ExOsense™ Piezo-Resonant Liquid Level Sensors

Developed specifically for the In Vitro Diagnostic market.

New ExOsense™ is the first affordable, non-intrusive liquid level sensor for plastic fluid containers. ExOsense™ sensors adhere to the outside of plastic bottles and are unaffected by the color or transparency of the plastic. Liquids inside the bottle are untouched, so with ExOsense™ there is no issue of material compatibility or contamination. Best of all, ExOsense™ sensors fit any size and shape vessel, from small bottles to large tanks.

The ExOsense™ sensor head features a peel-and-stick adhesive face that can be affixed anywhere on the outside of the tank to provide high, low or any intermediate point level fluid sensing. A detachable electrical cable feeds the fully sealed solid-state electronic control module (ECM).

Operating Principle

Our sensor incorporates patented transducer technology, employing piezoelectric material. When piezoelectric material is excited, it creates an acoustic signal as a function of the natural resonance of the material. ExOsense™ sensors generate this acoustic signal, direct it through the bottle wall and sense the reflected pulse.

The amount of energy that is reflected is determined by the “acoustic impedance mismatch” of the materials in use. For example, if sound passes through two materials with similar acoustic impedances (figure 1), very little energy will be reflected. If sound passes through two materials with dissimilar impedance values (figure 2), the majority of the acoustic energy will be reflected. This acoustic impedance mismatch provides the basis for the detection of liquid level.

*Acoustic Impedance: a material property defined as the product of sound velocity and material density. The relative transmission and reflection at an interface are governed in part by the acoustic impedances of the materials on each side of the interface. The letter Z is used for acoustic impedance and is expressed in [kg/s m²] = 1 Rayl:

Water Z = 1.5 MRayls; Air Z = 0 MRayls

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**Figures:**

Fig. 1: ZPLASTIC = 1.8
Fig. 2: ZPLASTIC = 1.8, ZWATER = 1.5

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**Features**

- Non-Intrusive, stays outside-the-bottle
- Small footprint
- Simple installation
- Robust design
- No user calibration needed
- Highly repeatable
- Eliminates fluid compatibility issues
- Mini moisture-resistant connector
- Works on most plastic bottles
- Programmable digital filter & output delay option

**Benefits**

- Never contacts the fluid
- Eliminates contamination
- Improves instrument uptime
- Maximizes container volume
- Gets closest to high and low levels
- No special mounting required
- Eliminates testing for compatibility
- Easy installation
- Works with sloshing fluid

**Equipment Used On**

- Clinical chemistry
- Hematology
- Immuno-chemistry
- Histology
- Medical Laser Systems
- Hemodialysis
- Cytology

**Fluid Monitoring Applications**

- Reagents
- Waste
- Diluent
- Detergent/wash
- Dialysate
- Coolant
- Saline
- Pure water

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Thinking Outside the Box…
Sensing Outside the Bottle
Specifications

Compatible Plastic Bottle Materials: Polyethylene (PE), Polypropylene (PP), Polycarbonate (PC), ABS, Styrene, PVC, and others

Bottle Materials Not Recommended: Teflon® family, or Any Foamed Core Plastics

Min. Bottle Diameter for Round Bottles: 3” (76.2 mm)

Bottle Wall Thickness: 0.4” to 0.15” (1.0 mm to 3.8 mm)

Termination of Sensor: Mini Connector to Electronics Control Module (ECM)

Input Power Supply (volts): 4.75 to 5.25 VDC (Optional Voltage Regulator available for 6 to 32 VDC)

Power Consumption (current): <40mA Typ. @ 5 VDC

Calibration: No User Calibration Required. Pre-configured for Container Materials, Wall Thickness, & Output Options. Factory Calibrated

Output Configuration: Open Collector; 40 mA, Max.

Switch Condition: Normally Open/Normally Closed

Standard Response Time: 2 msec.

Delay Range: 0 to 60 Seconds, Standard is No Delay, Optional is 0 to 60 Seconds.

RFI/EMI Susceptibility: 3v/m

Agency Approvals: UL 508 Listed (File E 305671), CE & IEC 61326 (RFI/EMI)

Operating Temperature

Sensor: 32°F to 158°F (0°C to 70°C)

Electronics: 32°F to 149°F (0°C to 65°C)

Repeatability: ±0.039” (±1 mm)

Accuracy: ±0.063” (±1.6 mm)

Sealing Capability: IP65

Dimensions

Super Simple Installation:

1. Peel & Stick
   Peel the adhesive cover off the sensor and stick it on the bottle where you want to indicate the level.

2. Connect
   Connect the sensor to the electronic module using the mini USB connector.

3. Sense
   Apply power and sense the fluid level.

ExOsense™ features an inline fully over-molded electronic control module and an optional voltage regulator.

Our Medical Equipment Specialists are ready to discuss your sensor requirements, so don’t hesitate to give us a call.

800.378.1600

GemsMedicalSolutions.com