# ExOsense™ Piezo-Resonant Sensors

- Non-Intrusive
- Repeatable
- Easy to Install – Easy to Use

ExOsense™ is the first affordable, non-intrusive liquid level sensor for plastic fluid containers. ExOsense™ sensors adhere to the outside of tanks, bottles and vessels, 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 containers to large tanks.

U.S. Patent 7,360,417

## 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** | 0.04″ to 0.15″ (1.0 mm to 3.8 mm) |
| **Termination of Sensor** | Mini USB Style Connector to Electronics |
| **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. Works on Bottle Materials or Wall Thickness Without User Input. |
| **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, Optimal 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 to158°F (0°C to 70°C) |
| **Electronics** | 32°F to149°F (0°C to 65°C) |
| **Repeatability** | ±0.039″ (±1 mm) |
| **Accuracy** | ±0.063″ (±1.6 mm) |
| **Sealing Capability** | IP65 |

## Typical Applications

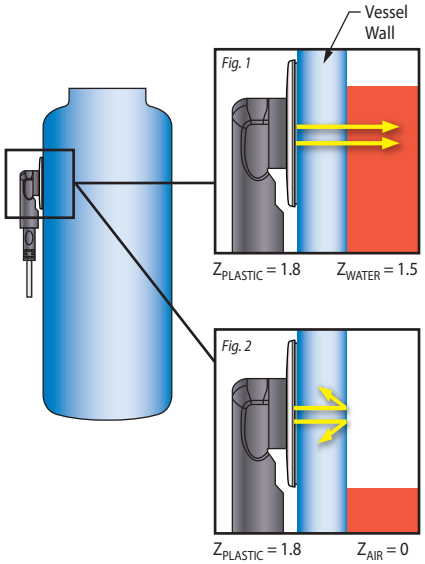
Fluid Monitoring:
- Ink handling systems
- Water purification systems
- Pesticide management and usage
- Water treatment systems
- Fluid storage tanks
- Coolant
- Saline
- Nuclear liquid wastes
- Containment systems
- Oil water separation systems
- Semiconductor fabrication
- Waste
- Chemicals
- Detergent/wash

## Operating Principle

Our sensor incorporates proprietary 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




Z = Acoustic Impedance

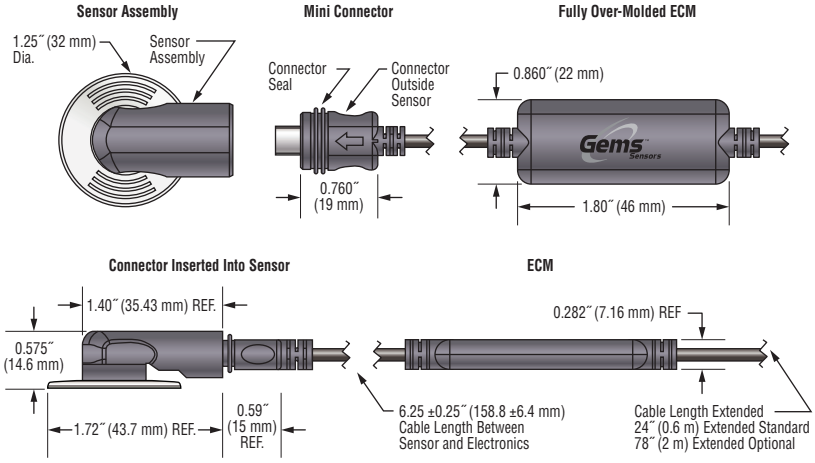
## Super Simple Installation

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

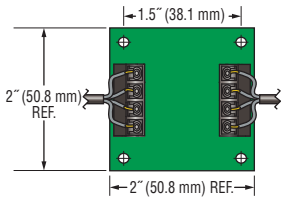
**2. Connect**
Connect the sensor to the ECM using the mini connector.

**3. Sense**
Apply power and sense the fluid level.

## Dimensions




### Optional Voltage Regulator 8-30V Input / 5V Output




| Connection Type | Part Number |
|---|---|
| Header | **219445** |
| Solder | **218699** |

## Features

- Non-Intrusive, stays outside the container
- Simple installation
- No calibration needed
- No long-term drift
- ±1.6 mm Accuracy
- Very small footprint
- Robust design for rough handling
- Mini, moisture-resistant connector for ease of use
- Fully scaled, over molded ECM

## Benefits

- Never contacts hazardous fluids
- Eliminates fluid contamination
- Repeatable liquid level sensing
- Easy to use
- Eliminates fluid compatibility issues
- Improves instrument uptime
- Maximizes tank volume
- Improves systems reliability
- No special mounting required
- Eliminates testing for media compatibility

## How To Order

Use the matrix below to select a Part Number based on Container Material, Container Thickness and Sensor Condition @ Current Sink.

| Container Material | Part Numbers | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Container Thickness | | | | | | | |
| | .04" to .062" (1.02 to 1.57 mm) | | .058" to .082" (1.47 to 2.08 mm) | | .08" to .102" (2.03 to 2.59 mm) | | .1" to .125" (2.54 to 3.18 mm) | |
| | N.O Wet Sink | N.C Dry Sink | N.O Wet Sink | N.C Dry Sink | N.O Wet Sink | N.C Dry Sink | N.O Wet Sink | N.C Dry Sink |
| HDPE | 219005 | 219013 | 219005 | 219013 | 219005 | 219013 | 219005 | 219013 |
| LDPE | 219002 | 219010 | 219002 | 219010 | 219008 | 219016 | 219008 | 219016 |
| Polypropylene | 219001 | 219009 | 219004 | 219012 | 219004 | 219012 | 219004 | 219012 |
| Polycarbonate | 219006 | 219014 | — | — | — | — | 219004 | 219012 |
| Polystyrene | 219005 | 219013 | 219005 | 219013 | 219005 | 219013 | 219005 | 219013 |
| Polysulfone | 219007 | 219015 | NR | NR | NR | NR | NR | NR |
| PVC | 219003 | 219011 | 219003 | 219011 | 219003 | 219011 | 219003 | 219011 |
| Polyester | — | — | 219002 | 219010 | — | — | 219006 | 219014 |
| ABS | 219001 | 219009 | 219001 | 219009 | 219001 | 219009 | 219001 | 219009 |

Note: All p/n above includes ExOsense sensor plus standard 5 VDC electronic control module, no delay 24" cable.
Consult factory for combinations not listed above.