, Lower Colorado River Authority

Primary & Secondary Sources

Drought conditions can deteriorate water quality and force the use of secondary water sources such as rivers or storage reservoirs. In such cases, continuous water quality monitoring near treatment plant intakes and in secondary sources is critical to direct management decisions.

To generate the most useful data, a multiparameter sonde can be integrated into a vertical profiler or EcoNet system. This can dramatically improve the quality of water entering treatment plants by continuously monitoring at various water intake depths, enabling you to select the optimal source.

Under a drought condition, dissolved oxygen levels in the water can fluctuate dramatically, even reaching critically low points around zero.



Low Oxygen Events

Low dissolved oxygen levels during drought can lead to the formation of manganese and iron compounds, increase internal phosphorus loading, or produce noxious gases. Additionally, algal blooms can cause dramatic fluctuations in DO and decomposition of blooms can create anoxic conditions which lead to fish kills.

A 6600 V2-4 sonde with ROX™ optical DO sensor provides continuous *in situ* data for several months. No other system is as reliable and accurate for long-term monitoring deployments.

Water quality is profiled within a storage reservoir by a YSI sonde attached to a stationary object such as a water tower. Data are transmitted to water utility managers via telemetry.

Ground water **monitoring**

Ground water and aquifers are important sources of drinking water.

For ground water monitoring, determining the quality of the water as well as its quantity and location (depth or level) are key data sets for local water utilities as well as citizens with private wells.

600XLM 600LS Level Scout 556MPS

Well Monitoring Network

Low-flow sampling is a widely used method to identify contamination in an aquifer or well. This method places a minimal amount of stress on the water system. A 556 multiparameter sampling instrument with flow cell quickly provides data for key parameters before and during low-flow sampling: pH, temperature, specific conductance, ORP, and dissolved oxygen.

For continuous monitoring of a network of wells, the slender 600XLM sonde easily fits down 2-inch wells and logs *in situ* measurements of depth (using a highly accurate vented level sensor), conductivity, temperature, pH, and DO.

Level Monitoring

For level sampling or monitoring, the small-diameter YSI Level Scout™ or 600LS sonde provides accurate level and temperature data. Data are logged internally and easily downloaded or accessed remotely via telemetry.

Salt Water Intrusion

When water resources are used heavily, water table levels can drop. This creates a risk that salt water can infiltrate the ground water system and degrade drinking water quality.

A 556 sampling instrument or slender 600LS monitoring sonde can capture valuable conductivity and calculated salinity data to keep you informed of changes in ground water.

Pollutant Monitoring

Short-term projects such as construction can affect the water quality of nearby aquifers. Continuous monitoring with an easy-to-use 600OMS with turbidity sensor throughout the project can characterize the potential impacts from sediment, spills, and other pollutants.

A portable 556 multiparameter instrument with flow cell quickly samples ground water wells.

The vented pressure transducer on all 6-Series sondes, such as the 600LS, meets the USGS Office of Surface Water accuracy specification for use in stream gauging applications.

Distribution **monitoring**

Drinking Water Monitoring

Measure free chlorine concentrations and other parameters of concern with Drinking Water Multiprobes. These portable systems are easy to move and set up at multiple sites, providing greater flexibility than large, wall-mounted systems.

YSI's free chlorine sensor has been tested by the US EPA, USGS, and US Department of Defense.

These sondes provide continuous data, an improvement over spot sampling protocols because the data stream is captured continuously. For example, chlorine levels can decrease relative to detention time in reservoirs or conductivity levels can spike after a rainfall.

Process Monitoring

Obtain data quickly by connecting a Drinking Water Multiprobe and flow cell to a 6500 Environmental Process Monitor. With multiple current loop channels, this integrated system easily delivers uninterrupted data to a plant's SCADA system and allows technicians to quickly access information.

Define setpoints for four parameters and trigger alarms if water quality exceeds safe ranges.

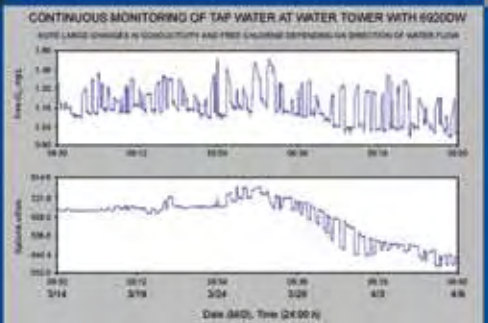
With millions of miles of pipe in distribution systems, safe delivery of drinking water is critical.

Continuous monitoring provides an assurance of safety, alerting utilities to sudden changes in the system due to aging pipes, storm or flood events, or even security breaches.

YSI's specialized drinking water sondes take readings at any point along the distribution system – treatment plant, water tanks, pumping stations – and provide a comprehensive view of water quality before it reaches the customer.

YSI's portable drinking water monitoring system is easy to set up and use (no reagents) for side-stream measurements throughout a distribution system.

6920DW sonde and 6500 monitor



Drinking water in a water tower comes from two sources – the main distribution line from the plant when pumps are filling the tank or the tank itself when the tank is discharging water into the distribution system. Data, collected in 15-minute intervals, revealed that free chlorine changed radically in discrete steps, a pattern which wasn't observed at the plant.

quick select
product guide

Features/Parameters	6600 V2	6920 V2	6820 V2	600 OMS	600XL/ 600XLM	600LS	6920 DW	600 DW-B	9600	Argonaut SL	Argonaut SW	River Surveyor	Flow Tracker	Level Scout	30	556	Profiling System	Hydro SAM	6500
Ammonium/ammonia*	□	■	■		▲												■	■	■
Blue green algae	■	■	■	■	□												■	■	■
Chloride*	□	■	■		▲												■	■	■
Chlorophyll	■	■	■	■	□												■	■	■
Conductivity	●	●	●	●	●	■	●	●							●	●	■	■	■
Depth	■	■	■	■	■												■	■	■
Dissolved oxygen	□	▢	▢		■											●	■	■	■
Dissolved oxygen, optical	■	■	■	■	□												■	■	■
Free chlorine							■	■										■	■
Nitrate	□*	■*	■*		▲*				●								■	■	■
Open channel flow**	■	■	■	■	■	●												■	■
ORP	■	■	■		■		■	■								■	■	■	■
pH	■	■	■		■		■	■								●	■	■	■
Resistivity**	●	●	●	●	●	■	●	●								●	■	■	■
Rhodamine	■	■	■	■	□												■	■	■
Salinity	●	●	●	●	●	■	●	●							●	●	■	■	■
Specific conductance**	●	●	●	●	●	■	●	●							●	●	■	■	■
Temperature	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	■	■	■
Total dissolved solids**	●	●	●	●	●	■	●	●								●	■	■	■
Turbidity	■	■	■	■	□		■										■	■	■
Vented level	■	■	■	■	■	●								●			■	■	■
Currents/Tides/Waves										●									
Discharge										●	●	●	●						
Flow										●	●	●	●						
Field-replaceable probes	●	●	●	●	●		●	●								●	■		
RS-232 & SDI-12 standard	●	●	●	●	●	●	●	●	●		●			●		●	■		
Fits 2" wells				●	●	●		●						●+	●	●			
Internal memory	●	●	●	●	●	●	●	●	●	●	●	●	●	●	■	●	●	●	●
Internal power (batteries)	●	●		■	■	■	●	●	●					●	●	●	■		
Flow cell	■	■	■		■		■	■								■		■	

* Freshwater only. ** Calculated parameters. ● Standard ■ Customer Selectable ▲ Special Order ▢ Available on 600XL V2 and 600XLM V2
+ Fits 1" wells. □ Available on 6600 V2-2 only ▢ Available on 6920 V2-4 or 6820 V2-4 only

sensor specifications

	Range	Resolution	Accuracy
Rapid Pulse™ dissolved oxygen % air saturation	0 to 500%	0.1%	0 to 200%: ±2% of reading or 2% air saturation, whichever is greater; 200 to 500%: ±6% of reading
Rapid Pulse™ dissolved oxygen mg/L	0 to 50 mg/L	0.01 mg/L	0 to 20 mg/L: ±2% of reading or 0.2 mg/L, whichever is greater; 20 to 50 mg/L: ±6% of reading
ROX™ optical dissolved oxygen# % air saturation	0 to 500%	0.1%	0 to 200%: ±1% of reading or 1% air saturation, whichever is greater; 200 to 500%: ±15% of reading; relative to calibration gases
ROX™ optical dissolved oxygen# mg/L	0 to 50 mg/L	0.01 mg/L	0 to 20 mg/L: ±1% of reading or 0.1 mg/L, whichever is greater; 20 to 50 mg/L: ±15% of reading; relative to calibration gases
Conductivity+	0 to 100 mS/cm	0.001 to 0.1 mS/cm (range-dependent)	±0.5% of reading + 0.001 mS/cm
Temperature~	-5 to 50°C	0.01°C	±0.15°C
pH	0 to 14 units	0.01 unit	±0.2 unit
Shallow depth	0 to 9.1 m (0 to 30 ft)	0.001 m (0.001 ft)	±0.018 m (±0.06 ft)
Medium depth	0 to 61 m (0 to 200 ft)	0.001 m (0.001 ft)	±0.12 m (±0.4 ft)
Deep depth	0 to 200 m (0 to 656 ft)	0.001 m (0.001 ft)	±0.3 m (±1 ft)
Vented level~~	0 to 9.1 m (0 to 30 ft)	0.001 m (0.001 ft)	±0.003 m (±0.01 ft)
Open-channel flow	Calculated measurement, requires vented level		
Free chlorine	0 to 3 mg/L	0.01 mg/L	±15% of reading or 0.05 mg/L, whichever is greater**
ORP	-999 to +999 mV	0.1 mV	±20 mV in Redox standard solutions
Salinity	0 to 70 ppt	0.01 ppt	±1% of reading or 0.1 ppt, whichever is greater
Nitrate/nitrogen*	0 to 200 mg/L-N	0.001 to 1 mg/L-N (range dependent)	±10% of reading or 2 mg/L, whichever is greater
Ammonium/ammonia/ nitrogen*	0 to 200 mg/L-N	0.001 to 1 mg/L-N (range dependent)	±10% of reading or 2 mg/L, whichever is greater
Chloride*	0 to 1000 mg/L	0.001 to 1 mg/L (range dependent)	±15% of reading or 5 mg/L, whichever is greater
Turbidity#	0 to 1,000 NTU	0.1 NTU	±2% of reading or 0.3 NTU, whichever is greater, in YSI AMCO-AEPA polymer standards
Rhodamine WT#	0 to 200 µg/L	0.1 µg/L	±5% of reading or ±1 µg/L, whichever is greater
TriOS Hydrocarbon	0.50 µg/L	0.1 µg/L	
Chlorophyll# ++	0 to 400 µg/L chl *a;* 0-100 RFU	0.1 µg/L chl *a;* 0.1% FS; 0.1 RFU	**Linearity** R^2 > 0.9999 for serial dilution of Rhodamine WT (0-500 µg/L)
Blue-green algae# phycocyanin	0 to 280,000 cells/mL 0 to 100 RFU	**Detection limit** 220 cells/mL§	**Linearity** R^2 > 0.9999 for serial dilution of Rhodamine WT (0-400 µg/L)
Blue-green algae# phycoerythrin	0 to 200,000 cells/mL 0 to 100 RFU	450 cells/mL§§	R^2 > 0.9999 for serial dilution of Rhodamine WT (0-8 µg/L)

Maximum depth rating for optical probes is 61 m (200 ft). ~ Operating temperature for Level Scout = -20 to 50°C; accuracy = ±1.0°C for 2 Mb versions and ±0.2°C for 4 Mb versions. ~~ Vented level for Level Scout: range = 0 to 211 m (0 to 692 ft); accuracy = ±0.5% FS. * Freshwater only. Maximum depth rating of 15.2 m (50 ft). **To maintain accuracy specification, flow must be at least 500 mL/min and pH should not change by more than ±0.3 units if mean pH is between 8.5 and 9.3. + Report outputs of specific conductance (conductivity correct C), resistivity, and total dissolved solids are also provided. These values are automatically calculated from conductivity according to algorithms found in *Standard Methods for the Examination of Water and Wastewater* (ed 1989). ++ Specification determined using monocultures of *Isochrysis sp.* and fluorometric extraction of chlorophyll *a*. Actual detection limits will vary depending on natural algae assemblage.
§ Estimated from cultures of *Microcystis aeruginosa*. §§ Estimated from cultures of *Synechococcus sp.*

YSI

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ETV

Third-Party Sensor Verification You Can Trust

YSI is the only company in its field to apply for and receive verification from the US EPA's Environmental Technology Verification Program. Independent tests on the following sensors demonstrated the accuracy of YSI sensor technology when compared to established standards in saltwater and freshwater:

6025 Chlorophyll
6560 Conductivity
6562 Dissolved Oxygen
6561 pH
6560 Temperature
6136 Turbidity

Sensors listed above were submitted to ETV program on YSI 6600EDS. Find information on performance characteristics of YSI water quality sensors at www.epa.gov/etv or call YSI at +1 937 767 7241 for ETV Verification Report. Use of the ETV name or logo does not imply approval or certification of this product nor does it make any explicit or implied warranties or guarantees as to product performance.

ISO 9001
ISO 14001
(Yellow Springs facility)

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CE

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