

# DS5X Multiparameter Water Quality Sonde



## Overview

For maximum deployment life and minimum maintenance, this multiparameter water quality sonde offers Hydrolab's superior sensor technology on a multi-parameter platform with a self-contained, automatic cleaning system.

Series 5 multi-parameter water quality instruments are the premier family of Hydrolab sondes that include the DS5X (DataSonde 5X), DS5 (DataSonde 5), and MS5 (MiniSonde 5) for monitoring several water quality parameters simultaneously in situ.

The three platforms allow optimized combinations of sensors and accessories to suit water quality monitoring applications in all environmental water sources, such as rivers, streams, lakes, reservoirs, oceans, bays, estuaries, and groundwater aquifers. Sensors are available to provide data for the following:

Temperature	Depth	Conductivity	Salinity
Specific Conductance	TDS	Total Dissolved Gas	Turbidity
Dissolved Oxygen	pH	Chlorophyll	Blue Green Algae
Rhodamine WT	ORP	Ammonium	Chloride
Ambient Light (PAR)	Nitrate		



## Features & Benefits of the DS5X

- ▶ Designed for extended deployments in environments where fouling and sediment are abundant
- ▶ Central cleaning system wipes away fouling from adjacent sensors to reduce maintenance frequency & improve long-term value .
- ▶ A single central motor cleans the entire suite of sensors, thereby minimizing power consumption.
- ▶ Brush design features robust fibers that won't separate
- ▶ 7 built-in expansion ports configured to fit your specific needs
- ▶ Measures up to 16 parameters simultaneously
- ▶ Available with Hach LDO optical dissolved oxygen sensor
- ▶ Redundant data logging memory and internal power supply included in every sonde.
- ▶ Integrate one additional parameter
- ▶ RS-485 communications available
- ▶ Improved Power Management (minimal power consumption)
- ▶ Optimized for long-term, unattended deployments in harsh environments
- ▶ Central cleaning system wipes away fouling from DO, pH, ISE's, Chlorophyll, Blue-Green Algae, Rhodamine, and Turbidity sensors

## Applications

There is no "standard" Multiparameter Water Quality Sonde. Each unit is customized according to parameters to be measured. When ordering, specify required parameters.

- ▶ Temperature
- ▶ Depth
- ▶ Conductivity
- ▶ Salinity
- ▶ Specific Conductance
- ▶ TDS
- ▶ Total Dissolved Gas
- ▶ Turbidity
- ▶ Dissolved Oxygen
- ▶ pH
- ▶ Chlorophyll
- ▶ Blue Green Algae
- ▶ Rhodamine WT
- ▶ ORP
- ▶ Ammonium Chloride
- ▶ Ambient Light (PAR)
- ▶ Nitrate

**SPECIFICATIONS for DS5, DS5X, & MINISONDE***(Subject to change without notice)*

Dimensions DS5 & DS5X	Dimensions MiniSonde	Weight	Battery Supply
Diameter 3.5"/8.9 cm Length - 23"/58.4 cm	Diameter - 1.75"/4.4 cm Length - 29.5"/74.9 cm (w/battery pack)	DS5/DS5X: 7.4 lbs/3.35 kg (typical) MiniSonde: 2.9 lbs/1.3 kg (typ. w/battery pack)	DS5/DS5X: 8 C batteries MiniSonde: 8 AA batteries
Operating Temperature	Maximum Depth	Communications Interfaces	Memory (all)
-5.0° C to +50° C (all)	200 m (all)	RS-232, SDI-12, RS-485	>120,000 readings
SENSOR	RANGE	ACCURACY	RESOLUTION
Hach LDO	0 to 60* mg/L *Exceeds maximum natural concentrations	± 0.1 mg/L @ ± 8 mg/L ± 0.2 mg/L @ > 8 mg/L ± 10% reading > 20 mg/L	0.01 mg/L
Polarographic DO	0 to 50 mg/L	± 0.2 mg/L @ ±20mg/L ± 0.6 mg/L @ > 20 mg/L	0.01 mg/L
Conductivity	0 to 100 mS/cm	± (0.5% of reading + 0.001 mS/cm)	0.1%
Salinity	0 to 70 ppt	± 0.2 ppt	0.01 ppt
pH	0 to 14 pH units	± 0.2 units	0.01 units
Turbidity, Self-Cleaning	0-3000 NTU	Compared to StablCal ± 1% up to 100 NTU ± 3% from 100-400 NTU ± 5% from 400-3000 NTU	0.1 NTU from 0-400 NTU; 1 NTU for >400 NTU
Turbidity, 4 Beam	0-1000 NTU	± (5% of reading + 1 NTU)	0.1 NTU from 0-100 NTU; 1 NTU for >100 NTU
Depth	0 to 10m (Vented Level) 0 to 25m 0 to 100m 0 to 200m	± 0.003 meters ± 0.05 meters ± 0.05 meters ± 0.1 meters	0.001 meters 0.01 meters 0.01 meters 0.1 meters
Chlorophyll a	<i>Dynamic Range</i> Low sensitivity: 0.03-500 µg/L Med. sensitivity: 0.03-50 µg/L High sensitivity: 0.03-5 µg/L	± 3% for signal level equivalents 0 of 1 ppb rhodamine WT dye or higher using a rhodamine sensor	0.01 µg/L
Blue Green Algae (fresh water or marine)	<i>Dynamic Range</i> Low sensitivity: 150-2,000,000 cells/mL Med. sensitivity: 150-200,000 cells/mL High sensitivity: 150-20,000 cells/mL	± 3% for signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor	20 cells/mL
Rhodamine WT	<i>Dynamic Range</i> Low sensitivity: 0.04-1000 ppb Med. sensitivity: 0.04-100 ppb High sensitivity: 0.04-10 ppb	± 3% for signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor	0.01 ppb
TDG (Total Dissolved Gas)	400 to 1400 mmHg	± 1.5 mmHg	1.0 mmHg
ORP	-999 to 999 mV	± 20 mV	1 mV
PAR	0 to 10,000 µmol s <sup>-1</sup> m <sup>-2</sup>	± 5% of reading	1 µmol s <sup>-1</sup> m <sup>-2</sup>
Temperature	-5 to 50°C	± 0.10°C	0.01°C
Ion Selective Electrodes			
Ammonia Max Depth: 15 meters	0 to 100 mg/L-N	Greater of ±5% of reading, or ±2 mg/L-N	0.01 mg/L-N
Nitrate Max Depth: 15 meters	0 to 100 mg/L-N	Greater of ±5% of reading, or ±2 mg/L-N	0.01 mg/L-N
Chloride Max Depth: 15 meters	0.5 to 18000 mg/L	Greater of ±5% of reading, or ±2 mg/L	4 digits

## Hach LDO® Dissolved Oxygen

NEW! 2nd generation Hach LDO sensor technology. Hach - the premier provider of luminescent dissolved oxygen (LDO) technology since 2002. Only Hydrolab Series 5 sondes feature Hach LDO technology.

### Features:

- ▶ No membranes = no air bubbles, no membrane relaxation, no maintenance
- ▶ Calibrations last without drift therefore deployments last longer, reducing frequency of maintenance trips to the field, saving time & money
- ▶ Highest accuracy & widest monitoring range available
- ▶ Compact housing allows complete integration into DS5X, DS5, or MS5
- ▶ Does not consume oxygen so passive fouling will not affect DO readings
- ▶ Rust design for long-lasting performance
- ▶ Manufactured & supported by Hach Hydromet, the experts in LDO technology

### Specifications:

- ▶ Range: 0 - 60 mg/L
- ▶ Resolution: 0.01 mg/L
- ▶ Accuracy: +/- 0.1 mg/L at <8 mg/L  
+/- 10% reading >20 mg/L  
+/- 0.2 mg/L at >8 mg/L

## pH Sensor

Hydrolab pH sensor uses glass bulb & refillable reference electrode for easily-maintained, long-lasting operation.

### Features:

- ▶ KCl impregnated glass bulb is permeable to hydrogen ions; reference filled with 3M KCl and has a porous Teflon junction. Salt bridge is formed between the two, and a potential is measured.
- ▶ Choice of standard or integrated refillable reference
- ▶ Optionally paired with ORP sensor
- ▶ Reference electrode is easily refilled in seconds - independent of pH sensor
- ▶ pH sensor does not need replacement when reference electrode is depleted; simply refill the reference for years of sensor life

### Specifications:

- ▶ Range: 0 to 14 pH units
- ▶ Resolution: 0.01 units
- ▶ Accuracy: +/- 0.2 units

## Chlorophyll a (by Turner Designs)

The most accurate Chlorophyll a Sensor on a Multiprobe.

### Features:

- ▶ Ultra-compact size designed for integration into DS5X, DS5, & MS5
- ▶ Available with solid Secondary Standards to provide a quick, simple method to verify sensor's stability
- ▶ Secondary Standard can be adjusted to a known chlorophyll concentration
- ▶ 3 auto-selected gain ranges for a range of 0.03 to 500 µg/l
- ▶ Electronic filtration of ambient light, efficient optical

coupling, & quality optical components provide the most accurate measurement of Chlorophyll a.

- ▶ Incredibly fast response time through electronic filtration of ambient light
- ▶ Excellent turbidity rejection (small sample volume & quality optical filters)
- ▶ Cost optimized for affordability & value

### Optical Characteristics:

- ▶ Light Source: Light Emitting Diode
- ▶ Detector: Photodiode
- ▶ Excitation Wavelength: Chl 460nm
- ▶ Emission Wavelength: Chl 685nm

### Specifications:

- ▶ Minimum Detection Limit: 0.03 µg/l
- ▶ Dynamic Range: Low sensitivity: 0.03-500µg/L
- ▶ Med. sensitivity: 0.03-50µg/L
- ▶ High sensitivity: 0.03-5µg/L
- ▶ Resolution: 0.01 µg/L
- ▶ Accuracy: +/- 3% for signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor
- ▶ Sensor housing:  
Stainless steel: Standard housing for typical fresh water applications.  
Titanium option: Corrosion-resistant housing for use in aggressive saline environments such as oceans, bays and estuaries.

## Rhodamine WT (by Turner Designs)

Hydrolab's Rhodamine WT sensor is the most accurate available on a multiprobe

### Features:

- ▶ Ultra-compact design specifically for integration into DS5X, DS5, & MS5
- ▶ Secondary Standards Option for quick, simple verification of sensor's stability
- ▶ Secondary Standard can correlate to a known dye concentration.
- ▶ 3 auto-selected gain ranges provide measurements from 0.04 to 1000 ppb
- ▶ Electronic filtration of ambient light, efficient optical coupling & quality components produce the most accurate measurement of Rhodamine WT.
- ▶ Incredibly fast response time through electronic filtration of ambient light
- ▶ Excellent turbidity rejection (small sample volume & quality optical filters)
- ▶ Cost-optimized for affordability & value

### Optical Characteristics:

- ▶ Light Source: Light Emitting Diode
- ▶ Detector: Photodiode
- ▶ Excitation Wavelength: RWT 550 nm
- ▶ Emission Wavelength: RWT 600 nm

### Specifications:

- ▶ Minimum Detection Limit: 0.04 ppb
- ▶ Dynamic Range: Low sensitivity: 0.04-1000 ppb
- ▶ Med. sensitivity: 0.04-100 ppb
- ▶ High sensitivity: 0.04-10 ppb
- ▶ Resolution: 0.01 ppb

- ▶ Accuracy: +/- 3% for signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor
- ▶ Sensor housing:  
Stainless steel: Standard housing for typical fresh water applications.  
Titanium option: Corrosion-resistant housing for use in aggressive saline environments such as oceans, bays and estuaries.

### Total Dissolved Gas (TDG)

Total Dissolved Gas (TDG) sensor uses a pressure transducer mounted behind a rigid gas-permeable silicone membrane to measure total gaseous compounds dissolved in a liquid.

#### Features:

- ▶ TDG is measured in units of pressure (mmHg)
- ▶ Pressure includes the partial pressure of all gas species dissolved in the water.

#### Benefits:

- ▶ Real-time measurement indicates water supersaturated with atmospheric gases, which can cause gas bubble gill disease in aquatic organisms.

#### Specifications

- ▶ Range: 400 to 1400 mmHg
- ▶ Accuracy:  $\pm 1.5$  mmHg
- ▶ Resolution: 1.0 mmHg



### Dissolved Oxygen

Based on a standard EPA-approved Clark Cell design, trusted for over 30 years.

#### Features:

- ▶ Design based on a standard Clark Cell design, and paired with a sample circulator
- ▶ Measures the current resulting from the electrochemical reduction of oxygen diffusing through a selective membrane
- ▶ Provides a continuous, steady-state reading

#### Benefits:

- ▶ Low maintenance - no need to "recondition" the sensor
- ▶ Complies with Standard Methods Article 4500-OG & EPA article 360.1 that require sufficient sample flow across the membrane.
- ▶ Circulator improves response time & helps sweep away traces of pH electrolyte.

#### Specifications:

- ▶ Range: 0 to 50 mg/L
- ▶ Accuracy: +/- 0.2 mg/L for 20mg/L or less  
+/- 0.6 mg/L for over 20 mg/L
- ▶ Resolution: 0.01 mg/L

### Li-Cor Ambient Light

The Photosynthetically Active Radiation (PAR) sensor measures sunlight intensity at a specified point in the water column.

#### Features:

- ▶ Single-PAR or dual-PAR sensor when a surface light sensor is needed.

- ▶ Available in flat or spherical form depending on desired light measurements.
- ▶ Measures real-time sunlight intensity (influences biota reliant on photosynthesis).
- ▶ Applications:  
Drinking water reservoir management (Algae bloom remediation is very expensive.)  
Primary production monitoring (organism growth - lower end of the food chain)  
General aquatic habitat study (submerged grasses & other plants)
- ▶ The DataSonde multiprobe measures PAR from the water column & the surface & integrates measurements with the rest of the data stream or logging record.



#### Specifications:

- ▶ Range: 0 to 10,000  $\mu\text{mol s-1m-2}$
- ▶ Accuracy:  $\pm 5\%$  of reading
- ▶ Resolution: 1  $\mu\text{mol s-1m-2}$

### Turbidity: 4-Beam

Compliant with 4B-GLI Method 2 & perfect for profiling or spot-check turbidity measurements.

#### Features:

- ▶ 4B-GLI Method 2 compliant
- ▶ 4-beam sensor uses standard backscatter, yet has multiple beams/references checking and rechecking accuracy

#### Benefits:

- ▶ Patented technology is immune to ambient light references; therefore, it is perfect for profiling in shallow rivers and streams
- ▶ Offers a unique, patented Quick-Cal Cube for calibration verification

#### Specifications:

- ▶ Range: 0-1000 NTU
- ▶ Accuracy:  $\pm (5\%$  of reading + 1 NTU)
- ▶ Resolution: NTU for 0-100 NTU;  
NTU for 100 NTU and greater



### Turbidity (Self-cleaning)

Measures from 0 to 3000 NTU & includes a user-programmable cleaning system to remove any fouling or debris that could otherwise affect readings.

#### Features:

- ▶ ISO 7027 compliant
- ▶ User-programmable self-cleaning system can perform up to 10 cleaning cycles before each reading
- ▶ Accurately measures up to 3000 NTU

#### Benefits:

- ▶ Fixed parking position ensures consistent data collection after each cleaning cycle
- ▶ 3000 NTU range allows Turbidity tracking even during rain storms or other events that could cause abnormally high readings
- ▶ Exceptional linearity even in high NTU environments
- ▶ Utilizes small aperture technique to reduce false readings from particulates and other debris

**Specifications:**

- ▶ Range: 0-3000 NTU
- ▶ Accuracy (compared to StablCal):
  - ± 1% up to 100 NTU,
  - ± 3% from 100-400 NTU
  - ± 5% from 400-3000 NTU
- ▶ Resolution: NTU from 0-400 NTU;  
NTU for >400 NTU
- ▶ Temperature Coefficient: 0.05%/C
- ▶ Sensor housing:
  - Stainless steel: Standard housing for fresh water applications & depths to 200 M.
  - Plastic: Corrosion-resistant for aggressive saline environments such as oceans, bays & estuaries. Rated to depths of 50 M.

**Conductivity**

Uses 4 graphite electrodes in an open cell design to provide extremely accurate & reliable data with virtually no maintenance.

**Features:**

- ▶ Design based on 4 graphite electrodes in an open cell design
- ▶ Measures current between 2 electrodes held at a fixed potential; additional electrodes are used to compensate for any fouling of the electrode surfaces.
- ▶ Sensor measurements used to derive Salinity, Total Dissolved Solids, and Resistivity

**Benefits:**

- ▶ Reduces measurement error from environment - sediment falls to the bottom of the cell & bubbles rise to the top. Reliable measurements in any condition.
- ▶ Easily maintained between deployments by cleaning with a Q-tip or cotton swab

**Specifications:**

- ▶ Range: 0-100 mS/cm
- ▶ Accuracy: ± (0.5% of reading + 0.001 mS/cm)
- ▶ Resolution: 0.001

**Depth/Vented Level**

High-stability, custom pressure sensor w/4 range options.

**Features:**

- ▶ Depth measures absolute hydrostatic pressure from an internal diaphragm
- ▶ Optimized for depths down to 10m, 25m, 100m, or 200m

**Benefits:**

- ▶ Vented level (0-10 m) uses a sealed dryer attached to a fixed cable that provides compensation for changes in barometric pressure.

**Specifications:**

- ▶ Range: 0 to 10m (Vented Level)
- ▶ Accuracy: +/- 0.003 meters
- ▶ Resolution: 0.001 meters
- ▶ Range: 0 to 25m
- ▶ Accuracy: +/- 0.05 meters
- ▶ Resolution: 0.01 meters

- ▶ Range: 0 to 100m
- ▶ Accuracy: +/- 0.05 meters
- ▶ Resolution: 0.01 meters
- ▶ Range: 0 to 200m
- ▶ Accuracy: +/- 0.1 meters
- ▶ Resolution: 0.1 meters

**Blue-Green Algae (by Turner Designs)**

Most accurate Blue-Green Algae sensor available on a multiprobe.

**Features:**

- ▶ Available in two forms, one for detecting phycocyanin (fresh water), and one for detecting phycoerythrin (marine water)
- ▶ Ultra-compact size design specifically for integration into DS5X, DS5, & MS5
- ▶ Secondary Standards provide quick & simple verification of sensor's stability
- ▶ Secondary Standard can correlate to a known Blue-Green Algae concentration.
- ▶ 3 auto-selected gain ranges: measurement range of 100 to 2,000,000 cells/mL for either phycocyanin or phycoerythrin.

**Benefits:**

- ▶ Real-time measurement identifies potential algal blooms before they become problematic, allowing time for corrective action
- ▶ Less expensive and more timely than cell counting or visual inspection
- ▶ Electronic ambient light filtration, efficient optical coupling & quality components provide the most accurate measurement of phycocyanin or phycoerythrin
- ▶ Incredibly fast response time through electronic filtration of ambient light
- ▶ Excellent turbidity rejection (small sample volume design & quality optical filters)
- ▶ Cost-optimized for affordability & value

**Optical Characteristics:**

- ▶ Light Source: Light Emitting Diode
- ▶ Detector: Photodiode
- ▶ Excitation Wavelength: Phycocyanin 590 nm
- ▶ Phycoerythrin 525 nm
- ▶ Emission Wavelength: Phycocyanin 650 nm
- ▶ Phycoerythrin 570 nm

**Specifications:**

- ▶ Minimum Detection Limit: 100 cells/mL
- ▶ Dynamic Range:
  - Low sensitivity: 150-2,000,000 cells/mL
  - Med. sensitivity: 150-200,000 cells/mL
  - High sensitivity: 150-20,000 cells/mL
- ▶ Accuracy: +/- 3% for signal level equivalents of 1 ppb rhodamine WT dye or higher using a rhodamine sensor
- ▶ Resolution: 20 cells/mL
- ▶ Sensor housing:
  - Stainless steel - Standard housing for typical fresh water applications.
  - Titanium option - Corrosion-resistant housing for use in aggressive saline environments such as oceans, bays and estuaries.



## Ion-Specific Electrodes

To measure Ammonia, Nitrate, or Chloride.

### Features:

- ▶ ISE is a reference electrode immersed in a solution of fixed ion concentration separated by a membrane containing a chemical compound that reacts with the ion of interest, measuring electrical potential that varies with concentration.

### Applications:

- ▶ Ammonia & Nitrate: Tracing movement of point or non-point source pollutants (i.e., runoff from agricultural operations), monitoring aquaculture for excessive waste concentrations, surveying nutrient levels in natural water bodies
- ▶ Chloride: Monitoring landfills for leaks, tracing movement of point or non-point source pollutants (i.e., storm water runoff) within a natural water body, monitoring estuaries for salinity changes, & salt water intrusion into ground or surface waters).



### Benefits:

- ▶ Ammonia: High levels of accessible nitrogen (total ammonia is one form) can lead to an overabundance of microorganisms, resulting in mortality to higher organisms (such as fish and shrimp) because of depleted dissolved oxygen
- ▶ Nitrate: Small changes in biologically available nitrogen levels can dramatically affect the levels of microbiological, plant, and eventually, animal life.
- ▶ Chloride: Does not react with, or adsorb to, most components of rocks & soils, and so is easily transported through water columns; therefore, it is an effective tracer for pollution from chemicals moving from man-made sources into natural water bodies, or for salt water intrusion.

### Specifications:

#### Ammonia

- ▶ Range: 0 to 100 mg/L-N
- ▶ Accuracy: Greater of +/- 5% of reading, or +/- 2 mg/L-N
- ▶ Resolution: 0.01 mg/L-N
- ▶ Max Depth: 15 meters

#### Nitrate

- ▶ Range: 0 to 100 mg/L-N
- ▶ Accuracy: Greater of +/- 5% of reading, or +/- 2 mg/L-N
- ▶ Resolution: 0.01 mg/L-N
- ▶ Max Depth: 15 meters

#### Chloride

- ▶ Range: 0.5 to 18,000 mg/L
- ▶ Accuracy: Greater of +/- 5% of reading, or +/- 2 mg/L-N
- ▶ Resolution: 4 digits
- ▶ Max Depth: 15 meters

## ORP

Hydrolab's ORP sensor uses a simple platinum band that donates or accepts electrons to monitor chemical reactions, quantify ion activity, or determine the oxidizing or reducing properties of a solution.

### Features:

- ▶ The state of the reaction is measured by the

potential developed between and inert noble metal electrode (platinum) and a reference electrode (same reference for pH)

- ▶ Compliant with SM2580 B

### Benefits:

- ▶ The ORP is greatly influenced by the presence or absence of molecular oxygen. Low redox potentials may be caused by extensive growth of heterotrophic microorganisms. Such is often the case in developing or polluted ecosystems where microorganisms utilize the available oxygen. Low ORP is another relative measure for biological oxygen demand.

### Specifications:

- ▶ Range: -999 to 999 mV
- ▶ Accuracy: +/- 20 mV
- ▶ Resolution: 1 mV



## Temperature

The Hydrolab temperature sensor is a 30k ohm variable resistance thermistor. The temperature sensor is included with every Hydrolab sonde.

### Features:

- ▶ 316 Stainless Steel, 30k ohm thermistor
- ▶ Variable resistor

### Benefits:

- ▶ Provides critical compensation for Dissolved Oxygen, Conductivity, pH, and nutrient sensors
- ▶ Compliant with EPA170.1 and SM2550B

### Specifications:

- ▶ Range: -5 to 50 ° C
- ▶ Accuracy: +/- 0.10 ° C
- ▶ Resolution: 0.01 degrees ° C



## SBE 56 Temperature Logger

The Sea-Bird Electronics (SBE) 56 is a compact, lightweight battery-powered temperature logger for use in depths down to 1500m. The SBE 56 also logs time and samples at user-programmable intervals from 0.5 seconds to 9 hours.

### Features of the SBE 56

- ▶ Long-term deployment capabilities in fresh, estuarine, and saltwater environments
- ▶ High accuracy and low drift rate with no in-field calibrations required, reducing field costs
- ▶ Low power consumption: can be deployed for 31 days at 0.5-second intervals or almost 2-years at 15-second intervals
- ▶ USB interface for fast data upload and rapid redeployment
- ▶ Easy attachment to trawl nets for fisheries and aquaculture operations

## Ordering

Cabling and mounting accessories are determined by the application and installation site.

The type and number of water quality sensors you include in your multi-parameter sonde determine pricing and ordering details.

For ordering information, please contact your Sutron Sales Manager or the Sales Administrator, (703) 406-2800.