

CO₂ & TDG in Aquaculture

Ensuring the health of fish in aquaculture settings requires careful monitoring of water quality parameters. Without monitoring and control of these parameters, poor health and even death are serious risks to aquaculture stocks. Measuring parameters like oxygen, pH, ammonia, temperature and nutrient levels do not always provide a complete picture of the health of the aquaculture environment. Pro-Oceanus provides rugged and reliable CO₂ and TDG sensors that provide continuous in-situ measurements to help ensure the best environmental conditions in all types of aquaculture facilities.

CO₂

Sources of High CO₂

- Fish respiration which increases with stocking density
- High levels already present in source water
- CO₂ production in biofilters
- Water temperature increases

Effects on Shellfish

- Less CO₃⁻² available for shellfish to form CaCO₃ shells
- Earliest larval stages are most susceptible
- Acidic environments linked to hatchery collapses

Effects on Finfish

- Drop in blood pH (acidosis) and reduction in the oxygen carrying capacity of the hemoglobin (hypercapnia)
- Slowed growth
- Reduced efficiencies in feed conversion
- Mineralized deposits in kidneys of salmonids
- Potential increased susceptibility to pathogens
- Erratic swimming due to interference with sense of smell



TDG

Sources of High TDG

- Leaks on suction side of water pumps will entrain ambient air into the system
- High dissolved gas present in source water
- Over-injection in oxygenation systems
- Water temperature increases

Effects on Finfish

- Bubbles (emboli) form in the vascular system and other tissues
- Cranial swelling and bulging of the eye
- Hyperinflation of the swim bladder in larvae and fry
- Eggs float to surface
- Onset can be rapid and lead to 50 - 100 % mortality due to acute bubble trauma

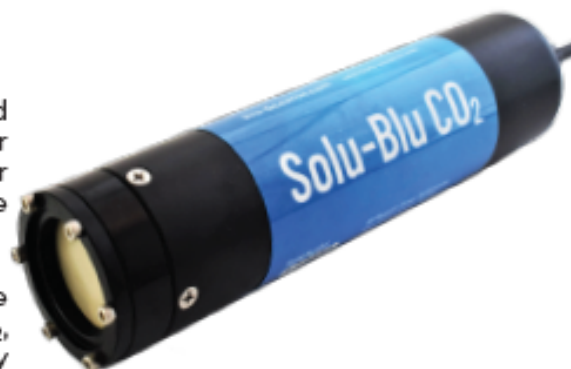


Figure 1: Zebrafish with GBD. Note the gas bubbles formed above the eyes under the outer tissue layer. Image from: <http://zebrafish.org/health>

Solu-Blu CO₂

The Solu-Blu series of instruments combine rugged design, ease of use and versatility, all in a single sensor package. The Solu-Blu dissolved CO₂ probe can be used for long-term continuous in-situ monitoring to provide reliable dissolved carbon dioxide data.

The probe provides a fully temperature and pressure compensated dissolved CO₂ and partial pressure of CO₂, and user-input salinity values allow for automatic salinity correction. Flow-through and in-line adapters are also available for simple and effective industrial solutions.



Sensor Specifications

Measurement Range	0 - 50 mg/L *other ranges available	Input Voltage	digital: 7 - 24 VDC analog: 12 - 24 VDC
Size	Length: 20 cm Diameter: 4.76 cm	Data Output	RS-232, ASCII format 0-5 V or 4-20 mA
Accuracy	± 3% of max range	Depth Rating	0 - 50 meters
Equilibration time (t₉₂)	4 minutes	Water Temperature	-2° to 35° C

Solu-Blu TDG



The Solu-Blu TDG sensor can be integrated into many water recirculation systems with ease. It provides both barometric and TDG pressure measurements in a single sensor, providing long-term gas saturation monitoring.

Unlike traditional TDG sensors that use silicone microbore tubing that is easily fouled and may slowly leak water over time, Pro-Oceanus sensors utilize an advanced flat membrane material that eliminates these problems. This results in improved long term accuracy, reliability, and lower cost of ownership.

Sensor Specifications

Measurement Range	75-150% Saturation *other ranges available	Input Voltage	digital: 7 - 24 VDC analog: 12 - 24 VDC
Size	Length: 20 cm Diameter: 4.76 cm	Data Output	RS-232, ASCII format 0-5 V or 4-20 mA
Accuracy	± 0.1%	Depth Rating	0 - 50 meters
Equilibration time (t₉₂)	dependant on gas composition	Water Temperature	-2° to 35° C

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