



Proteus Water Quality Probe

An award-winning, patented, multi-parameter, real-time sensor platform to accurately and reliably measure BOD, COD, TOC and Coliforms (Total, Faecal or E. coli) in permanent and temporary applications.

The Proteus is the world's first scientifically proven real-time sensor for measuring BOD that can measure a wide range of water quality, environmental and industrial applications. A multiprobe that measures your choice of parameter, all in one package, that can deliver data in the toughest field conditions. The Proteus has been designed for its ease of use, reliable data and economical operation.

Applications

- BOD/COD/TOC Loading to Wastewater Treatment Works
- CSO Monitoring
- Coastal Water Monitoring
- Point Source Pollution Monitoring
- Total Coliform Monitoring (Total, Faecal or E. coli)
- Efficiencies of Wastewater Treatment Works
- Diffuse Pollution Monitoring
- Groundwater Water Quality Monitoring
- Survey tool combined with Bluetooth®
- SCADA, RTU and logger integration via RS232, SDI-12, Modbus® RTU

Parameters include:

BOD*	COD*	TOC*	DOC*	Tryptophan
Coliforms (Total, Faecal, E. coli)*				Crude Oil
TAN*				Refined Oils
Nitrate*				Ammonium
Total Phosphate*				EC / Salinity / TDS
Ortho-Phosphate*				Turbidity/TSS
Dissolved Oxygen				Blue Green Algae
Pressure				(Freshwater & Marine)
Chloride				Chlorophyll a (red excitation)
pH				Chlorophyll a (blue excitation)
Temperature				Rhodamine
Optical Brighteners				Fluorescein Dye
ORP / REDOX				CDOM

* Providing local adequate field calibration. Contact us for details.

PROUD TO BE AWARDED



THE QUEEN'S AWARDS
FOR ENTERPRISE:
INNOVATION
2022



Derived Parameter Specifications

Parameter		Range	Resolution	Accuracy	Comments
BOD	BOD mg/l	0 - 2000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
Coliform Counts	CFU/100 ml	>1 count/100ml	1 count/100ml	±10 Coliforms*	Local site calibration can improve accuracy. Can be used for faecal coliforms, E. coli or total coliforms.
COD	COD mg/l	0 - 4000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
DOC	DOC mg/l	0 - 3000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
TOC	TOC mg/l	0 - 3000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
Ammonium (Optical or ISE)	NH4	0-200 mg/l	0.01 mg/l	±0.1 mg/l 0 - 10 mg/l* ±0.5 mg/l 10 - 200 mg/l*	Environmental/river applications typically 0 - 2 mg/l Wastewater applications typically 0 - 50 mg/l
Phosphate	PO4	0 -100 mg/l	0.01mg/l	±0.1 mg/l 0 - 2 mg/l* ±0.5 mg/l 2 - 100 mg/l*	Environmental/river applications typically 0 - 1 mg/l Wastewater applications typically 0 - 50 mg/l
Turbidity	Total Suspended Solids (TSS)	0 to 500 mg/l	4 digits max 2 d.p.	±2 % of reading or 0.2	Calculated using the correlation between turbidity and a sediment standard or sample. Local calibration can be applied .

Benefits and Features



Self cleaning: As it is essential that optical sensors have a cleaning mechanism, the Proteus is also supplied with an integral wiper which cleans all of the Proteus' sensors before every measurement cycle.

Process control: Let the Proteus monitor multiple process parameters 24/7.

Simple to use & intuitive software

Scalable: The patented and award-winning Proteus breaks the boundaries of water quality meters. The Proteus offers a unique platform to add additional sensors such as pH, REDOX, electrical conductivity, dissolved oxygen, turbidity and many others.

Robust: Exceptional build quality with CPVC body and sensor guard

Coliforms: The Proteus is the first instrument globally that has the potential to measure bacteria/coliforms in drinking water in real time.

Multiple power options: Power can be provided by an optional internal lithium battery pack for unattended logging, or an external power source (battery, mains or solar). External ON/OFF switch for logging without need for PC connection.

Ultra-low maintenance: The system is fully serviceable in the field but requires almost no maintenance and no reagents. Logs data unattended minimizing manpower requirements and safety issues for up to 2 years.

Easy integration: The Proteus can be effortlessly integrated with telemetry/SCADA systems and other 3rd party or datalogging devices via RS232/Modbus/SDI12 or simply by using its internal datalogger. The integrated datalogger can log 1,000,000 readings and it can be used with PC, Tablets or Mobile Phones.

Sensor Specifications

Parameter		Range**	Resolution	Accuracy	Comments
Temperature	Water Temperature	-5 to 50°C	0.01	±0.01°C	Never needs calibration.
pH/ORP	pH	0 to 14 units	0.01	±0.1 within 10°C of calibration, 0.2°C otherwise	Refillable reference electrode; corrected for temperature; typical sensor life > 4 years.
	ORP	-999 to 999 mV	1	±20 mV	Platinum ORP sensor is combined with pH sensor.
Turbidity	Turbidity	0-40 NTU	4 digits max 2 d.p.	±2 % of reading or 0.2	Compensated for temperature; filtered for non-turbidity spikes; includes wiper to clean the optics.
		40-400 NTU		±2 % of reading or 0.2	
		400-5000 NTU		±2 % of range	
Transmissivity	Transmissivity	0 to 100 % transmission	4 digits	Linearity of 0.99R ²	Mounts alongside the Proteus.
Optical Dissolved Oxygen	Concentration	0 to 20 mg/l	0.01	±0.1	Compensated for temperature and salinity; EPA approved "lifetime" luminescence method; typical sensor cap life > 4 years.
		20 to 30 mg/l	0.01	±0.15	
		30 to 50 mg/l	0.01	±5 % of reading	
	% saturation	0 to 500 % saturation	0.1%	Corresponds with the accuracy of the concentration reading	
Conductivity	Specific conductance, µS/cm	0 to 5000 µS/cm	0.1	±0.5 % of reading ±0.001	Corrected for temperature; four easy-to-clean graphite electrodes.
	Specific conductance, mS/cm	0 to 100 mS/cm 100 to 275 mS/cm	0.001 0.001	±1 % of reading ±2 % of reading	
	Salinity	0 to 70 PSU	0.01	±2 % of reading	Calculated from specific conductance. PSU = Practical Salinity Units which is equivalent to ppt.
	Total dissolved solids (TDS)	0 to 65 g/l	0.1	±5 % of reading	Calculated from specific conductance.
Pressure	Depth	0 to 25 m	0.01	±0.05 m	Conductivity sensor fitted for Salinity.
		0 to 100 m		±0.4 m	
	Vented depth (level)	0 to 10 m	0.001	±0.003 m	Compensated for temperature, salinity, barometric pressure.
	Barometric pressure	400 to 900 mmHg	0.1 mmHg	±1.5 mmHg	Included with (non-vented) depth sensor.
Fluorometers	CDOM/fDOM	0 to 1000 ppb	4 digits max 2 d.p.	Linearity of 0.99R ² (temperature compensated 0-50°C) Accuracy ±1 ppb	Highest-quality LED based fluorometric sensors rated to 100 m depth otherwise max depth same as depth sensor.
	Chlorophyll a (red excitation)	0 to 500 µg/l			
	Chlorophyll a (blue excitation)	0 to 500 µg/l			
	Crude oil	0 to 1500 ppb			
	Fluorescein dye	0 to 500 ppb			
	Optical brighteners	0 to 15,000 ppb			
	Phycocyanin (freshwater BGA)	0 to 40,000 ppb			
	Phycoerythrin (marine BGA)	0 to 750 ppb			
	Refined oil	0 to 10,000 ppb			
	Rhodamine dye	0 to 1000 ppb			
Tryptophan	0 to 2000 ppb				
Ion-selective electrodes (ISE's)	Ammonium	0 to 100 mg/l as nitrogen	0.1	±5 % or 2 mg/l	Corrected for ionic strength (via conductivity readings); the accuracy specification relies on non-trivial maintenance practice and frequent calibration near the temperature of measurement; ammonium and nitrate require tip replacement every 3 - 6 months. Please contact us for applications > 10 m.
	Nitrate	0 to 100 mg/l as nitrogen			
	Chloride	0 to 18,000 mg/l			
	Sodium	0 to 20,000 mg/l			
	Calcium	0 to 40,000 mg/l			
	Bromide	0 to 80,000 mg/l			
TDG	Total Dissolved Gas	600-800 mmHg	0.1 mmHg	±0.1 mmHg	Pressure sensor with gas permeable membrane, max depth 15m.
PAR	Photometric PAR	10,000 µmol/cm ²	4 digits	±5 % of reading	LiCor spherical sensor.

* Providing local adequate field calibration. Contact us for details.

** customised ranges are available

General Specifications

	Proteus 35	Proteus 40
Diameter	89 mm (3.5")	102 mm (4.00")
Length - w/o Battery Pack	483 mm (19")	483 mm (19")
Material	CPVC body and sensor guard	
Typical Weight - with IBP	2.85 kg (6.28 lbs)	3.00 kg (6.61 lbs)
Number of sensors	Up to 11	Up to 13
Battery Pack	8 "C" cells	8 "C" cells

Internal Power Battery Life	1 to 24 month depending on sensors / logging rates	Communications	USB, RS232, Modbus® RS485, SDI-12 as standard. Bluetooth® optional.
External Power	5-15 vdc	Sample Rate	1 Hz
Operating Temperature	-5 to +50°C, non-freezing	Data Memory	>1,000,000 logged readings
Calibrated Range	-5 to +30°C	Logging Rates	1 second to 1 day
Depth Rating	100 m	Warranty	2 years (All sensors excluding ISE's)

Parameter Information	
Ammonia (NH3)	Ammonia is normally found in very low concentrations in natural waters. It is a result of microbiological activity breaking down nitrogen-containing material. Elevated levels of ammonia can be very harmful to aquatic life and fish in particular.
Biochemical Oxygen Demand (BOD)	Biochemical oxygen demand is a measure of the amount of oxygen used by micro-organisms (e.g. aerobic bacteria) in the oxidation of organic matter. High levels of BOD (due to excess organic matter) indicate greater consumption of oxygen by micro-organisms, meaning less is available to fish and other aquatic life.
Chemical Oxygen Demand (COD)	Chemical Oxygen Demand (COD) measures the amount of oxygen required to chemically oxidize the organic material and inorganic nutrients, such as Ammonia or Nitrate, present in water. It is widely used as an indicator of organic pollution and many industrial and wastewater effluents have strict permits associated with COD concentration.
Coliform Counts (total, faecal & E. coli)	Local calibration is possible for 1-2 of these parameters. Total coliform bacteria are commonly found in the environment and not necessarily harmful. Faecal coliforms represent a sub-group of coliform bacteria and are found in large quantities in the intestines/faeces of animals and people. E. coli is a major sub-group of the faecal coliform group and represents the best indicator for faecal pollution monitoring.
Colour	Colour has historically been used as an indicator for Dissolved Organic Matter (DOM). CDOM (Chromomorphpic Dissolved Organic Matter) sensors can accurately measure DOM. It is therefore possible to use CDOM to indicate colour and DOM with a local site calibration.
Conductivity	Conductivity is a measure of the ability of water to pass an electric current; it is affected by the presence of dissolved solids such as chloride, nitrate and phosphate. Conductivity can be a very useful indicator that a discharge of some sort has entered a stream, or some other change has occurred.
Dissolved Oxygen	Oxygen is essential for the survival of aquatic life and is incorporated into surface waters by direct absorption from the atmosphere, more so in turbulent streams. It is then consumed by organisms and decaying organic matter. An excess of decaying organic matter leads to a shortage of oxygen, which can prove fatal for fish.
Dissolved Organic Carbon (DOC)	Dissolved Organic Carbon is operationally defined as the amount of organic carbon based compounds that can pass through a 0.45 µm filter.
Nitrate (NO3)	Nitrate is a naturally occurring by-product of the breakdown of organic waste. In low concentrations it stimulates the growth of aquatic plants. At higher concentrations it can be directly harmful and can also lead to excess algae growth and eutrophication. The primary source of excess nitrate is surface runoff from agricultural land.
pH	pH is related to the concentration of hydrogen ions in a solution and is a measure of acidity or alkalinity. In natural ecosystems it can vary from around 4.5, for acid peaty upland waters, to over 10.0 where there is intense photosynthetic activity.
Redox (ORP)	Redox (Reduction-oxidation) or ORP (Oxidation Reduction Potential) is a measure of the oxidising or reducing potential of a water body. Many important biochemical processes are oxidation or reduction reactions (e.g. ammonia>nitrite>nitrate). The ORP level in a river or treatment plant will govern (along with DO and pH levels) which reactions are prevalent.
Temperature	Physical temperature of the watercourse. Largely dictated by climate, but also of interest around thermal discharges. Temperature extremes can be harmful to aquatic organisms, and also have an effect on other parameters, e.g. pH and dissolved oxygen.
Total Organic Carbon (TOC)	Total Organic Carbon is a measure of the total amount of carbon in organic compounds in water.
TSS (Total Suspended Solids)	TSS (Total Suspended Solids) can be derived by using a turbidity (NTU) sensor to measure backscatter caused by suspended sediment in the water. As suspended sediment can be in the form of clay, silt, organic or organic matter there is no single relationship between turbidity and TSS. However, the relationship is typically near perfect ($R^2 > 0.95$) and can easily be derived by undertaking regression analysis between the two parameters and entering that factor into the Proteus software.
Turbidity	Turbidity is a measure of the clarity of water. Silts and soils that are suspended within rivers and lakes cause high levels of turbidity, especially during storm and run-off events.