GaiaXus Water Guardian: Datasheet

Description

The GaiaXus Water Guardian is a self-contained water quality monitoring device designed to measure and report common water quality parameters. It is primarily designed for education and community engagement. It can be used in classrooms or in field-based applications, is water/weather/shock resistant, and able to withstand ordinary field conditions.

Water Guardian Specifications	
Turbidity / Nephelometry	• Nephelometer operating 850nm LED at 90 degree angle • Trans-illumination turbidity measurement using a 850nm LED and a separate 650nm LED. • Range 5-400 NTU using Formazin standard.
Salinity	• Practical range 0 – 42000 ppm • 5 – 200k µS ± 2% at 25°C • 2000 – 42000 ppm ± 2% at 25°C
Temperature measurement range	• 0-40 ± 2°C
Pressure measurement range	• 0-100 kPa ~ 0-1000mbar ± 2mbar (0-60 °C)
Operating depth range	• 0-10m ± 0.02m (25°C and 0 ppm)
Chlorophyl measurement range	• Qualitative detection using 650nm (red) absorbance. See Page XX for details
Battery life	• 300 – 500 charge cycles with >60% battery capacity
Battery type	• Li-ion Rechargeable battery, 3.6V, 3500mAh
Charge type	• Qi © wireless power transfer, 350mA/h. ~ 9h to full charge from depleted battery

Housing	• Nylon© PA-12
Pressure rating	• 1 bar (100KPa) overpressure ~ 10m depth in freshwater.
Weight	• 400g (~ 14.1oz)
Dimensions	• 175mm (L) x 92mm (OD)
Sensor volume	• 53mL
Channel diameter	• 20mm

Operating Modes	
Continuous Recording	Records data every 10 seconds
Grab Sample	Takes a single reading at greatest depth.
Towing Mode	Records data at pre-set intervals and associates it with GPS coordinate from the mobile device. Used to survey from a slow-moving watercraft (e.g. kayak). Requires the mobile device to be present with the operator
Buoy Mode	Allows the system to record water quality data at set intervals at a single position.

Turbidity / Nephelometry

The GaiaXus Water Guardian uses two related methods to estimate water clarity and particle load.

a) **Nephelometry** describes the measurement of optical scatter from suspended particles. Particles scatter light based on their size, polarization and material composition. The GaiaXus Water Guardian uses an 850nm LED. Generally, Nephelometers are calibrated using Formazin (Hach 246142).

b) **Absorbance spectrophotometry (turbidity).** This mode measures the loss of the light that passes through water caused by both particles and dissolved material and is therefore relatable to "Secchi Disc" readings. The GaiaXus Water Guardian uses an 850nm LED. These assays can also be calibrated using Formazin but are responsive also to other materials, e.g. dissolved materials that do not scatter light.

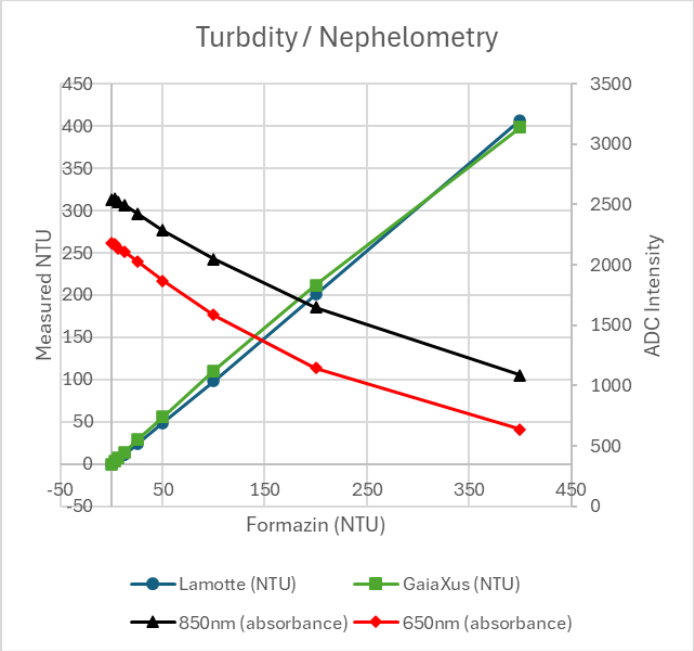

Figure 1. Turbidity and Nephelometry Performance

Figure 1 displays the performance of a GaiaXus Water Guardian with known calibration solutions (Formazin, NTU). Comparative data was acquired using a calibrated Lamotte handheld turbidity monitor (Model No. 2020e). The increase in NTU in nephelometry is displayed as is the GaiaXus data for absorbance in both 650nm and 850nm (ADC Intensity).

Chlorophyll

Chlorophyll alpha displays an absorbance peak at 650nm (red). In a benchtop assay, the GaiaXus Water Guardian is able to assess the relative concentrations of isolated chlorophyll in aqueous solution using absorbance.

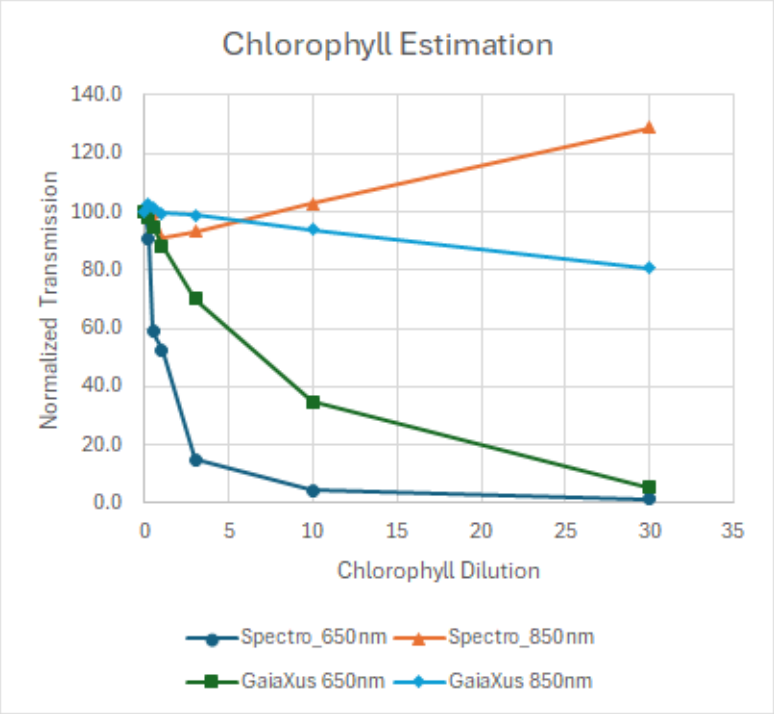

Figure 2. Qualitative turbidity measurements after serial dilutions from raw plant extract (100%). Absorbance values at 650nm from the GaiaXus Water Guardian and a commercial spectrophotometer are shown alongside with equivalent absorbance values at 850nm.

Conductivity

The GaiaXus Water Guardian uses standard conductivity measurements to quantify ion concentrations in water.

The system can be calibrated with KCl, NaCl or using standardized conductivity solutions. In the example shown in Figure 3, the system was calibrated using NaCl from 0 to 35g g/L and displays both the GaiaXus Water Guardian-measured conductivity readings as well as reference values for NaCl (https://aqua-chem.com/water-quality-conductivity-conversion-table/).

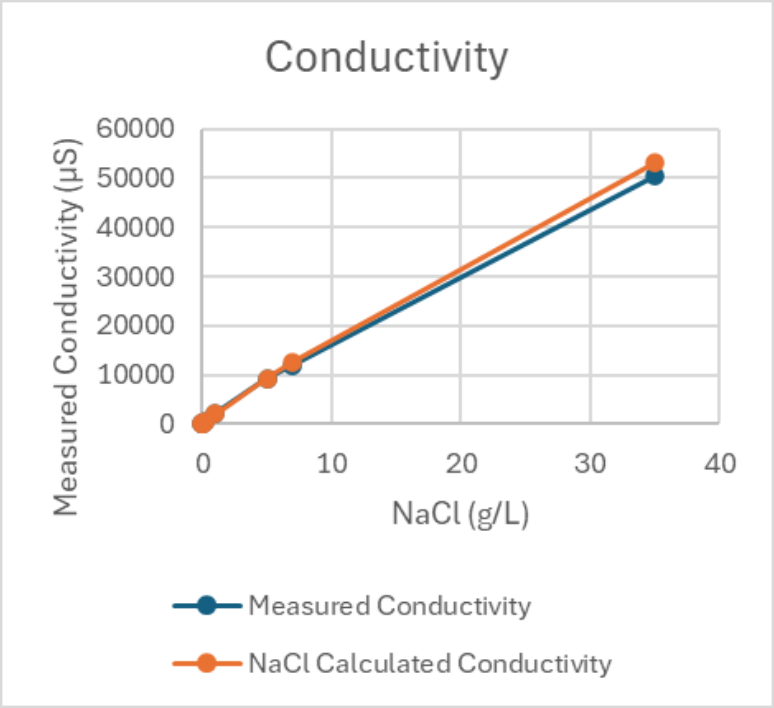

Figure 3. Conductivity measurements using the GaiaXus Water Guardian

Disclaimer

The GaiaXus Water Guardian shall be used only by or under the supervision of adults. All activities near water can be dangerous and care should be taken to minimize the risks.

The GaiaXus Water Guardian reports water quality parameters within the context of environmental science. The system or generated data shall not be used in a water safety related context.

Contact

For more information, contact GaiaXus