

## Float Type Level Switches

### Standard or Custom Length Versions

GEMS offers a choice of hundreds of standard, single station liquid level switches. From the compact, all-plastic LS-3 Series to the rugged, all-stainless steel LS-1950 Series, each is instrument quality throughout and built for long service dependability. Sizes and materials have been carefully selected to provide you, the designer, with the greatest flexibility for applications requiring liquid level point monitoring.

With GEMS custom length level switches you have a wide variety of choices. Custom length units may be configured with a single station, or as many as seven (depending on series), in lengths from just a few inches to 10 feet. Mounting and float materials include PVC, polypropylene, Polysulfone, PVDF, brass, stainless steel and more.



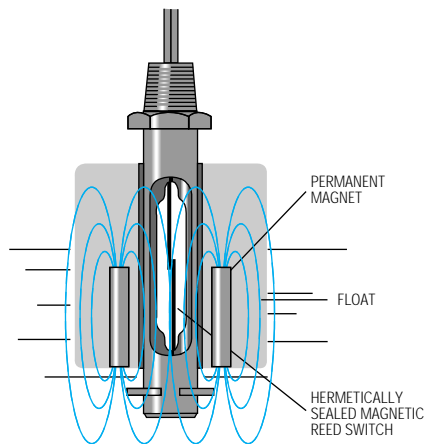
### Unique Variations and Options

Need a level switch with an integrated syphon tube? Or, maybe a level switch that also provides continuous temperature output? You'll find both of these and other interesting designs inside this catalog. GEMS offers more unique "standard" variations, such as bent stems, specialized mountings and floats, or slosh shields because we've been designing and manufacturing liquid level sensors for over 40 years. Be sure to review the Accessories section for other options and system additions.

### General Operating Principle

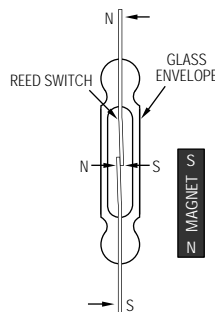
GEMS Level Switches operate on a direct, simple principle. In most models, a float encircling a stationary stem is equipped with powerful, permanent magnets. As the float rises or lowers with liquid level, the magnetic field generated from within the float actuates a hermetically sealed, magnetic reed switch mounted within the stem. The stem is made of non-magnetic metals or rugged, engineered plastics. When mounted vertically, this basic design provides a consistent accuracy of  $\pm 1/8$  inch. Multi-station versions use a separate reed switch for each level point being monitored.

Side-mounted units use different actuation methods because of their horizontal attitude. The basic principle, however, is the same: as a direct result of rising or falling liquid, a magnetic field is moved into the proximity of a reed switch, causing its actuation.



### Reed Switch Reliability

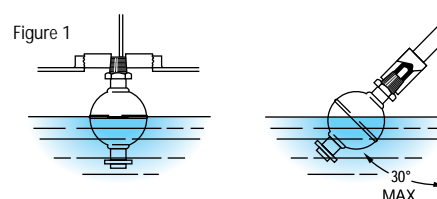
The durable construction of these reed switch designs ensures long, trouble-free service. Because the effects of shock, wear and vibration are minimized, these hermetically sealed switches provide precise repeatability with no more than 1% deviation. The switch actuation points remain constant over the life of the unit. See "Reed Switch Protection" at the end of this Float Type section for information on extending the life of GEMS Level Switches.



## Installation and Maintenance

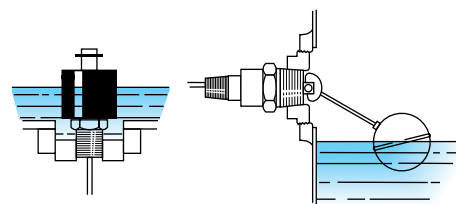
### Orientation

A standard NPT female boss in tank top, bottom or side is all that is required for rapid installation. Units operate normally in any attitude — from the vertical to a 30° inclination — with lead wires up or down. Standard IPS pipe extends units to any intermediate level in the tank. Figure 1.



### Accuracy and Repeatability

The accuracy of GEMS level switches is  $\pm 1/8$ " (3.2 mm) of true liquid level. In order to assure the proper accuracy for your liquid, please specify the specific gravity of the media. GEMS will automatically calibrate for the submergence of the float, based on this specific gravity information. Furthermore, accuracy may be enhanced by specifying whether the circuit condition should be measured on decreasing or increasing liquid level. The repeatability of the actuation point is approximately 1/32 inch (.79 mm).



### Moisture Protection

When moisture exists in conduit and extension pipes, the potential for this moisture to wick down the wire leads and into the switch assembly exists. Should this happen, the switch will appear to be closed due to a high resistance path through the moisture.

There are several means that can be used to prevent this from happening.

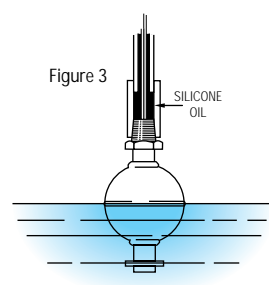
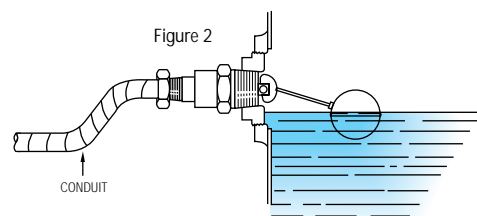
1. Pitch conduit away from the level switch when possible so that condensation will drip away from the level switch assembly. Figure 2.
2. When a vertical run of extension pipe is used to extend a level switch down from the top of the tank, a non-conductive silicone oil should be used to fill the vertical run. Alternatively, an appropriate potting may be used to fill the vertical run to occupy the space in which condensation will normally form. Figure 3.

By working closely with your GEMS representative, there are many design considerations that can help lessen the effects of moisture.

1. Consider a product such as the GEMS LS-270 Single Level Switch which has a water-tight molded cable.
2. Consider using a unit with a connector and gasket seal.
3. Consider using moisture resistant heat shrink tubing on the switch capsule assembly.
4. Consider using Scotchcast® 2114 sealing compound and electrical insulator. Part No. 157636.

**A WORD OF CAUTION:** Most of GEMS level products incorporate a potting cap or are fully potted. Due to the bonding characteristics of the potting to the wire leads, there is no way of assuring a water tight seal at the potting joint. Our potting cap will resist moisture to some degree, but the precautions mentioned above should be used to assure moisture doesn't enter the switch and cause a short.

Please refer to the GEMS Instruction Bulletins supplied with products for detailed installation and maintenance procedures.



## Installation and Maintenance - Continued

### Thread Treatment

#### Sealing

When threading metal threads into a metal coupling, pipe sealant or Teflon® tape is recommended. Due to potential compatibility problems, when sealing plastic threaded units, a compatible pipe sealant such as **No More Leaks™** from Permatex® is recommended.

#### Tightening

When threading a plastic level switch into a metal coupling, the installer should use a suitable wrench and tighten the threads 1 to 1-1/2 additional turns past hand tight. Over torquing of the threads will result in damage to the plastic mounting plug.

### The Affect of Thread Engagement on Actuation Points

The length of mounting threads engaged at installation is important in calculating switch actuation points and the actual length of stem extending into the tank. Use the chart below to find the thread engagement length (T) for a given NPT size. Factor the T dimension into any calculation of switch actuation levels (L) and overall length (L<sub>0</sub>).

T Dim.	NPT							
	1/8"	1/4"	1/2"	3/4"	1"	1-1/4"	2"	3"
	.27"	.39"	.53"	.55"	.68"	.71"	.76"	1.20"

**Examples:** To solve for "L" use the formulas shown in the examples below. To calculate the Actual Tank Intrusion, substitute the L<sub>0</sub> value in place of L<sub>1</sub> in any of the formulas.

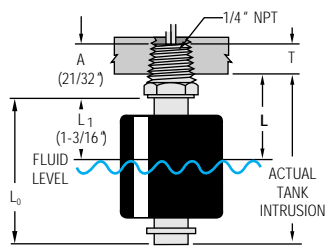
#### Internally Mounted – Standard Length

LS-1900 Series internally mounted through a 1/4" NPT hole. To calculate L dimension:

$$L = L_1 + (A - T)$$

$$L = 1\text{-}3/16" + (21/32" - .39")$$

$$L = 1.46"$$



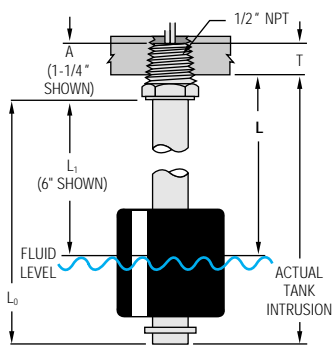
#### Internally Mounted – Configurable Length

LS-800 Series (Type 1) internally mounted through a 1/2" NPT hole. To calculate L dimension:

$$L = L_1 + (A - T)$$

$$L = 6" + (1\text{-}1/4" - .53")$$

$$L = 6.72"$$



### Definition of Variables Used in Examples Below

- A = Mounting length.
- T = Thread engagement.
- P = Distance from coupling (bung) top to inside surface of tank or bracket.
- L = Switch actuation level as measured from inside surface of tank or bracket to fluid surface.
- L<sub>1</sub> = Switch actuation level, nominal, as measured from bottom of mounting (based on a liquid specific gravity of 1.0).

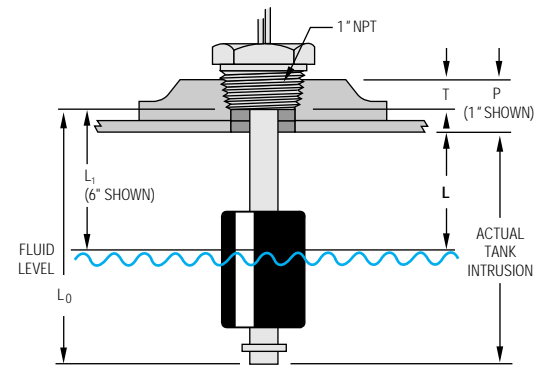
#### Externally Mounted – Configurable Length

LS-700 Series (Type 3) externally mounted through a 1" NPT hole. To calculate L dimension:

$$L = L_1 - (P - T)$$

$$L = 6" - (1" - .68")$$

$$L = 5.68"$$



No More Leaks is a trademark of Permatex® Industrial Corp., a subsidiary of Loctite Corp. Teflon is a registered trademark of DuPont Corp.