



## WATER LEVEL MONITORING

# VENTED VS. NON-VENTED LEVEL LOGGERS

Two main types of instruments are available for automated water level measurements: **vented and non-vented level loggers**. Compared to vented loggers, non-vented loggers generally require less maintenance in the field, but require more data processing and are typically less accurate. This summary is supplemental to that for water level monitoring using an automated level logger.

### SUMMARY OF TECHNOLOGY

Water level loggers are composed of a pressure sensor (transducer) coupled to a data logger, either directly in one housing or connected through a cable. The pressure sensor is positioned at a fixed depth in the stream (typically the bottom). Water enters a port near the bottom of the sensor and exerts pressure on a diaphragm. The diaphragm sends an electronic signal to the data logger that varies with pressure. The total pressure exerted on the diaphragm is the sum of the water depth (pressure increases with depth) and the atmospheric pressure. To calculate water depth, atmospheric pressure must be subtracted from the pressure sensed by the diaphragm (i.e., barometric compensation).

Vented loggers compensate automatically by exposing the back side of the diaphragm to the atmosphere through a narrow vent tube; thus, the diaphragm feels strictly the net difference between the water pressure and the atmospheric pressure. The net difference is directly related to the water depth.

Non-vented loggers do not have a vent tube; thus, they measure total pressure at the diaphragm (i.e., sum of water depth and atmospheric pressure), which requires compensating during data processing. To compensate, atmospheric pressure is measured separately at a nearby location using a barometric logger (barologger), and subtracted from the total pressure recorded by the level logger.

Photo credit: WaterSmith Research Inc.

## IMPORTANT CONSIDERATIONS

Vented loggers are typically more accurate than non-vented loggers, but require more regular maintenance to ensure the vent tube is dry and unobstructed. There is often a desiccant reservoir at the vent tube inlet to reduce moisture ingress. The desiccant needs to be refreshed frequently in humid or freezing conditions.

Frozen water in the sensor port can damage the diaphragm, which may not be repairable, depending on the product. Options to protect against freezing include removing the pressure sensor during freezing conditions, surrounding the pressure sensor with liquid antifreeze (e.g., propylene glycol, vegetable oil; some pressure sensors are available with an oil-filled diaphragm), or selecting a pressure sensor made of material that can withstand freezing (e.g., stainless steel 316L, titanium, Hastelloy).

Salinity can damage pressure sensors. If brackish water may be encountered, consider purchasing a product that is constructed with stainless steel, titanium, or Hastelloy.

One Solinst Barologger 5 can provide barometric compensation of non-vented water level loggers within a 30 km radius and 300 m elevation difference.

## ATMOSPHERIC PRESSURE COMPENSATION

- **Non-vented:** Recorded pressure includes atmospheric pressure; data from a separate barologger are required to correct pressure readings
- **Vented:** Automatically compensates for atmospheric pressure (no barologger required)

## INSTALLATION ENVIRONMENT

- **Non-vented:** Fully submerged in the stream with no vent tube extending to the surface; can be more feasible for deep water or harsh weather
- **Vented:** Vent tube inlet must stay above water and free of debris and moisture; can require frequent maintenance in humid or freezing conditions

## MAINTENANCE NEEDS

- **Non-vented:** lower maintenance but need to ensure barologger data are available and temporally synchronized; likely preferable for remote sites
- **Vented:** Check vent tube regularly; obstructions from debris or moisture affect readings; avoid kinking vent tube during transportation/installation

## ACCURACY AND STABILITY

- **Non-vented:** Often has better long-term stability, especially for long deployments or remote monitoring
- **Vented:** Readings can drift if issues occur with vent tube

## COST

- **Non-vented:** Often half the cost of vented, but need to also purchase a barologger (60–80% of level logger cost); one barologger can serve multiple level logger sites in close proximity
- **Vented:** Often double the cost of non-vented

## PRODUCTS TO CONSIDER

**Non-vented:** Solinst Levellogger 5 (pair with Solinst Barologger 5), HOBO MX2001 (integrated barologger), Keller DCX-22 (available with integrated barologger), Keller Acculevel (requires separate data logger and barologger)

**Vented:** Solinst LevelVent 5, Seametrics PT2X, OTT PLS (requires separate data logger), METER HYDROS 21 (requires separate data logger)

## ADDITIONAL RESOURCES

Water Survey of Canada, 2022a,b