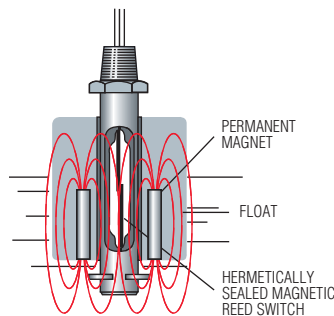


Float Type Level Switches

Single Point

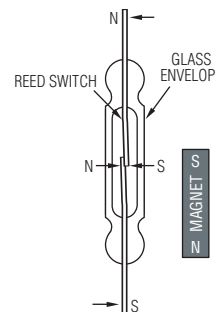
GEMS Level Switches operate on a direct, simple principle. In most models, a float encircling a stationary stem is equipped with powerful, permanent magnets. As the float rises or lowers with liquid level, the magnetic field generated from within the float actuates a hermetically sealed, magnetic reed 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" in Appendix X for information on extending the life of GEMS Level Switches.



Wide Variety

Top/Bottom Mounting



Side Mounting



Specialty



Contents	Page Start
Small Size	
Engineered Plastic.....	A-2
Alloy.....	A-8
Large Size	
Engineered Plastic.....	A-12
Alloy.....	A-13
Specialty Switches.....	A-20
Leak Detection.....	A-22

LEVEL SWITCHES - SINGLE POINT

Additional technical information can be found in Appendix X.

Small Size – Engineered Plastics

LS-3 Series – Offers High Reliability, Compact Size and Low Costs in NPT, Straight and Metric Threads

Ideal for shallow tanks or restricted spaces, or for any low-cost, high volume use. LS-3 Series are available in FDA compliant materials, consult GEMS for details.

LEVEL SWITCHES – SINGLE POINT

Polysulfone Float



For water based liquids, with limited use in oils and chemicals.

Polypropylene Float (Hollow)



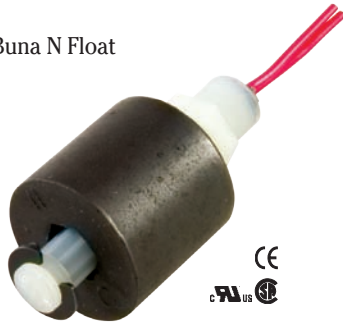
Features a low specific gravity float offering broad chemical compatibility.

Polypropylene Float (Solid)



With Polypropylene stem and float, switch offers broad chemical compatibility.

Buna N Float



Ideal for oils and fuels.

ALL-PVDF



Stem and float of corrosion-resistant PVDF for ultra-pure applications.

New 3/4" Polypropylene Float



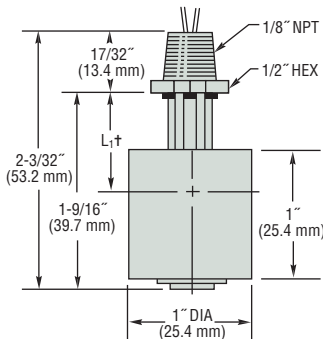
See next page for details.

Common Specifications

Approvals: U.L. Recognized – File No. E45168; CSA Listed – File No. 30200. CE Declaration Available Upon Request. NSF materials are Standard 61 compliant. For NSF approved level switches contact Gems.

Switch SPST: 20 VA, 120-240 VAC. Units are shipped N.O. unless otherwise specified. Selectable, N.O. or N.C., by inverting float on unit stem.

Dimensions – 1" Float Models only



† L₁ = Actuation Level (see chart below)

Electrical Termination	Alternate Mountings		
	3/8"-16 Straight Thread	G1/8" 1/8"-28 BSP	M12x 1.75 Straight Thread
Lead Wires			
Cable			

How To Order – Select Part Number based on specifications required.

Stem and Mounting Material	Float Material	Float Dia.	Actuation Level ¹	Min. Liquid Sp. Gravity	Pressure Max. @ 70°F (21°C)	Operating Temperature	Mounting Type	Electrical Termination	Part Number
Polysulfone	Polysulfone	1"	3/4" (19.0 mm)	.75	50 psi (3 bar)	-40°F to +225°F (-40°C to +107°C)	1/8" NPT	Lead Wires	42295 ⚡
Polypropylene ²	Polypropylene (Hollow)	1"	13/16" (20.6 mm)	.60	50 psi (3 bar)	-40°F to +225°F (-40°C to +107°C)	1/8" NPT	Lead Wires	142505 ⚡
							3/8"-16	Lead Wires	171517
							G 1/8"-28	Cable	171518
							M12x1.75	Cable	189739
Polypropylene ³ NSF Std. C-2 (Kynar float retaining clip)	Polypropylene ³ (Hollow) NSF Std. C-2	1"	13/16" (20.6 mm)	.60	50 psi (3 bar)	-40°F to +225°F (-40°C to +107°C)	1/8" NPT	Lead Wires	209475
							3/8"-16	Lead Wires	209455
							G 1/8"-28	Lead Wires	209460
							M12x1.75	Lead Wires	209465
Polypropylene ²	Polypropylene (Solid)	1"	9/16" (14.3 mm)	.90	150 psi (10 bar) @ 68°F (20°C)	-40°F to +150°F (-40°C to +66°C)	1/8" NPT	Lead Wires	116826 ⚡
							3/8"-16	Lead Wires	171514
		3/4"	7/16" (11.1 mm)	.95	Atmospheric	-40°F to +176°F (-40°C to +80°C)	M12x1.75	Cable	189787
Nylon	Buna	1"	13/16" (20.6 mm)	.45	150 psi (10 bar)	-40°F to +250°F (oil) (-40°C to +121°C [oil])	1/8" NPT	Lead Wires	162745 ⚡
							M12x1.75	Cable	189786
		3/4"	11/16" (17.5mm)	.85	150 psi (10.3 bar)	-40°F to +176°F (water) (-40°C to +80°C [water])	1/8" NPT	Lead Wire	177818
PVDF	PVDF	1"	1/2" (12.7 mm)	.86	50 psi (3 bar)	-40°F to +250°F (-40°C to +121°C)	1/8" NPT	Teflon Jacketed Lead Wires	173250

Notes:

1. Based on a liquid specific gravity of 1.0.
2. All Polypropylene units carry a Kynar retaining clip. Accessories Available in OEM Quantities: Jam Nut, Gaskets, and Slosh Shields.
3. NSF C-2 Approved unit, for water use only.

⚡ – Stock Items.

3/4" Diameter Floats for Tiny Tanks

Our smallest LS-3 yet!

- ▶ Reliable alternative to more expensive electronic sensors.
- ▶ Fits smaller devices. Less material, lower cost.
- ▶ Proprietary float more buoyant than competitors.

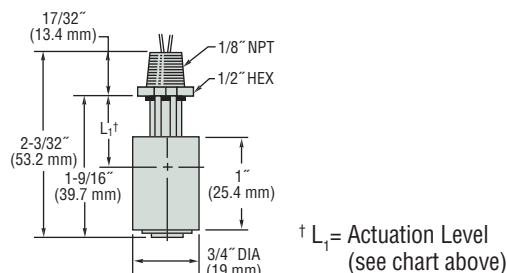
Small yes, but with BIG performance. No other 3/4" float switch on the market matches our LS-3 specs. These units are ideal for potable water, medical devices and other compact appliances, such as printers. Gems proprietary float enables use in lighter-than-water fluids. NSF/ FDA compliant models available at your request. Please consult factory.

Specifications

Wetted Material	
Stem and Mounting	
P/N 201540	Polypropylene with Kynar retaining clip
P/N 177818	Nylon
Float	
P/N 201540	Polypropylene
P/N 177818	Buna-N
Operating Temperature, Max.	
P/N 201540	212°F (100°C)
P/N 177818	250°F (121°C) oil, -40°F to +176°F (-40°C to +80°C)
Pressure, Max.	
P/N 201540	Atmospheric
P/N 177818	150 psi (10.3 bar)



Dimensions



Order by Part Numbers:

- LS-3, 3/4" Polypropylene Float: 201540**
- LS-3, 3/4" Buna-N Float: 177818**

Unique Features Make These LS-3 Models Special

These small switches feature unique configurations for special applications.

LEVEL SWITCHES – SINGLE POINT

Part No. 142545
With Slosh Shield



Cut-away version shown

Compact, all-polypropylene switch with slosh shield is ideal for use with turbulent liquids in small tanks. FDA compliant materials.

Part No. 46999
Bottle Level

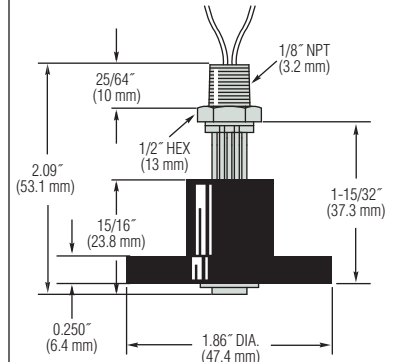
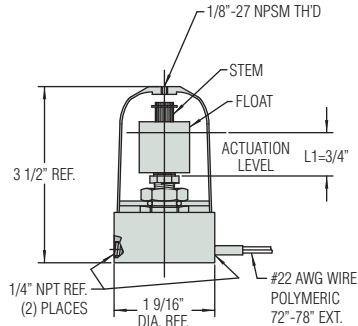
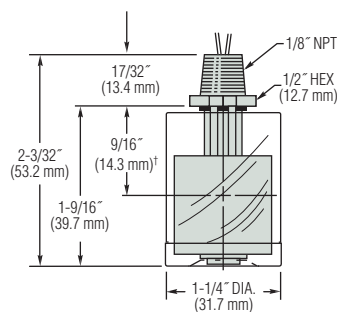


For external mounting on tanks too small to accommodate internally mounted switches. (See note below)

Part No. 76707
For Low Level



For detecting levels as low as 5/8" from tank bottom. Use in water, some oils and chemicals.



Order By Part Number	142545 ⚡	46999 ⚡	76707 ⚡
Materials			
Stem and Mounting	All Polypropylene (Including Shield ⁴)	Polysulfone	All Polysulfone (Including Collar)
Float	Polypropylene (Solid)	Polysulfone	Buna N
Other Wetted	—	Brass, Aluminum, Polycarbonate, Viton A	Epoxy
Min. Liquid Sp. Gr.	.90	.75	—
Operating Temperature	-40°F to +150°F (-40°C to +65.6°C)	-40°F to +120°F (-40°C to +48.9°C)	-40°F to +180°F (-40°C to +82.2°C)
Pressure, PSI, Max.³	150	50	
Switch¹, SPST	20 VA, N.C./N.O. Dry ²	20 VA, N.C. Dry	
Electrical Termination	No. 22 AWG, 22" L., PVC Lead Wires	No. 22 AWG, 72" L., Polymeric Lead Wires	No. 22 AWG, 72" L., PVC Lead Wires

Notes:

- See "Electrical Data" on Page X-5 for more information.
- Switch operation is selectable, N.O. or N.C., by inverting the float on the unit stem.
- Maximum pressure at 70°F (21°C).
- Consult factory for other available materials.

† L₁ = Switch actuation level, nominal (based on a specific gravity of 1.0).

Note: LS-3 Series Bottle Level Switch is also available with any of the float materials shown on opposite page. Contact GEMS for correct part number.

⚡ – Stock Items.

LS-7 with 5 Amp Relay

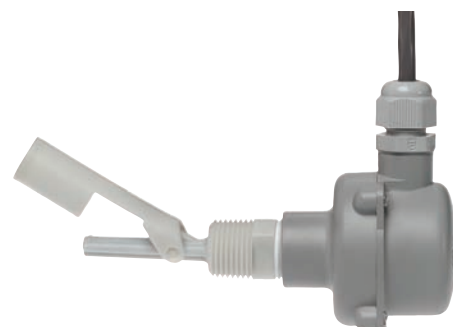
▶ O-Ring Sealed, Water Resistant J-Box

An SPDT relay enables this LS-7 to control two independent loads up to 5 amps each. Switching N.O. for one load and N.C. for the other. This unit is designed to operate with a load connected to each of the two outputs. These loads must be 10 watts, minimum, for correct SPDT switching. One load used alone must be connected to the N.O. terminal. With this load, which may be less than 10 watts, the unit will operate the same as an SPST unit.

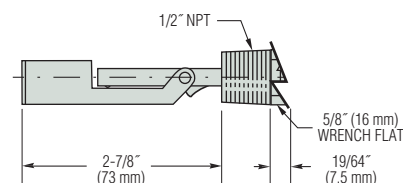
Specifications

Wetted Materials	Polypropylene
Min. Liquid Specific Gravity	0.55
Operating Temperature	-40°F to +250°F (-40°C to +121°C)
Operating Pressure	100 psi @ 70°F, max.
Float Arc Envelope	1.50"
J-Box with 5A Relay	120 VAC 50/60 Hz Contacts: 5A – 240 VAC Res 1/3 HP – 120 VAC 5A – 28 VDC Res

Order by Part Number: 181291



Dimensions



LS-1 – Miniature Level Switch

- ▶ Extremely Compact
- ▶ Easy Installation
- ▶ Low Cost

This miniature level switch feature an all-polypropylene stem and float construction for broad chemical compatibility. Fluted stem resists solids build-up. Float is held in place with integral stem tangs, which simultaneously eliminates a separate retaining ring and makes inverting the float for reversing switch actuation very easy.

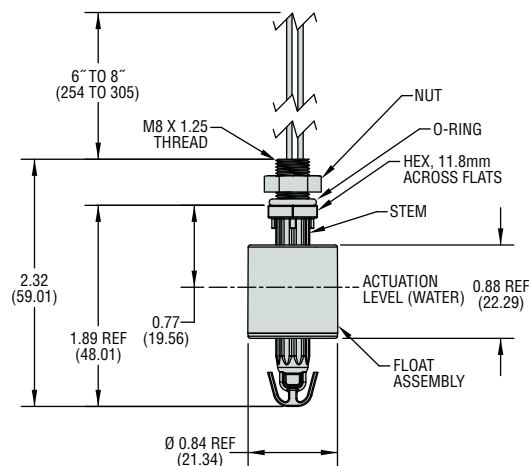
Specifications

Wetted Materials	Polypropylene
Stem and Float	Polypropylene
O-Ring	EPDM
Mounting Threads	M8 x 1.25"
Min. Liquid Specific Gravity	0.70
Operating Temperature	0°F to 175°F (-17°C to +79°C)
Operating Pressure	0 to 5 psig (0 to 0.3 bar)
Electrical Termination	22 AWG, 6"-8" PVC Jacketed Lead Wires (Black)
Switch Operation	N.O. Dry (May be converted to N.C. Dry by inverting float on stem)
Mounting Attitude	Vertical with lead wires up.

Order by Part Number: 602881



Dimensions



Small Size – Engineered Plastics

LS-7 Series–Compact Side Mounts are the Solution to Many Small Tanks

These low-cost units are ideal for high volume use in small tanks and vessels. Engineered plastics construction offers broad compatibility in water, oils and chemicals.

LEVEL SWITCHES – SINGLE POINT

Type 3 Internal Mounting	Type 5 External Mounting	Type 7 External Mounting
<p>UL US CE</p> <p>Polypropylene or Nylon.</p>	<p>UL US CE</p> <p>Polypropylene or Nylon.</p>	<p>UL US CE</p> <p>Polypropylene or Nylon; conduit connection.</p>
<p>ZIP CORD LEADWIRES, 24" EXTENDED</p> <p>3.84" (97.5 mm)</p> <p>GASKET (WHITE BUNA N INCLUDED)</p> <p>5/8"-11 THREAD</p> <p>LOCKING NUT (NYLON)</p> <p>2-3/4" (69.8 mm)</p>	<p>ZIP CORD STYLE 24" LEADWIRES</p> <p>4-1/4" (108 mm)</p> <p>5/8" (16 mm)</p> <p>2-7/8" (73 mm)</p> <p>5/8" HEX</p> <p>1/2" NPT</p>	<p>LEAD WIRES, 24" EXTENDED</p> <p>1/2" NPT</p> <p>4-1/2" (114 mm)</p> <p>5/8" (16 mm) WRENCH FLAT</p> <p>19/64" (7.5 mm)</p> <p>2-7/8" (73 mm)</p>

Common Specifications

Switch Rating*: SPST, 20VA

Lead Wire Gauge: No. 22 AWG

Approvals: All LS-7 Series switches on this page are U.L. Recognized – File No. E45168, and are CSA Listed-File No. 30200. For NSF approved level switches contact Gems.

Mounting Attitude: Horizontal.

*See "Electrical Data" on Page X-5 for more information.

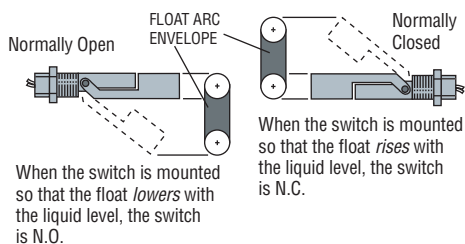
Media Compatibility

Media	LS-7 Compatible Types
Oil, Fuel, Hydrocarbons	Nylon
Broad Range of Chemicals and Water	Polypropylene
Limited Chemicals and Water	Noryl®

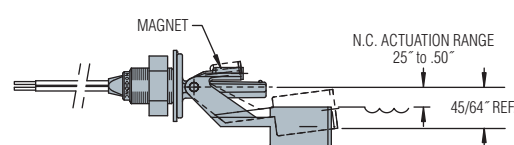
Switch Operation

Depending on the mounting position, the float on these switches can rise or lower with the liquid level. By rotating the switch 180°, the switch operation can be Normally Open or Normally Closed (except Type 12).

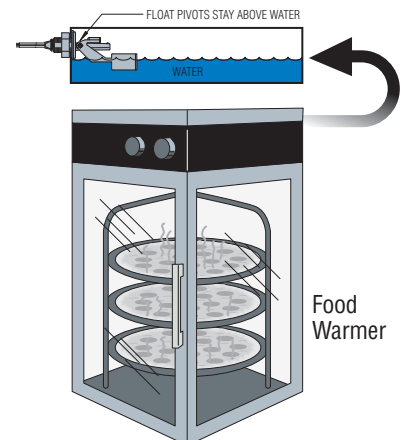
Types 3, 5, 7, 10 and 13



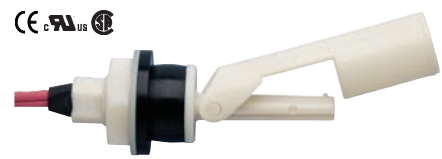


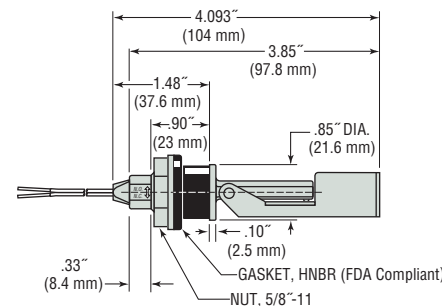
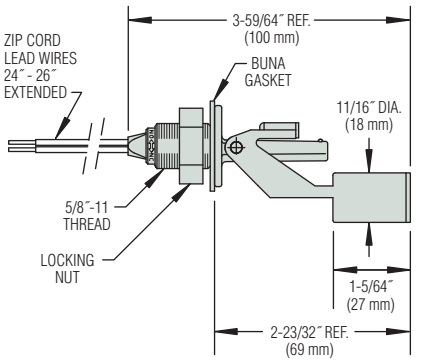
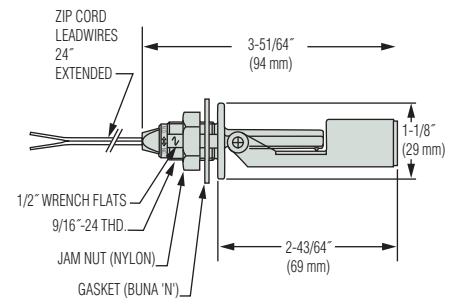
Type 12 – N.C. "Drop Float" Design



The LS-7 Type 12 is ideal for use on food warmers, hot water heaters, steam cookers, small boilers or wherever water evaporation occurs. The switch is used effectively for either high fluid level alarms or water make up systems. The units are made of Noryl®, which carries both NSF and WRC approval for use in potable water, and are supplied with FDA-approved Buna gaskets.



- ▶ Nylon is ideal for oils and fuels.
- ▶ NSF Standard 61 polypropylene is ideal for potable water and broad chemicals.

Type 10 External Mounting	Type 12 Internal Mounting	Type 13 Internal Mounting
 <p>Externally mounts through and seals non-threaded holes using a HNBR compression gasket.</p>	 <p>Side mount "Drop Down" design for calcifying hot water applications. NSF and WRC compliant Noryl®.</p>	 <p>Polypropylene or Nylon.</p>
 <p>Note: Recommended hole size = 7/8" dia. x 1/32" - 5/32" thick panel.</p>		

How To Order – Select Part Number based on specifications required.

Mounting Type	Materials*			Min. Liquid Sp. Gr.	Operating Temperature	Operating Pressure, Max.	Float Arc Envelope	Part Number
	Stem and Mounting	Float	Lead Wire Jacket					
3	Nylon	TPE†		.65	-40°F to +250°F (-40°C to +121.1°C)	100 psi @ 70°F	2.20	165570 ⚡
	Polypropylene			.55	-40°F to +225°F (-40°C to +107.2°C)			164520 ⚡
5	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F	1.25	131100 ⚡
	Nylon			.65	-40°F to +250°F (-40°C to +121.1°C)			140620 ⚡
7	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F	1.50	160450 ⚡
	Nylon			.65	-40°F to +250°F (-40°C to +121.1°C)			160460 ⚡
10	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	50 psi @ 70°F	2.08	165800 ⚡
	Nylon			.65	-40°F to +250°F (-40°C to +121.1°C)			165900 ⚡
12	Noryl®	TPE†		.80	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F	.70	191080 ⚡
13	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F	2.20	197050 ⚡

* Polysulfone and Ryton® R-4 are available upon request.
 † Thermoplastic Elastomer Zip Cord, 22 AWG.
 Note: NSF C2 Versions available. Contact factory.

⚡ – Stock Items.

See alloy versions on next page.

LEVEL SWITCHES – SINGLE POINT

Small Size - Alloys

LS-7 Series - Compact Alloy and Alloy/Plastics Side Mounts

Built for durability, our LS-7 Series switches utilize stainless steel, or zinc bodies. Ideal for any small tank or vessel destined for a rugged environment. All-stainless steel material of construction of Types 9 and 11 is generally recognized as safe with FDA for food contact regulations.

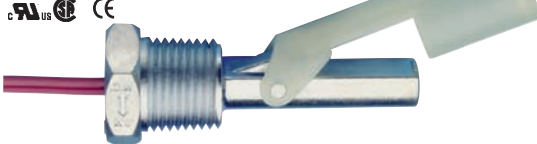
LEVEL SWITCHES - SINGLE POINT

Type 6 - External Mounting



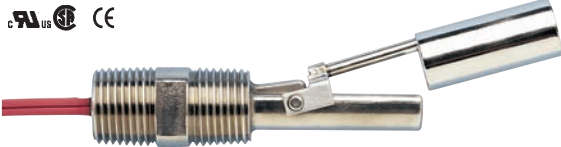
Polysulfone float. Zinc alloy body with polypropylene or nylon float. SAE Mounting.

Type 8 - External Mounting



Zinc alloy body with nylon or polypropylene float.

Type 9 - External Mounting



316 Stainless Steel body with 316 SS, nylon or polypropylene float.

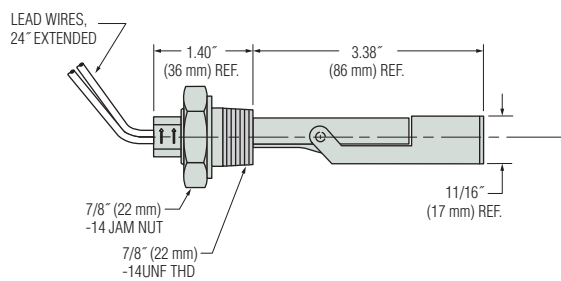
Type 11 - Internal Mounting



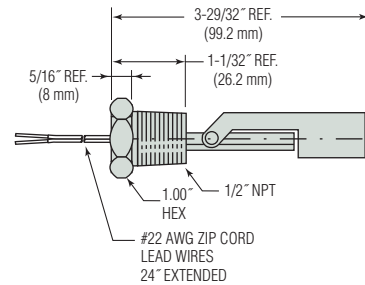
316 Stainless Steel body with 316 SS float.

Dimensions

Type 6



Type 8



Common Specifications

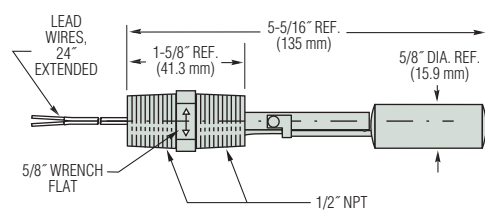
Switch Rating*: SPST, 20VA

Lead Wire Gauge: No. 22 AWG

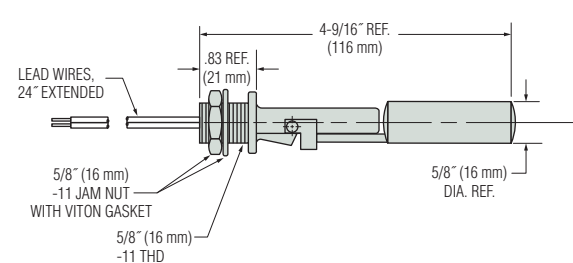
Mounting Attitude: Horizontal.

*See "Electrical Data" on Page X-5 for more information.

Type 9

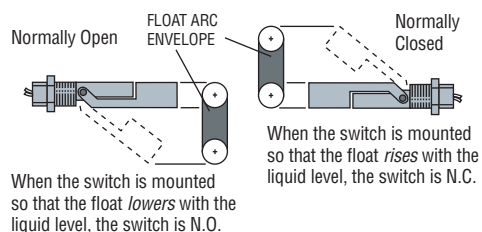


Type 11



Switch Operation

Depending on the mounting position, the float on these switches can either rise or lower with the liquid level. By rotating the switch 180°, the switch operation can be Normally Open or Normally Closed.



How To Order – Select Part Number based on specifications required.

Mounting Type	Materials			Min. Liquid Sp. Gr.	Operating Temperature	Operating Pressure, Max.	Float Arc Envelope	Part Number
	Stem and Mounting	Float	Lead Wire Jacket					
6	Zinc Alloy*	Nylon	TFE†	.65	-40°F to +250°F (-40°C to +121°C)	100 psi @ 70°F	1.36	155660
		Polypropylene		.75	-40°F to +225°F (-40°C to +107°C)	150 psi @ 70°F	1.36	179870
8	Zinc Alloy*	Nylon	TFE†	.65	-40°F to +250°F (-40°C to +121°C)	100 psi @ 70°F	1.40	160950
		Polypropylene		.55	-40°F to +225°F (-40°C to +107°C)	150 psi @ 70°F	1.40	162795
9	316 Stainless Steel	316 S.S.	TFE†	.80	-40°F to +300°F (-40°C to +149°C)	300 psi @ 70°F	1.43	164870 ⚡
		Nylon		.65	-40°F to +250°F (-40°C to +121°C)	100 psi @ 70°F	1.40	164850
		Polypropylene		.55	-40°F to +225°F (-40°C to +107°C)	100 psi @ 70°F	1.40	164860
11	316 Stainless Steel		Teflon®	.80	-40°F to +300°F (-40°C to +149°C)	300 psi @ 70°F	1.65	179445

†Thermoplastic Elastomer Zip Cord.

⚡ – Stock Items.

***Zinc Alloy Material Note:**

When mounted in certain cathodic metals, including stainless steel, and used in water-based liquids, galvanic corrosion may occur. Consult factory for information.

Small Size – Alloys

Rugged Durability, With Broad Heat and Pressure Capabilities, are Hallmarks of These Compact Switches

Ideal for shallow tanks or restricted spaces, or for low-cost, high volume use.

LS-1700 Series – Buna N Float



LS-1700 Series – Teflon® Float



LS-1750 Series – All Stainless Steel



LS-1755 Series – All Stainless Steel



Offer broad chemical compatibility for general purpose use. Also ideal for oils and water.

Rugged construction suitable for most corrosive liquids, and for high temperatures and pressures. Stainless steel is generally recognized as safe (GRAS) with FDA for food contact regulations.

Dimensions

LS-1700 Series		LS-1750 Series		LS-1755 Series			
Buna N Float		Teflon® Float		Stainless Steel Float and Stem			

†L₁ = Switch actuation level, nominal (based on a liquid specific gravity of 1.0).

Common Specifications

Electrical Termination: No. 22 AWG, 24" L., Polymeric Lead Wires, (except Part No. 79990 which has Teflon® Lead Wires).

Approvals: Series Nos. LS-1700, LS-1750 and LS-1755 are U.L. Recognized – File No. E45168 and GSA Listed – File No. 30200.

Switch Operation: Units are shipped N.O. unless otherwise specified. Selectable, N.O. or N.C., by inverting float on unit stem (except for LS-1700 Series switches with Teflon® Floats; see selection in "How to Order" table).

How To Order – Select Part Number based on specifications required.

Series Number	Material			Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.**	Switch* SPST	Part Number
	Stem and Mounting	Float	Other Wetted					
LS-1700	Brass	Buna N	316 S.S., Epoxy	.45	Water: to 180°F (82.2°C) Oil: -40°F to +300°F (-40°C to +149°C)	300	20 VA	01701 ⚡
	316 S.S.						20 VA	01702 ⚡
	316 S.S.	Teflon®		.85	-40°F to +250°F (-40°C to +121.1°C)	1000	20 VA, N.O.	26791 ⚡
							20 VA, N.C.	27980 ⚡
LS-1750	316 S.S.	316 S.S.	316 S.S.	.70	-40°F to +300°F (-40°C to +148.9°C) -40°F to +480°F (-40°C to +204.4°C)	100	20 VA	01750 ⚡
							20 VA	79990 ⚡
LS-1755	316 S.S.	316 S.S.	316 S.S.	.90	-40°F to +300°F (-40°C to +148.9°C)	275	20 VA	01755 ⚡

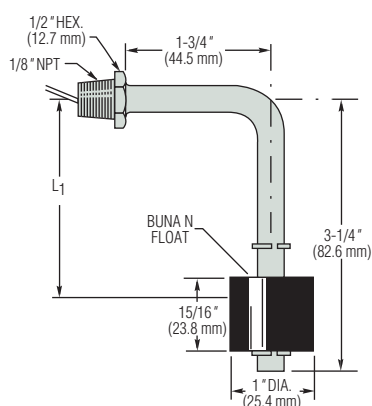
* See "Electrical Data" on Page X-5 for more information.
** Higher pressures are temperature dependent.

LS-77700 Series – Bent Stem Switches Provide Greatest Buoyancy Of Any Side Mount Version

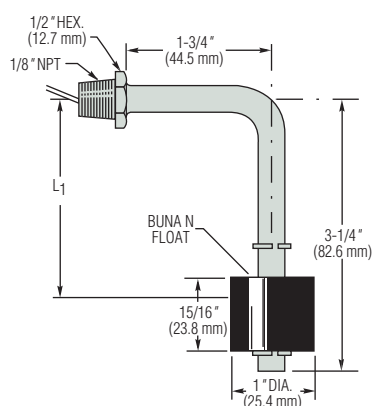
These units perform in liquids with specific gravities as low as .45; switches protrude into tank less than 3 inches.

Dimensions

Type I – 1/8" NPT



Type II – 3/8-24" Thread



L₁ Dimension (based on liquid specific gravity of 1.0):

Buna N Float: 2-3/8" (60.3 mm) ± 3/16"

Stainless Steel Float: 2" (50.8 mm) ± 3/16"

Common Specifications

Electrical Termination: No. 22 AWG, 24" L., Teflon® Lead Wires

Approvals: U.L. Recognized – File No. E45168

Switch* SPST: 20 VA, 120-240 VAC. Switch is N.O. (Dry), but available N.C. (Dry).

Mounting Attitude: Vertical ± 30°.

Other Wetted Materials: Float Stop is Beryllium Copper or PH-15-7-MO Stainless Steel.

Grooved Stem Option: Stem may be grooved to prevent accidental or vibrational movement of float stops (grip rings).



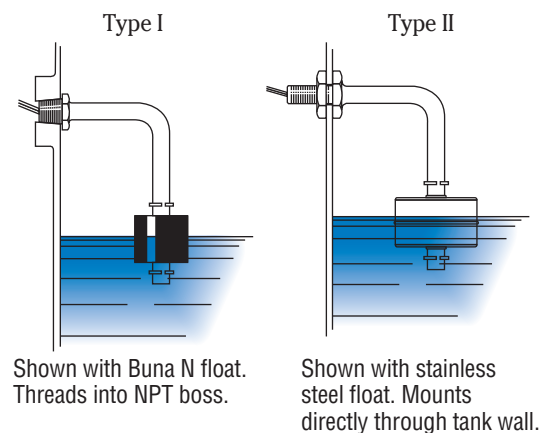
Type II version shown.

Typical Wiring Diagram



When mounted "stem up," units are N.C. dry.

Typical Installation



Shown with Buna N float. Threads into NPT boss.

Shown with stainless steel float. Mounts directly through tank wall.

How To Order – Select Part Number based on specifications required.

Type	Materials		Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.	Part Number
	Stem and Mounting	Float				
I	Brass	316 Stainless Steel	.70	-40°F to +300°F (-40°C to +149°C)	100	117711
	316 Stainless Steel					117712 ⚡
	Brass	Buna N	.45	Water: to 180°F (82°C) Oil: -40°F to +300°F (-40°C to +149°C)	300	118125 ⚡
	Stainless Steel					118126
II	Brass	316 Stainless Steel	.70	-40°F to +300°F (-40°C to +149°C)	100	117715
	316 Stainless Steel					117716 ⚡
	Brass	Buna N	.45	Water: to 180°F (82.2°C) Oil: -40°F to +300°F (-40°C to +149°C)	300	118127 ⚡
	Stainless Steel					118128

*See "Electrical Data" on Page X-5 for more information.

⚡ – Stock Items.

Large Size – Engineered Plastics

Select from these Engineered Plastics for Aggressive or Ultra-Pure Liquids

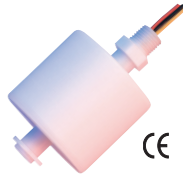
Each of these series offers unique features. Choose from this selection when all-plastic material is desirable and tank space is not restricted.

LS-74780 – All CPVC



Particularly well suited for rough service. Ideal for use in chemical and plating applications.

LS-1900TFE



Resists build-up of foreign material or sticky media. Float travel remains uninhibited in viscous or corrosive liquids. SPDT switch.

LS-1700TFE



A medium-size solution for ultra-pure liquid level sensing. Made of corrosion resistant PTFE for low particle generation.

LEVEL SWITCHES – SINGLE POINT

Dimensions

LS-74780	LS-1900TFE	LS-1700TFE
<p> PVC JACKETED LEAD WIRES 21/32" (16.7 mm) 1/4" NPT 5/8" HEX (15.9 mm) 3-7/16" (87.3 mm) 3/4" (19.1 mm) 1-13/16" (46.0 mm) 2-25/32" (70.6 mm) 1-1/2" DIA. (38.1 mm) </p>	<p> TEFLON® JACKETED LEAD WIRES 13/16" (20.6 mm) 1/4" NPT 21/32" HEX (16.7 mm) .92" (22.3 mm) 3-15/32" (88.1 mm) 2-21/32" (67.5 mm) 1-15/16" (49.2 mm) 2-1/8" DIA. (54 mm) </p>	<p> WIRE 22 AWG. TEFLON JACKETED 24" TO 26" (610 mm to 660 mm) EXTENDED LENGTH 1/8" NPT REF. 5/8" REF. (15.9 mm) 1/2" HEX. REF. (12.7 mm) ACTUATION LEVEL 2-1/2" REF. (63.5 mm) #174105. FLOAT #174106. RETAINING CLIP 1-31/32" REF. (50.0 mm) 1-1/8" DIA. REF. (28.5 mm) 5/16" DIA. REF. (7.9 mm) </p>

†L_s = Switch actuation level, nominal (based on a liquid specific gravity of 1.0 and N.O. dry circuit—dimension will vary for N.C. circuit).

Common Specifications

Electrical Termination: No. 18 AWG, 24" L., Lead Wires (Jacket material is indicated on dimensional drawings, above).

How To Order – Select Part Number based on specifications required.

Series Number	Materials		Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.	Switch*	Part Number Mounting Size	
	Stem, Mounting and Other Wetted	Float					1/4" NPT	1/8" NPT
LS-74780	CPVC		.85	-40°F to +180°F (-40°C to +82.2°C)	15	SPST, 20 VA	74780** ⚡	—
LS-1900TFE	Teflon®		.80	-40°F to +300°F (-40°C to +148.9°C)	30	SPDT, 20 VA	133299 ⚡	—
LS-1700TFE	PTFE		.86	+32°F to +212°F (0°C to +100°C)	25	SPST, 20 VA, N.O.	—	174100
						SPST, 20 VA, N.C.	—	174200

* See "Electrical Data" on Page X-5 for more information.

** Switch operation is selectable, N.O. or N.C., by inverting the float on the unit stem. Units are shipped N.O. unless otherwise specified.

†† 100 VA switches are not U.L. Recognized.

⚡ – Stock Items.

Large Size – Alloys

LS-1800 and LS-1900 Series are a Step Above Our Plastic Units for Pressure Capabilities

Excellent stability for general use in oils and water.

LS-1800 Series –
Buna N Float



LS-1800 Series –
Teflon® Float



LS-1900 Series –
Buna N Float



Intermediate in size, LS-1800 switches provide long life and dependability to meet a broad range of requirements.

With large float displacement, switch withstands rough service; is suitable for high viscosity liquids.

Dimensions

LS-1800 Series		LS-1900 Series
Buna N Float	Teflon® Float	Buna N Float
<p>17/32" (13.5 mm) 1/8" NPT 1/2" HEX (12.7 mm) 2-15/16" (74.6 mm) 7/8" (22.2 mm)† 2-13/32" (61.1 mm) 1-3/4" (44.5 mm) 1-1/4" DIA. (31.7 mm)</p>	<p>17/32" (13.5 mm) 1/8" NPT 1/2" HEX (12.7 mm) 2-15/16" (74.6 mm) 7/8" (22.2 mm)† 2-13/32" (61.1 mm) 1-3/4" (44.5 mm) 1-1/4" DIA. (31.75 mm) SPRING FLAT WASHER</p>	<p>21/32" (16.7 mm) 1/4" NPT 5/8" HEX (15.9 mm) 3-3/16" (80.9 mm) 1-3/16" (30.2 mm)† 2-17/32" (64.3 mm) 1-13/16" (46.1 mm) 1-7/8" DIA. (47.6 mm)</p>

†L₁ = Switch actuation level, nominal (based on a liquid specific gravity of 1.0).

Common Specifications

Electrical Termination: No.18 AWG, 24" L., Polymeric Lead Wires.

Approvals: All Switches on this page are U.L. Recognized – File No. E45168, and are CSA Listed – File No. 30200.

Switch Operation: Selectable, N.O. or N.C., by inverting float on unit stem (except for LS-1800 Series switch with Teflon® float). Units are shipped N.O. unless otherwise specified.

How To Order – Select Part Number based on specifications required.

Series Number	Material			Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.	Switch* SPST	Part Number
	Stem and Mounting	Float	Other Wetted					
LS-1800	Brass	Buna N	316 Stainless Steel, Hysol	.75	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA	01801 ⚡
		100 VA**		35651 ⚡				
	316 Stainless Steel	Buna N		.75	20 VA	01807 ⚡		
		Teflon®		.65	100 VA**	35657 ⚡		
LS-1900	Brass	Buna N	316 Stainless Steel, Hysol	.55	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA, N.O.	01811 ⚡
				20 VA			01901 ⚡	
	316 Stainless Steel			.55	100 VA***	35676 ⚡		
				100 VA	35682 ⚡			

*See "Electrical Data" on Page X-5 for more information.

*** LS-1900 100VA unit is UL Resistive Rated.

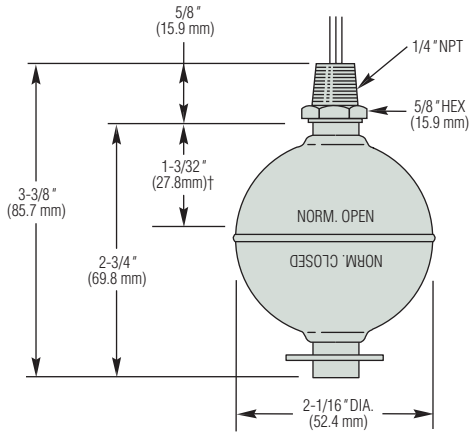
**LS-1800 100 VA switches are not U.L. Recognized.

Large Size – Alloys

LS-1950 – All Stainless Steel For High Pressure and Temperature

For high performance applications, the LS-1950 provides high temperature and pressure capabilities. Materials of construction comply with FDA food contact regulations.

Dimensions



Exceptionally accurate and rugged for higher temperatures and in pressurized or corrosive liquids. For oils, water and chemicals.

†L₁ = Switch actuation level, nominal (based on a liquid specific gravity of 1.0 and N.O. dry circuit – dimension will vary for N.C. circuit).

Common Specifications

Electrical Termination: No. 18 AWG, 24" L., Polymeric Lead Wires (except Part No. 79999 which has Teflon® lead wires).

Approvals: LS-1950 Series switches are U.L. Recognized – File No. E45168 and are CSA Listed - File No. 30200 (Part No. 79999 is U.L. Recognized only).

Switch Operation: Selectable, N.O. or N.C., by inverting float on unit stem. Units are shipped N.O. unless otherwise specified.

How to Order – Select Part Number based on specifications required.

Series Number	Materials		Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.	Switch ¹	Part Number
	Stem and Mounting	Float					
LS-1950	316 Stainless Steel	0.75		-40°F to +300°F (-40°C to +149°C)	750	SPST, 20 VA	01950 ⚡
				-40°F to +480°F (-40°C to +249°C)		SPST, 100 VA ²	26717 ⚡
						SPST, 20 VA	79999 ⚡

Notes

- See "Electrical Data" on Page X-5 for more information.
- UL Resistive Rated

⚡ – Stock Items.

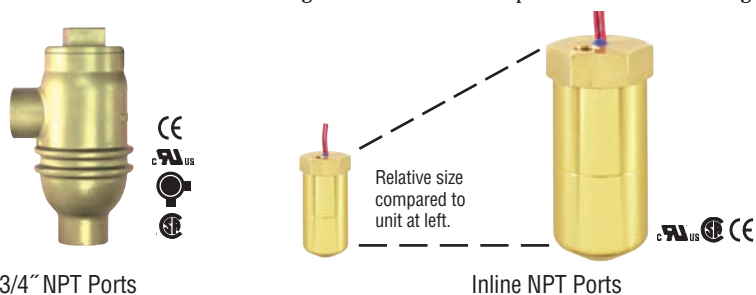
Large Size – Alloys

When a Switch Won't Fit In the Tank, Use a Non-Intrusive Bottle Type

Bottle type level switches are ideal for large or small tanks or where access to the inside is impractical or impossible. These units mount completely outside of the tank, at the level actuation point.

LS-800-5 Series – Single Level,
Brass or Stainless Steel Housing

LS-159000 Series – Low Cost,
Compact Aluminum Housing



For Remote Alarms –
See Page E-29

- Adjustable Volume
- Indoor Outdoor
- Solid-State



Dimensions

LS-800-5 – Brass and Stainless Steel	LS-159000

†L₁ = Switch actuation level, nominal (based on a liquid specific gravity of 1.0).

Common Specifications

Electrical Termination: No. 18 AWG, 24" L., Polymeric Lead Wires (LS-800-5) / No. 22 AWG, 24" L., Polymeric Lead Wire (LS-159000).

Approvals: Series Nos. LS-800-5 and LS-159000 are U.L. Recognized – File No. E45168 and CSA listed – File No. LR-30200.

Switch Operation: Selectable, N.O. or N.C., by inverting float on unit stem.

Mounting Attitude: Vertical with lead wires up.

How To Order - Select Part Number based on specifications required.

Series Number	Materials				Min. Liquid Sp. Gr.	Pressure, PSIG, Max.	Operating Temperature	L ₁	Switch*	Part Number
	Housing	Stem and Mounting	Float	Other Wetted						
LS-800-5	Brass		316 Stainless Steel	Beryllium Copper	.75	500 @ 70°F	-40°F to +300°F (-40°C to +148.9°C)	3/4" (19 mm)	SPST, 20 VA	172625
				Copper					SPST, 100 VA	172986
	316 Stainless Steel		S.S. ARMCO H-15-7 MO		750			7/16" (11 mm)	SPST, 20 VA	172635
									DPDT	172988
LS-159000	Aluminum	Brass	316 S.S.	Beryllium Copper	.90	600 @ 70°F	-40°F to +300°F (-40°C to +148.9°C)	See Dimensions	SPST, 20 VA	144080
			Buna N	Viton®	.50	250 @ 70°F				-40°F to +250°F (oil); +180°F (water) (-40°C to +121°C [oil]; +82°C [water])

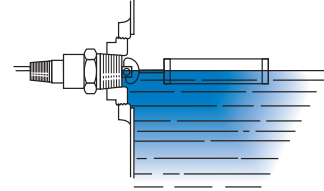
*See "Electrical Data" on Page X-5 for more information. DPDT relay information is with Dimensions above.

Large Size – Alloys

Side Mounting Switches Solve the Problem of Inaccessible Tank Tops & Bottoms

These units solve the problem of point level sensing in tanks with inaccessible tops or bottoms, or at intermediate locations in larger tanks. Operation is positive and dependable. The float pivots with changing liquid level, displacing a shuttle which magnetically actuates a hermetically sealed switch within the unit. Installation is through the tank side at the detection point.

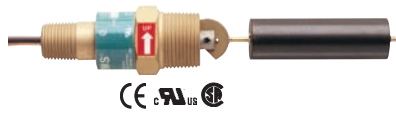
Typical Installation



**UL Approved
Explosion-Proof**

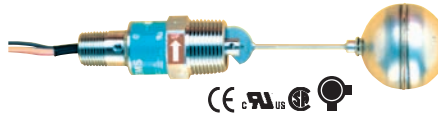
LEVEL SWITCHES – SINGLE POINT

LS-2050 Series – Brass and Buna N



General purpose materials designed to provide reliable service in oils and water.

LS-2050 Series – All-Stainless Steel



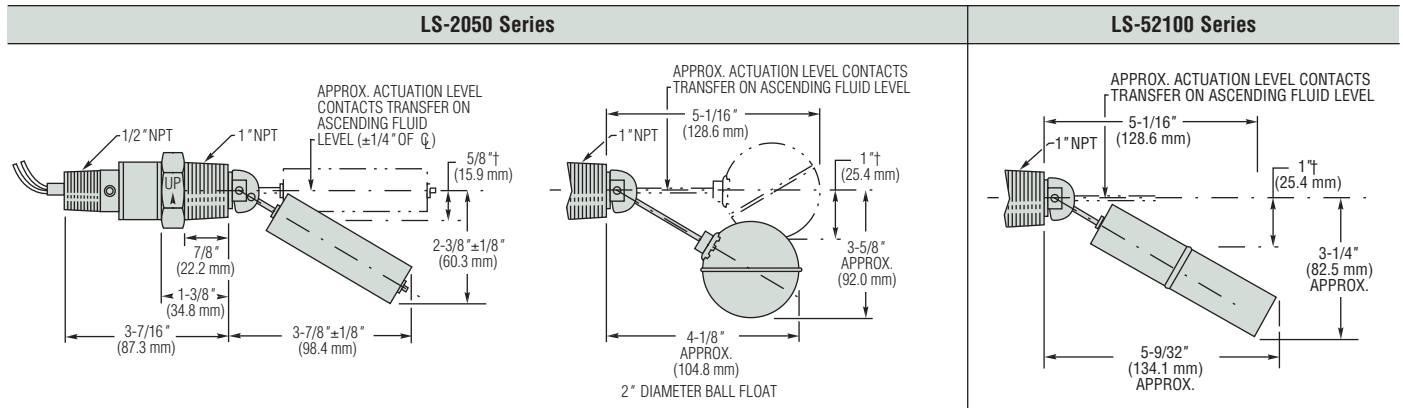
Ultimate strength: for pressures to 900 PSIG and temperatures to 300°F (148.9°C). Explosion-proof models available.

LS-52100 Series – All Stainless Steel



Rugged, all-stainless steel unit offers broad chemical compatibility at temperatures to 300°F (148.9°C). Explosion-proof models available.

Dimensions



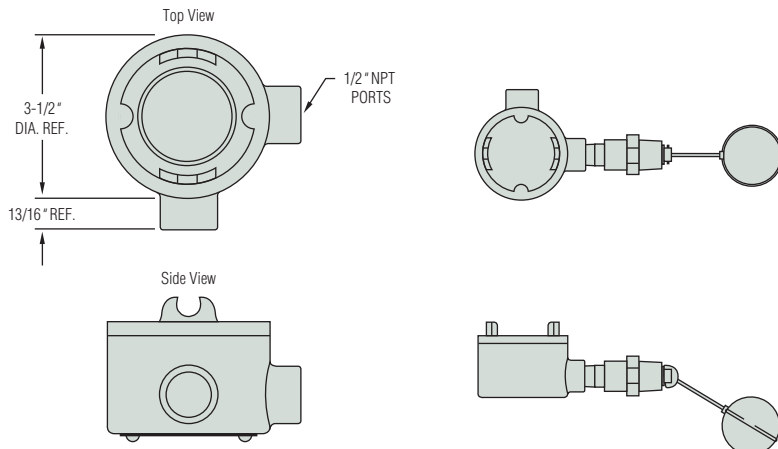
\dagger Approximate de-actuation level, nominal (based on a liquid specific gravity of 1.0).

* Switch Mounting dimensions are the same as shown on the LS-2050 Series drawing (far left).

Explosion-Proof Versions

CSA or FM Approved versions are available in all-stainless steel configurations only.

Typical Example (P/N 55690 Shown):



For Remote Alarms – See Page E-29

- Adjustable Volume
- Indoor Outdoor
- Solid-State



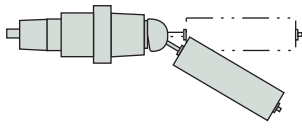
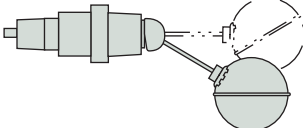
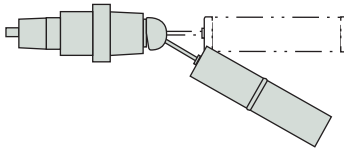
Common Specifications

Electrical Termination: No.18 AWG, 24" L., Polymeric Lead Wires.


Approvals: LS-2050 Series Switches are U.L. Recognized – File No. E45168 and are CSA Listed. Explosion-proof units are approved for Class I, Division 1, Group D hazardous areas.

Mounting Attitude: Horizontal, ±15°.

Performance

	LS-2050 Series		LS-52100 Series
	Brass Mounting/Buna-N Float	All-Stainless Steel	
			
Operating Temperature	Water: to +180°F (82.2°C) Oil: -40°F to +250°F (-40°C to +121°C)		-40°F to +300°F (-40°C to +148.9°C)
Pressure, PSIG Max. @ 70°F	150	900	500
Min. Liquid Sp. Gr.	.8	.9	.85
Switch Differential in Liquid	1/2" Minimum	Approximately 3/4"	

How To Order – Select Part Number based on specifications required.

Series Number	Materials			Switch ¹	Part Numbers		
	Stem and Mounting	Float	Other Wetted		Standard Versions	With Bellows (Details Below)	Explosion-Proof 
LS-2050	Brass	Buna N	316 Stainless Steel, Beryllium Copper, Teflon®, Ceramic	SPDT, 20 VA	30288 ⚡	—	—
	316 Stainless Steel	316 Stainless Steel	Stainless Steel, Teflon®, Ceramic	SPDT, 20 VA	30290 ⚡	175650	55690
				SPST, 100 VA, N.O. ^{2,4}	48068	—	—
				SPST, 100 VA, N.C. ^{2,4}	48069	—	—
LS-52100	316 Stainless Steel	304 Stainless Steel	430 Stainless Steel, Teflon®, Ceramic	SPDT, 20 VA	52100 ⚡	—	121753
				SPST, 100 VA, N.O. ³	116971 ⚡	—	—
				SPST, 100 VA, N.C. ³	116972	—	—

Notes

- See "Electrical Data" on Page X-5 for more information.
- Not CSA Approved.
- Not U.L. Recognized or CSA Approved.
- UL Resistive Rated

⚡ – Stock Items.

LEVEL SWITCHES – SINGLE POINT

Large Size – Alloys

FABRI-LEVEL™ Components and Kits Build Into Custom Switches in Minutes

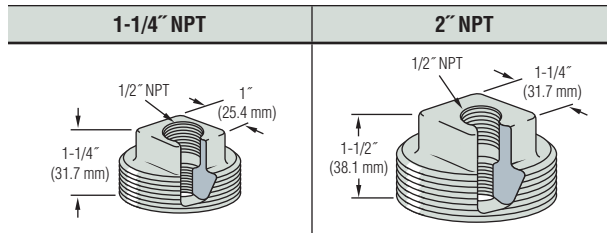
GEMS FABRI-LEVEL™ units can be custom-assembled in minutes from standard components, right in your plant. Simple instructions are furnished with kits.

FABRI-LEVEL™ Components

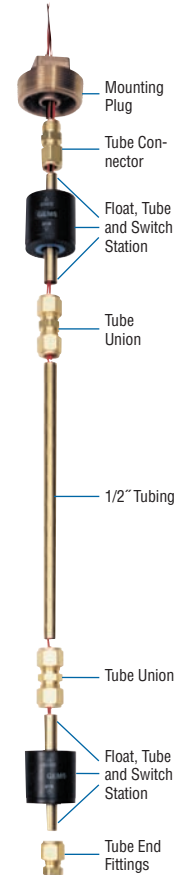
How to Order: Specify Part Number and quantity of each component required.

Mounting Types

Provides clearance for inserting unit in tank. 2" NPT Mounting must be used with stainless steel floats.



Material	Part Numbers	
Brass	26034 ⚡	24408 ⚡
316 Stainless Steel	26033	24407 ⚡



Level Station Assemblies

Each Station is comprised of a float, tube section and switch.

Lead Wires: SPST: #18 AWG, 60" L., Teflon®; **SPDT:** #22 AWG, 60" L., Teflon®

Float Material		Buna N				316 Stainless Steel			
Compatible Mounting Type		1-1/4" NPT		2" NPT					
Float Dimensions									
Operating Temperature		Water: to +180°F (+82°C); Oil: -40°F to +230°F (-40°C to +110°C)				-40°F to +275°F (-40°C to +135°C)			
Pressure, PSI, Max.		150				750			
Min. Media Specific Gravity		.75		.55		.75			
Mounting Size	Switch Type	Tubing Material	Part Number	A Dim.	Part Number	A Dim.	Part Number	A Dim.	
1-1/4" NPT	SPST 20 VA	Brass	26609 ⚡	4" (101.6 mm)	—	—	—	—	
		Stainless Steel	26608 ⚡						
	SPDT 20 VA	Brass	26737 ⚡	4-29/64" (113.0 mm)					
		Stainless Steel	26738						
2" NPT	SPST 20 VA	Brass	—	—	24410 ⚡	4" (101.6 mm)	—	4-1/4" (107.9 mm)	
		Stainless Steel			25328 ⚡				24411 ⚡
	SPDT 20 VA	Brass			24578	4-29/64" (113.0 mm)		—	4-29/64" (113.0 mm)
		Stainless Steel			25329				

* See "Electrical Data" on Page X-5 for more information.

⚡ – Stock Items.

Fittings and Tubing

Description (1/2" Fittings)	Tube Connector	Tube Union	Tube End Fitting	90° Elbow	1/2" O.D. Tubing	
					10" Length	36" Length
Function	Connects tube to mounting plug, mounts unit from inside of tank.	Connects level stations or extension tubes.	Seals end of unit.	For side entry into tank	For extending units or level station spacing.	
Material	Part Numbers					
Brass (Nylon Ferrule)	24633 ⚡	24412 ⚡	24553 ⚡	24631	25199 ⚡	24637 ⚡
All-316 Stainless Steel	24634 ⚡	24413 ⚡	24554 ⚡	24632	25204	24638 ⚡

FABRI-LEVEL™ Kits

FABRI-LEVEL Switch Kits contain all components for complete assembly of a 1- or 2- station level switch unit for pipe-plug mounting in your tank. Kits are available in several material and size combinations. N.O. or N.C. operation of the SPST switch is selectable by inverting the float(s) on the unit stem. Two 10" (254 mm) lengths of tube are furnished to space level stations as desired. Components available for custom-building other configurations are listed on the facing page and above.

Specifications

Kits use the components listed individually on the facing page and above. Please review for performance and dimensional data.

How To Order

Specify Kit Number and quantity.

Materials		Mounting NPT	Kit Number
Fittings	Floats		
Brass	Buna N	1-1/4"	26128 ⚡
		2"	24576 ⚡
316 Stainless Steel	Buna N	1-1/4"	26130
		2"	26675
316 Stainless Steel		2"	24577 ⚡

Warning: Improper application, assembly or installation of FABRI-LEVEL™ Kits or components may result in injuries to personnel or damages.

⚡ – Stock Items.



Each Kit Contains:

- 1 Tube Connector
- 1 Mounting Plug
- 2 Level Stations (Switch, Tube, Float)
- 2 Extension Tubes
- 1 Tube End Fitting
- 3 Tube Unions

Specialty Switches

GEMS Excels in Switches for Special Requirements

The products below are examples of the custom engineering GEMS can provide to meet specific application needs. These units are ideal for use in oils and water.

TH800
Series Temperature/
Level Switch



Level monitoring and temperature switch in a single unit. Intermediate in size; single-setting temperature sensor is in bottom of stem.

LS-38760 Series –
Cushioned Float



Cushioned float and switch for turbulent liquids or excessive vibration. Easily grounded. Ideal for tank trucks, construction equipment or mobile applications.

LS-270 Series –
Bracket Mounting
Slosh Shield



U.L. Recognized – File No. E45168

Small, lightweight, and extremely stable in nonstatic, highly contaminated liquids. Slosh shielding minimizes effects of turbulence and helps prevent interference by foreign material. Bracket-mounted to any convenient surface.

LEVEL SWITCHES – SINGLE POINT

Dimensions

	TH800 Temperature/Level Switch	LS-38760 Series	LS-270 Series
	<p>Wire diagram on page B-21</p>		
Electrical Termination	18 AWG, 24" L., Polymeric Lead Wires	18 AWG, 36" L., Polymeric Lead Wires	18/2 Cable, 6 ft. L., Neoprene with waterproof connection

†L_s = Switch actuation level, nominal (based on a liquid specific gravity of 1.0).

LS-270 Series Note: Installed vertically with cable upward. Caution: Elastomer seals in the sensor and cable are subject to deterioration and aging, and therefore need to be checked regularly. Life expectancy of seals varies with application.

How To Order – Select Part Number based on specifications required.

Series	Material			Min. Liq. Sp. Gr.	Operating Temperature	Pressure PSI, Max.	Switch ¹		Part Number
	Stem and Mounting	Float	Other Wetted				Level SPST	Temperature ³	
TH800 Temp./Level	Brass	Buna N	Beryllium Copper, Hysol	.75	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA, N.O.	N.C., open on +150°F ±10°F, incr.	57143 ⚡
							20 VA, N.C.	N.O., close on +150°F ±10°F, incr.	57144 ⚡
LS-38760	Aluminum	Buna N	S.S., Hysol	.55	-40°F to +180°F (-40°C to +82°C)	150	20 VA, N.C.	—	38760 ⚡
LS-270	316 S.S.	Buna N	Beryllium Copper, Copper Nickel, Polycarb. 304 S.S.	.55	-40°F to +140°F (-40°C to +60°C)	150	20 VA, N.O.	—	43765 ⚡
							20 VA, N.C.		43760 ⚡
							50 VA ² , N.O.		43980 ⚡
							50 VA ² , N.C.		43982 ⚡

Notes:

- See "Electrical Data" on Page X-5 for more information.
- Switches are not U.L. Recognized or CSA Listed.
- See Page B-21 for thermostat ratings and wiring diagram. Other temperature settings are available; consult factory.

Specialty Switches – Continued

Portable Level Switch — Integral Mounting Magnet



Precisely monitors liquid level and is ideal for controlling filling operations and preventing overflows. Permanent magnet attaches unit securely to steel tank wall at exact level required.

LS-750 Series — Weighted for Suspension Cable



With a compact-sized float, slosh shield and weighted collar, the LS-750 provides liquid level detection for a wide variety of applications. Suspend in stand pipes or sumps for leak detection duty, or drop into wells for ground-water monitoring. Supplied with 25 feet of waterproof cable.

U.L. Recognized—
File No. E-45168.
CSA Listed-File No.
LR-30200.

LS-700F Series



Overfill Protection for Refrigerant Tanks. The LS-700F enables safe compliance with EPA directives to recover refrigerants. These units are designed to fit standard 30# and 50# D.O.T. approved refrigerant tanks. They provide 80% full shutoff capability when used as an integral part of a recovery system.

U.L. Recognized—
File No. SA8857.
CSA Listed-File No.
LR-30200-31.

Dimensions

Portable Level Switch	LS-750	LS-700F
SJO, 18/2 10'L., Neoprene	22 AWG, 2-Wire Cable	3- or 4-Pin, Quick-Connect Receptacle

†L₁ = Switch actuation level. In liquid with specific gravity of 1.0, switch actuation is approximately half the distance from end of stem to mounting, or at the halfway point of float travel.

How To Order — Select Part Number based on specifications required.

Series	Material			Min. Liquid Sp. Gr.	Operating Temperature	Pressure PSI, Max.	Switch*	Electrical Termination Option	Part Number
	Stem and Mounting	Float	Other Wetted						
Portable	Brass	Buna N	Aluminum, 316 S.S.	.85	Oil: -40°F to +230°F (-40°C to +110°C) Water: to 180°F (82°C)	10	SPST, 20 VA N.O., Dry	—	15208 ⚡
LS-750	Brass	Buna N	Nylon, PVC, Beryllium Copper	.45		150	SPST, 20 VA N.C., Dry	PVC Cable Jacket	149350 ⚡
	316 S.S.**	316 S.S.	PVDF, Viton®	.65	-40°F to 212°F (-40°C to +100°C)	375	SPST, 10 VA N.C., Dry	Teflon® Cable Jacket	197433
LS-700F	Brass	304 S.S.	—	.98	-40°F to +221°F (-40°C to +105°C)	400	SPST, 20 VA N.C., Dry	3-Pin	128500 ⚡
								4-Pin	144900 ⚡

*See "Electrical Data" on Page X-5 for more information.

⚡ – Stock Items.

** Stainless steel is generally recognized as safe (GRAS) with FDA for food contact regulations.

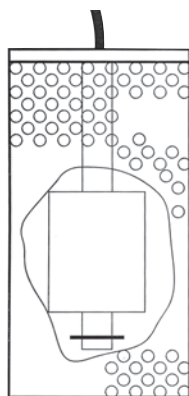
Leak Detection Sensors

- ▶ Compact Size
- ▶ Low Cost
- ▶ Reliable
- ▶ Hydrocarbon Detection

Warrick® Leak Detection Sensors are designed for single wall piping, sump alarms and other small areas. Combine with Warrick Monitoring Panels for complete leak detection systems.

LEVEL SWITCHES – SINGLE POINT

DLP-1 & DLP-2



Designed to detect presence of liquid in sumps, attached access pipes, annular spaces, or locations requiring a small float-operated sensor. Two models to fit 1-1/2" and 2" standard piping.

DWP-25



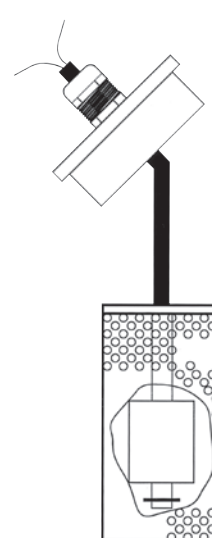
Designed for use in the annular space of double wall fiberglass tanks to detect the presence of conductive liquid. When combined with Warrick DMS or TA alarm panel, DWP-25 sensors can detect the presence of water or other conductive liquids in normally dry annular spaces.

DFP-25



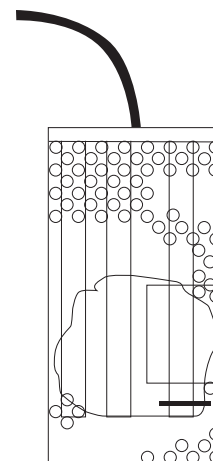
Designed for use in the annular space of double wall fiberglass tanks to detect hydrocarbon liquids. When hydrocarbons are present, a hydrocarbon wax pellet dissolves and closes a springloaded switch to signal a leak. This sensor is not reusable after exposure to hydrocarbons.

SVP-2



Designed to monitor hydrocarbon vapors in wells or sumps by absorbing the vapors and triggering a switch. Should not be used where vapors are continuously present. Fits in standard 2" pipe with cover.

DSP-2



Utilizes conductivity probes and a reed switch based float switch to detect the presence of liquid and differentiate between hydrocarbons and water. When combined with Warrick DMS or TA two-channel alarm panel, the DSP-2 can discriminate between water and hydrocarbon liquids causing fault condition.

How to Order

Order by Part Number (same as Series Name for these products).

Series	Body Components	Number of Sensor Wires	Wire Length	O.D.	Part Number
DLP-1*	Buna-N float, Stainless Steel and plastic housing	2 (N.O. in resting position)	16 ft.	1.22"	DLP-1
DLP-2*				1.88"	DLP-2
DSP-2*					DSP-2
DWP-25	Stainless Steel probes in plastic housing	2	25 ft.	.625"	DWP-25
DFP-25	Spring-loaded switch, plastic housing, wax pellet	2	25 ft.	.625"	DFP-25
SVP-2	Chemical-resistant plastic and Stainless Steel housing	2	16 ft.	2"	SVP-2

* EPA Approved when used with Warrick TA or DMS panel. See pages E-30 and E-31 respectively.

Applications

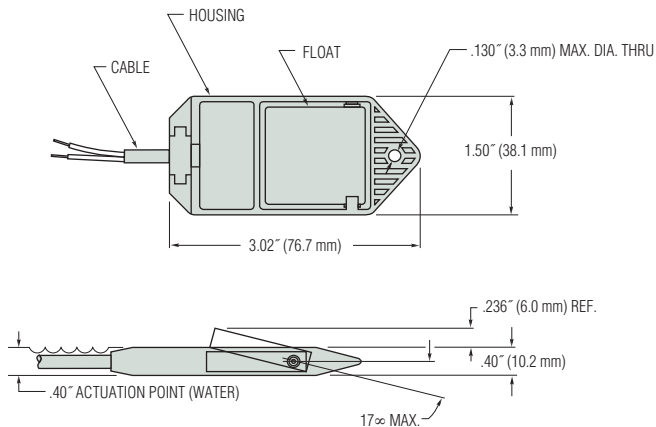
- Above Ground Storage Tanks
- Underground Storage Tanks
- Sumps
- Dry Annular Spaces

LS-10 Series – Slim Profile for Interstitial Liquid Sensing

The GEMS LS-10 liquid sensor accurately detects the presence of liquid in fiberglass double-wall tanks, containment sumps and double-wall pipes. Dry contact switching ensures dependability throughout its long service life. This reusable sensor easily fits small, interstitial spaces and senses liquid hydrocarbons or water. The unit is unaffected by hydrocarbon vapor, thereby reducing the risk of false alarms.

The LS-10 sensor's rounded design makes it easy to remove, clean and reinstall after an alarm condition is triggered, or for maintenance.

Dimensions



Specifications

Wetted Materials:

Housing: Valox®

Float: Foamed Polyethylene with Solid Polyethylene Pin

Tape: UHB Double-Sided 3M Tape (p/n 160330 only)

Cable: PVC

Pressure: Atmospheric

Operating Temperature: -40°F to +176°F (-40°C to +80°C)

Accuracy: ±1/8 inch

Switch Rating: 10W, 50-100 VDC Resistive Only, N.C. (opens on rising)

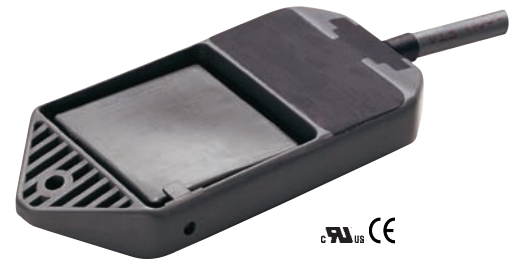
Cable: Two (2) Conductor PVC Jacketed 24-26" Extended

Approvals: UL Recognized

How to Order – Select Part Number based on mounting option

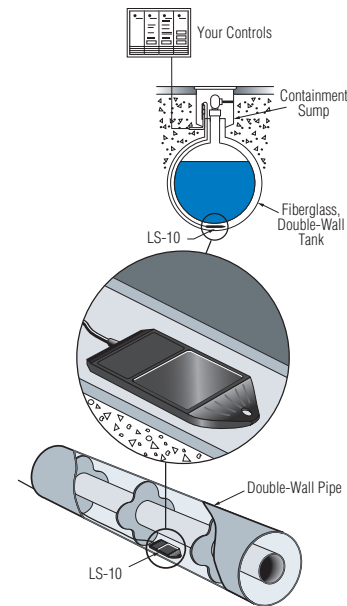
Series Number	Mounting Option	Part Number
LS-10	With Double-Sided Tape	160330
	No Tape	160340
	No Tape – 25' PVC Jacketed Cable	156000 ⚡

Note: The LS-10 sensor is a non-voltage producing device and does not contain energy storing components. However, since primary use is in hazardous locations, an appropriate intrinsically safe interface device is required for its use.



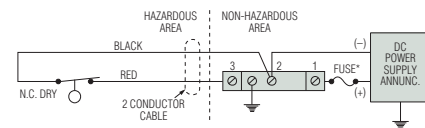
Typical Applications

- ▶ Fiberglass Double-Wall Tanks
- ▶ Double Wall Pipes
- ▶ Containment Sumps
- ▶ Piping Sumps

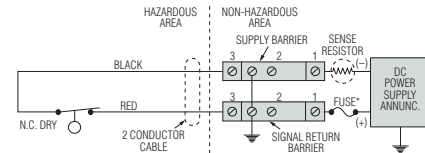


Typical Wiring Diagrams

Non-Isolated System—Single Zener Barrier

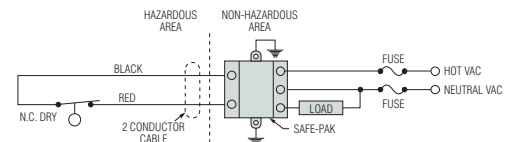


Isolated System - Dual Zener Barrier



If two signal lines must be maintained above ground potential, an individual zener barrier is required per single line.

Single Safe-Pak® Relay



Safe-Pak® is an intrinsically safe, solid state relay

LEVEL SWITCHES – SINGLE POINT

Series M Mechanical Tilt Float Level Switch

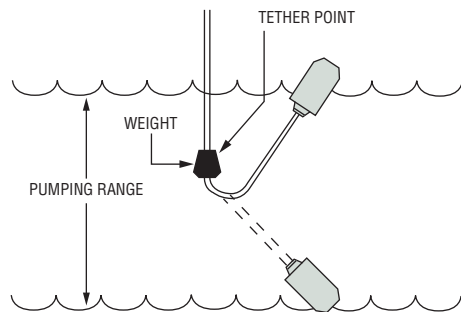
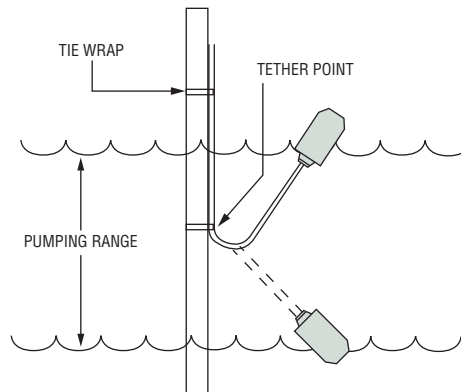
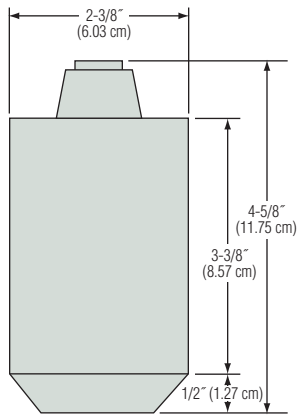
- ▶ Non-Mercury Switch
- ▶ Sealed Cable
- ▶ Impact & Corrosion Resistant ABS Shell
- ▶ N.O., N.C., SPDT Contacts
- ▶ Various Cable Lengths
- ▶ Color Coded Body

Designed for level control and alarm applications in difficult liquids such as sewage and waste water. Series M mechanical tilt floats are ideal for applications where the presence of mercury is a concern. Series M Switches have impact resistant ABS shell and neoprene jacketed cable.

Specifications

Cord	2 or 3 conductor 16 AWG wire SJOW Oil Resistant CPE
Contact Rating	13 amp @ 120/240 VAC 1/2 hp
Contact Design	SPST, Normally Open or Normally Closed Common with N.O. & N.C. (form C)
Temperature Rating	
Dry	32°F to 194°F (0°C to 90°C)
Water Resistant	32°F to 140°F (0°C to 60°C)
Overall Weight	1.0 lbs. (not including weight)
Tether Method	Tie-wrap nylon, weight: 2.5 lbs.
Approvals	U.L. Recognized, CSA Cert.

Dimensions

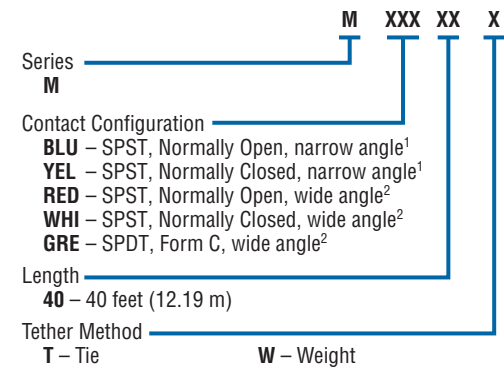


Applications

- Level Control
- Alarms
- Sewage Lift Systems
- Slurries
- Drainage Sumps
- Wastewater Treatment
- Holding Tanks

How to Order

Use the **Bold** characters from the chart below to construct a product code.



Tether Method	Part Number
Tie Wrap	7762360
Weight	7762381

Notes:

1. Narrow angle pumping range approximately 2 in. to 8 in.
2. Wide angle pumping range approximately 5 in. to 18 in.

Electro-Optic Level Switches

Single Point

- ▶ Small size
- ▶ Economically priced
- ▶ Built-in, solid-state electronics
- ▶ No moving parts
- ▶ Simple, one-unit installation

ELS Series Level Switches are low cost, compact, optical level sensors with built-in switching electronics. With no moving parts, these small units are ideal for a variety of point level sensing applications — especially where dependability and economy are a must.

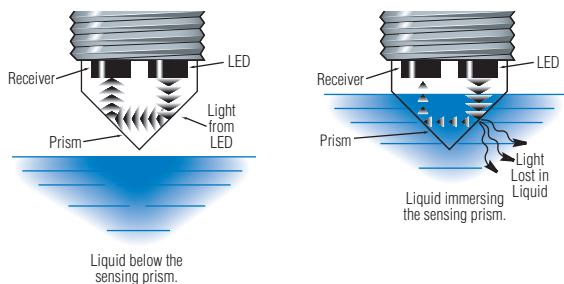
Level switches are suitable for high, low or intermediate level detection in practically any tank, large or small. Installation is simple and quick through the tank top, bottom or side. Solid state-switching ensures dependability over long service life.

The sensor offers $\pm 1\text{mm}$ repeatability and broad liquid compatibility. They are not recommended for use in any liquid that crystallizes or leaves a solid residue.

General Operating Principle

The electro-optic sensor contains an infrared LED and a light receiver. Light from the LED is directed into a prism which forms the tip of the sensor.

With no liquid present, light from the LED is reflected within the prism to the receiver. When rising liquid immerses the prism, the light is refracted out into the liquid, leaving little or no light to reach the receiver. Sensing this change, the receiver actuates electronic switching within the unit to operate an external alarm or control circuit.

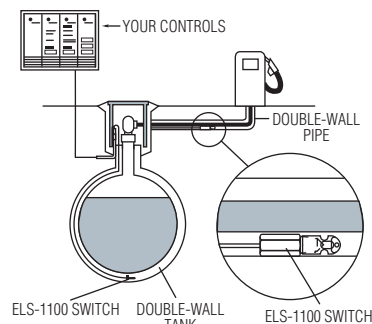
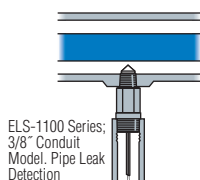
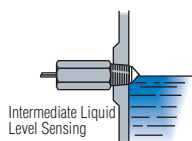


Reflective Surface

Any optical sensor may be affected by reflective surfaces. Consult Gems if prism is to be less than 2 inches from any reflective surface.

Typical Applications

- Medical laboratory
- Food and beverage systems
- Pharmaceuticals
- Petrochemicals
- Leak detection
- Hydraulic reservoirs
- Machine tools



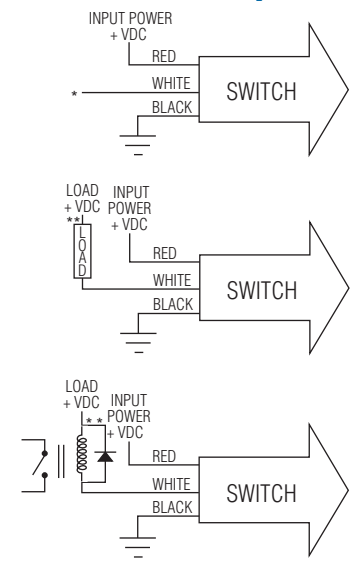
Contents	Page Start
Engineered Plastic	A-26
Alloy	A-30
Opto-Pak	A-31

Industry's Largest Selection!



LEVEL SWITCHES - SINGLE POINT

Typical Wiring Diagrams - For all electro-optic units not otherwise specified.



* TTL/CMOS Output-For levels greater than 5 volts, a 10K pull-up resistor is required at the output.
 ** Maximum load=40mA @ 30VCD.

ELS-950 Series Rugged Electro-Optic Level Sensor

The ELS-950 Series represents Gems' smallest electro-optic level sensor developed to monitor a broad range of media including OHV type fluids.

Our UL approved design features a TPE over-molded electronics insert, TPE insulated wires, and fluorocarbon o-ring seals that create a watertight, environmentally resistant assembly, ideally suited for use in harsh environments.

The ELS-950 is excellent for industrial OEMs requiring a solid-state sensor for small space and high temperature environments.

Typical Applications

- Coolant reservoir monitoring and warning
- Medical diagnostic, sterilizer, washers and dialysis equipment
- Low lubricant warning on machine tools, generator sets, on- or off-highway vehicles
- Low level warning in hydraulic reservoirs
- Plastic over flow bottles, plastic radiators
- Leak detection for drip pans

Specifications

Materials	
Housing	Polysulfone (Contact Gems for alternative material types)
O-Ring	
1/2"- 20UNF Mounting	Fluorocarbon
M12x1-8 Mounting	Fluorocarbon
Electronics	Over-molded TPE
Operating Pressure	0 to 250 PSI (0 to 17 bar) maximum
Operating Temperature	-40°F to +230°F (-40°C to 110°C)
Current Consumptions (No Load)	
5 VDC	4 mA
12 VDC	10mA
Output	Sink 40 mA max., up to 30 VDC
Repeatability	±1 mm
Approvals	CE, UL file No. 108913 IP66/67 Rating Pending ROHS Compliant

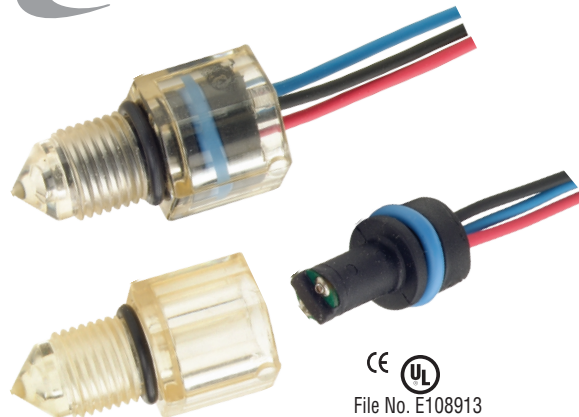
How To Order

Specify Part Number based on Input and Output Condition required.

Input Power	Actuation Condition	Lead Wire Length	Mounting Type		
			1/4" MNPT	1/2"- 20UNF-2B	M12x1-8
5 VDC ±10%	Wet	6 inches	224504 ⚡	224501 ⚡	224508 ⚡
		2 meters	226545	226541	226549
	Dry	6 inches	224505	224502 ⚡	224509 ⚡
		2 meters	226546	226542	226550
12 VDC ±10%	Wet	6 inches	224506 ⚡	224503 ⚡	224510 ⚡
		2 meters	226547	226543	226551
	Dry	6 inches	224507 ⚡	223625 ⚡	224511 ⚡
		2 meters	226548	226544	226552

Note: Cable length available in 6" or 2 meters

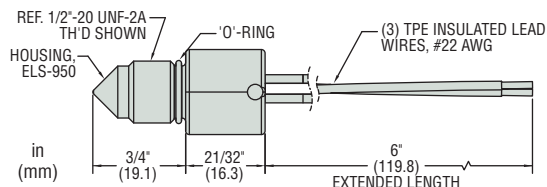
⚡ - Stock Items.



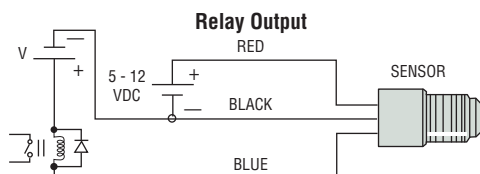
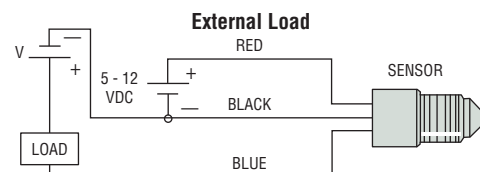
CE File No. E108913

ELS-950 shown with over-molded electronics and o-ring sealing exposed. Actual units are not designed for disassembly.

Dimensions



Wiring Diagrams



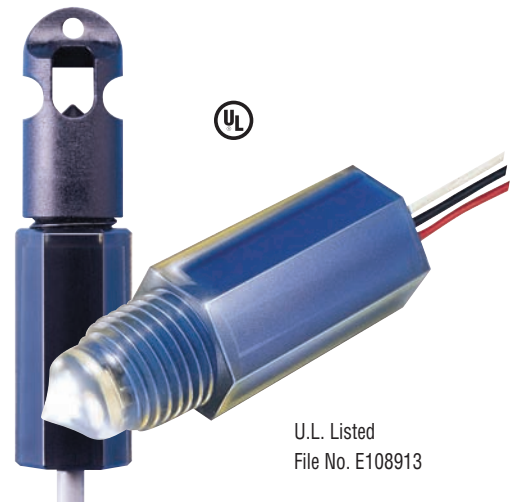
General Purpose ELS –1100 Series Satisfies Most Applications

These polysulfone units are both compact and economical. They feature a variety of mountings, power requirements and electrical terminations to make it easy to find a perfect match for your application.

Specifications

Materials	
Housing and Prism	Polysulfone or Nylon
Operating Pressure	0 to 150 PSI, Maximum
Operating Temperature*	0°F to 176°F (-17.8°C +80°C)
Current Consumption	18 mA, Approximately
Output†	TTL/CMOS Compatible. Open Collector Output May Sink 40 mA UP TO 30 VDC.
Repeatability	±1 mm
EMI Susceptibility	Meets (MIL-STD-461B Part 2 Modified) Specification of 10 V/M for Frequency Range 30 to 1000 MHz (Except 609 MHz = 9 V/M and 679 MHz = 7.5 V/M).

* These switches are not for use in freezing liquid or steam/high condensation environments. Contact Gems for alternative solutions.



U.L. Listed
File No. E108913

Dimensions

1/4" NPT Mounting	1/4" NPT Mounting with 3/8" Conduit	1/2" Straight Thread Mounting with O-Ring	M12x1-8g Straight Thread with O-Ring	"Fish" Pull Ring
Electrical Termination				
Lead Wires, 22 AWG, PVC Jacketed, 12" to 14" Extended				25' Cable, 22 AWG, PVC Jacketed

How To Order

Specify Part Number based on Mounting Type, Input Power and Output Condition required.

Input Power	Probe Condition at Current Sink	Mounting Type					
		1/4" NPT	1/4" NPT & 3/8" Conduit		1/2" Straight Thread	M12x1-8g Straight Thread	"Fish" Pull Ring
		Polysulfone	Polysulfone	Nylon	Polysulfone	Polysulfone	Polysulfone
5 VDC	Wet	138167 ⚡	144225	175631	144235	166541	—
10-28 VDC	Wet	142700 ⚡	143585 ⚡	157750	143580	169555	143577
	Dry	143570 ⚡	143590	175632	143575	169556	148973

⚡ – Stock Items.

Intrinsically-Safe Versions

GEMS ELS-1100 Switches may be rendered intrinsically-safe for Class I, Division 1, Group C & D when used with appropriate GEMS Zener Barriers. Call Gems Sensors for special ELS-1100-IS (intrinsically-safe) part numbers and Installation Bulletins 148745 and 148744, File No. E44570.

Extended Power and Switching Capabilities of 12 VDC Models with Gems.

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-31.



ELS -1100HT

Handles Temperatures to 212°F

Slightly larger than the ELS-1100, the "HT" or High Temperature version is made from high performance Isoplast® plastic. While maintaining broad chemical compatibility, these units also handle fluid temperatures to 212°F. They feature 3/8" NPT mountings and the shortest of any of our plastic electro-optic switch bodies – HTS versions are a mere 1/2" long!

Typical Applications

- Coolant reservoir monitoring
- Medical diagnostic and sterilizer equipment
- Low lubricant warning on machine tools
- Low level warning in hydraulic reservoirs

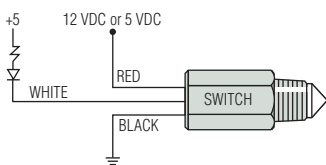
Specifications

Materials	
Housing and Prism	Isoplast®
Operating Pressure	0 to 150 PSI, Maximum
Operating Temperature*	-40°F to +212°F (-40°C +100°C)
Current Consumption	45 mA, Approximately
Output	TTL/CMOS Compatible. Transistor Output with 10K Pull Up Resistor May Sink 18 mA. 12 VDC input power units switch a maximum 5 VDC on output
Repeatability	±1 mm

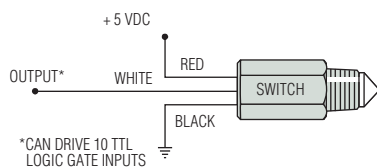
* These switches are not for use in freezing liquids or steam/high condensation environments. Contact Gems for alternative solutions.

Wiring Diagrams

Transistor Output



TTL Compatible Output



How To Order

HT Series

Specify Part Number based on Input and Output Condition required.

Input Power	Probe Condition at Current Sink	
	Wet	Dry
5 VDC	153061 ⚡	153062
12 VDC*	153063 ⚡	153064

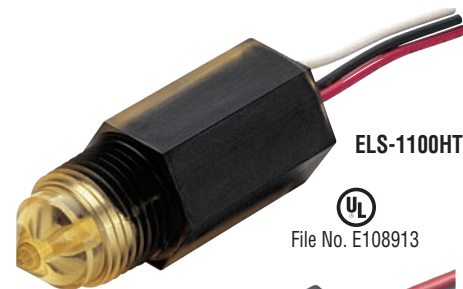
*12 VDC input power units switch a maximum 5 VDC on output. Note: Extend the power and switching capabilities of 10-28 VDC models with Gems Opto-Pak Controllers.

⚡ – Stock Items.

HTS Series - 5 VDC Input Only

Specify Part Number based on Wet or Dry switch actuation and mounting type.

Mounting Type	Probe Condition at Current Sink	
	Wet	Dry
3/8" NPT	181674	181675
M16x2	191341	191342



ELS-1100HT



File No. E108913



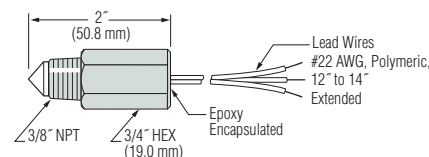
ELS-1100HTS



File No. E108913

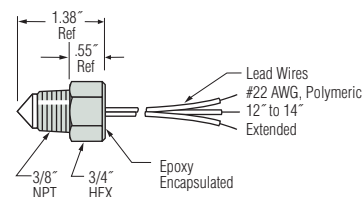
Dimensions

HT Series

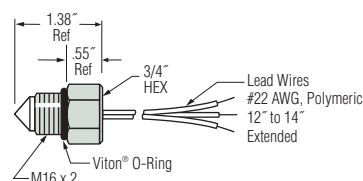


HTS Series

3/8" NPT Mounting



M16 x 2 Straight Thread Mounting with O-Ring



Extended Power and Switching Capabilities of 12 VDC Models with Gems.

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-31.



ELS-1100TFE Teflon® For Ultra-Pure or Aggressive Fluids

When high purity or resistance to chemical attack is vital, ELS-1100TFE sensors are the ultimate solution. They feature a pure Teflon® body and prism construction. Even the Hypalon® vapor barrier and Teflon® coated lead wires give evidence to the care we've taken to make this the perfect liquid level sensor for pharmaceuticals, semiconductor manufacturing, food and beverage, chemical processing, or anywhere purity or chemical resistance is the major criteria.

Specifications

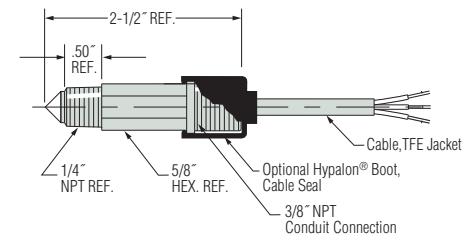
Materials	
Housing and Prism	Teflon®
Operating Pressure	0 to 150 PSI, Maximum
Operating Temperature*	0°F to 176°F (-17.8°C +80°C)
Input Voltage	10 - 28 VDC
Current Consumption	18 mA, Approximately
Output†	TTL/CMOS Compatible. Open Collector Output May Sink 40 mA Up to 30 VDC.
Repeatability	±1 mm
EMI Susceptability	Meets (MIL-STD-461B Part 2 Modified) Specification of 10 V/M for Frequency Range 30 to 1000 MHz (Except 609 MHz = 9 V/M and 679 MHz = 7.5 V/M).

* These switches are not for use in freezing liquid or steam/high condensation environments.
Contact Gems for alternative solutions.

† See Page A-25 for Wiring Diagrams



Dimensions



How To Order

Specify Part Number based on Output Condition and Boot Option.

Probe Condition at Current Sink	Part Number	
	With Cable Boot	No Cable Boot
Wet	187595	173800 ⚡
Dry	185600	173700

ELS-1100FLG Flange Mounting for Installations Without Threaded Holes

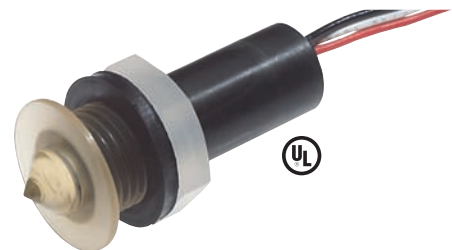
The easy solution for thin wall tanks ($\leq 1/4$ " thick): ELS-1100FLG Series. No threads needed with these flanged units. Slip through a .75" hole and tighten the jam nut; Viton® gasket forms a tight seal. Ideal for sheet metal, molded plastic tanks and medical applications where elimination of exposed threads removes potential bacterial breeding grounds.

Specifications

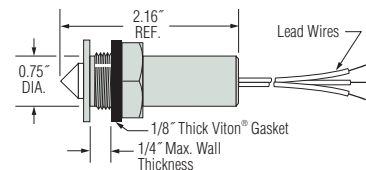
Materials	
Housing and Prism	Polysulfone
Operating Pressure	0 to 150 PSI, Maximum
Operating Temperature*	0°F to 176°F (-17.8°C +80°C)
Input Voltage	10 - 28 VDC
Current Consumption	18 mA, Approximately
Output†	TTL/CMOS Compatible. Open Collector Output May Sink 40 mA Up to 30 VDC.
Repeatability	±1 mm
EMI Susceptability	Meets (MIL-STD-461B Part 2 Modified) Specification of 10 V/M for Frequency Range 30 to 1000 MHz (Except 609 MHz = 9 V/M and 679 MHz = 7.5 V/M).

* These switches are not for use in freezing liquid or steam/high condensation environments.
Contact Gems for alternative solutions.

† See Page A-25 for Wiring Diagrams



Dimensions



How To Order

Specify Part Number based on Input Power and Output Condition Required.

Input Power	Probe Condition at Current Sink	
	Wet	Dry
5 VDC	187575	187590
10-28 VDC	187585	187580

Extended Power and Switching Capabilities of 12 VDC Models with Gems.

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-31.



The Enhanced ELS-1150

Compact Electro Optic Level Switch available in Nickel-Plated Carbon Steel or Stainless Steel

The enhanced ELS-1150 series is the highest performing electro optic level switch from Gems Sensors. At just 1.38" long, the ELS-1150 has been upgraded with a micro processor board design to provide a wide range of capabilities including sinking and sourcing and time delay outputs. The strong fused glass prism eliminates leak potential and is capable of handling extreme temperature and pressure applications up to 2500 psi. The ELS-1150 series is available in FM and EP versions with wide voltage ranges (ELS-1150XP). Built with solid state reliability, the sensor is available at an affordable price in Nickel-Plated Carbon Steel or Stainless Steel. The compact size of the sensor makes them ideal candidates for monitoring the small, pressurized vessels found in HVAC, refrigeration and hydraulic applications. The sensors are most commonly used for low, high and intermediate level detection.

The stainless steel version (ELS-1150SS) is excellent for application requiring corrosion resistance and is ideal for acids, solvents and dielectric water applications.

* Higher temperature versions available up to 125°C.
Contact our factory experts for additional ordering information.

Applications

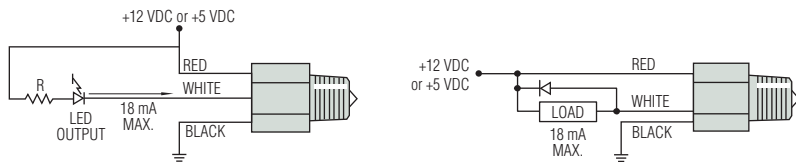
- Hydraulic and lubricating oil reservoirs
- Critical fluid level monitoring on machine tools, compressors, chillers and other industrial OEM equipment
- Ideal unit capable of handling corrosive liquids such as: acids, solvents, and dielectric water applications
- Medical Equipment; Anesthesia, Histology

Specifications

Mounting	1/2" NPT, 3/4"-16 Straight Thread
Materials	
Housing	Nickel-Plated Carbon Steel or Stainless Steel
Prism	Fused Glass
Operating Pressure	0 to 2500 PSI, Maximum
Operating Temperature*	-40°F to +212°F (-40°C to +100°C)
Current Consumption	~45 mA
Output	Open Collector Output, 18 mA Sink, Max.
Electrical Termination	22 AWG, Polymeric, 12" to 14" Extended Lead Wires
Repeatability	±1 mm
Approvals**	CE, UL File No. E108913, CUL

* These switches are not for use in freezing liquid or steam/high condensation environments. For higher temperature versions up to 257°F (125°C), and for other alternate requirements, contact Gems factory.
** Carbon Steel model only.

Wiring Diagrams - Typical

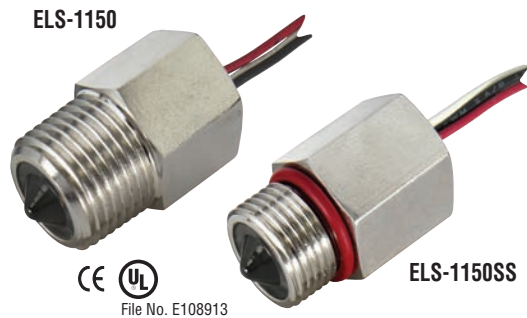


Note: Inductive loads must be diode suppressed.

How To Order

Specify Part Number based on Input Power/ Output Condition and material required.

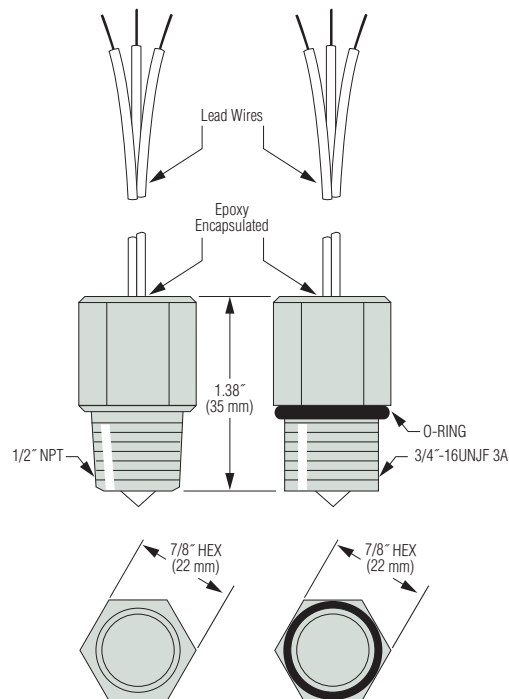
Input Power	Probe Condition at Current Sink	Nickel-Plated Steel Housing		Stainless Steel Housing
		1/2" NPT Mounting	3/4" - 16 Straight Thread	1/2" NPT Mounting
5 VDC	Wet	194469	195201	205486
	Dry	194470	195202	205487
12 VDC	Wet	194471	195203	205490
	Dry	194472	195204	205495



Dimensions

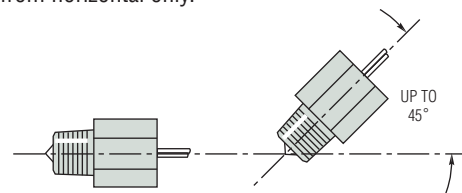
1/2" NPT Mounting

3/4" - 16 Straight Thread Mounting



Mounting Attitude

These units must be mounted horizontally or up to 45° from horizontal only.



Extended Power and Switching Capabilities of 12 VDC Models with Gems.

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-31.



Opto-Pak® Controllers for GEMS Electro-Optic Switches

Extend power and switching capabilities of 12 VDC Electro-Optic switches

- ▶ Converts TTL output signal to an SPDT 5 Amp relay output.
- ▶ Operates with 12 VDC ELS-1100, ELS-1100HT*, ELS-1150, ELS-1200* and ELS-300 Series Electro-Optic Switches.
- ▶ Available as open board or mounted in NEMA 4X junction box.

GEMS Opto-Pak Controllers convert standard 110 VAC line current to the 12 input power required for ELS-1100 and ELS-300 operation, and provide an SPDT, 5 Amp relay output for direct control of moderate loads. Two models are available: an open circuit board Opto-Pak Controller for incorporation into custom enclosures, and the self-contained, NEMA 4X model pictured here.

*12 VDC versions only.

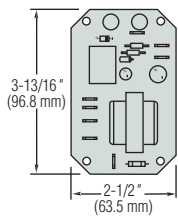
Specifications

Voltage Input	115 VAC ±10%, 50/60 Hz
Maximum Current Draw	70 mA @ 120 VAC
Relay Output	SPDT; 5 Amps @ 115 VAC, 5 Amps @ 30 VDC
Operating Temperatures	-13°F to + 158°F (-25°C to + 70°C)
Electrical Connections	1/4" Male Spade Terminals*

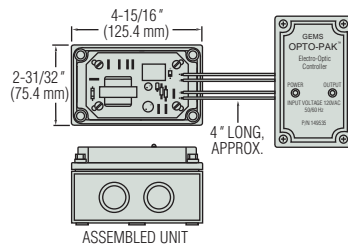
*Ten (10) 1/4" female spade connectors (not shown) shipped loose with each unit.

Dimensions

Open Circuit Board Type



NEMA 4X Type



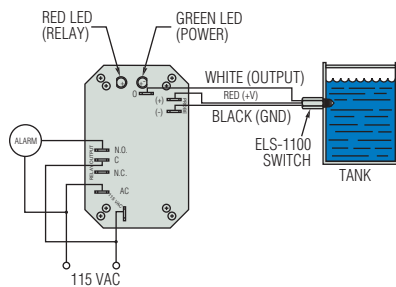
Green and Red LEDs indicate power and output status.

Typical Applications

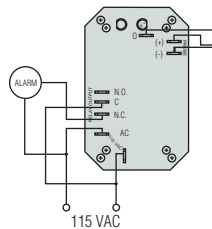
Works with 12V units:

- ELS-1100
- ELS-1100HT
- ELS-1200
- ELS-300
- ELS-1100FLG
- ELS-1150
- ELS-950

Typical Wiring
Normally Open



Normally Closed



How To Order

Specify Opto-Pak™ Controllers by Part Number.

Description	Part Number
Open Board	149536 ⚡
NEMA 4X Enclosure	149535

⚡ – Stock Items

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.

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 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

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.

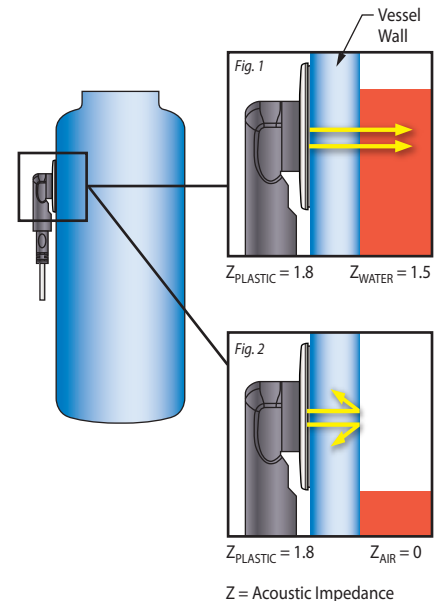
* Acoustic Impedance: a material property defined as the product of sound velocity and material density. The relative transmission and reflection at an interface are governed in part by the acoustic impedances of the materials on each side of the interface. The letter Z is used for acoustic impedance and is expressed in [kg/s m²] = 1 Rayl: Water Z = 1.5 MRayls; Air Z = 0 MRayls



U.S. Patent 7,360,417 

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





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.

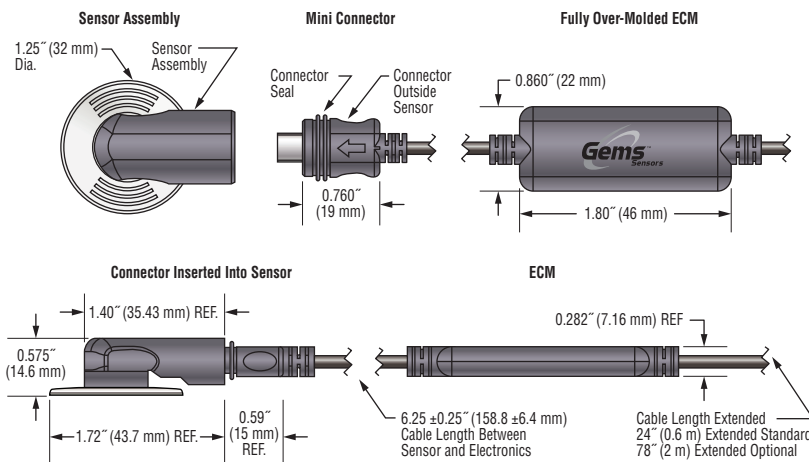
2. Connect

Connect the sensor to the ECM using the mini connector.

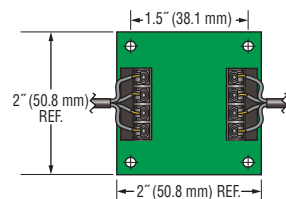
3. Sense

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.

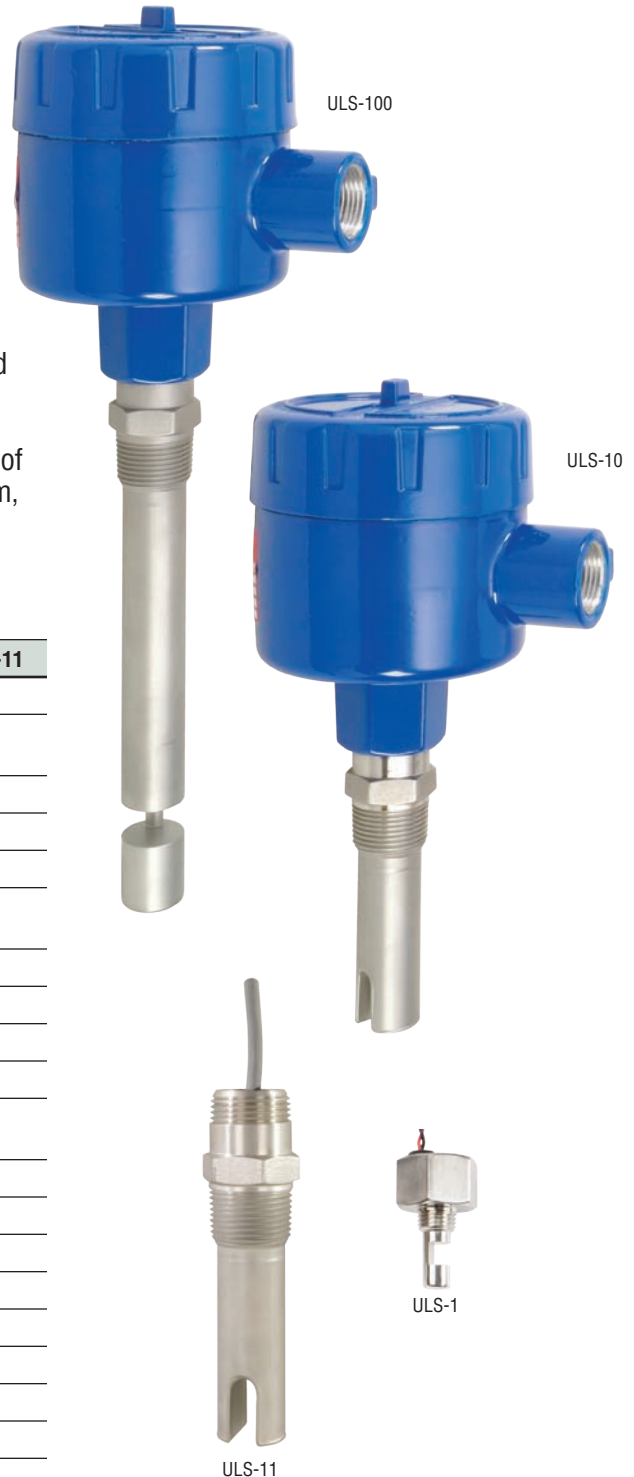
Container Material	Part Numbers							
	Container Thickness							
	.04" to .062" (1.02 to 1.57 mm)		.058" to .082" (1.47 to 2.08 mm)		.08" to .102" (2.03 to 2.59 mm)		.1" to .125" (2.54 to 3.18 mm)	
	N.O Wet Sink	N.C Dry Sink	N.O Wet Sink	N.C Dry Sink	N.O Wet Sink	N.C Dry Sink	N.O Wet Sink	N.C Dry Sink
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.

Ultrasonic Switches Monitor the Toughest Applications

- ▶ Operates in a wide variety of liquids
- ▶ Handles pressures to 1000 psi
- ▶ Unaffected by foam, vapors, particulate or turbulence
- ▶ Lengths to 121 inches (307.3 cm)
- ▶ Can be side, top or bottom mounted
- ▶ Sized and priced for most applications
- ▶ Easy to install — simple to use

GEMS ULS Series of ultrasonic switches are designed for a broad spectrum of viscous to light liquids; including some of the most challenging liquids you may deal with: acids, freon, paints, lacquers, etc. Stainless steel units are built to withstand high temperatures and pressures with welded stainless steel sensor probes that have no seals to leak and no moving parts to wear out. ULS Series switches are unaffected by variation in temperature, pressure, density or type of liquid. ULS-10 and ULS-100 electronics are housed in cast aluminum, NEMA 4/NEMA 7 explosion proof and water tight enclosures.



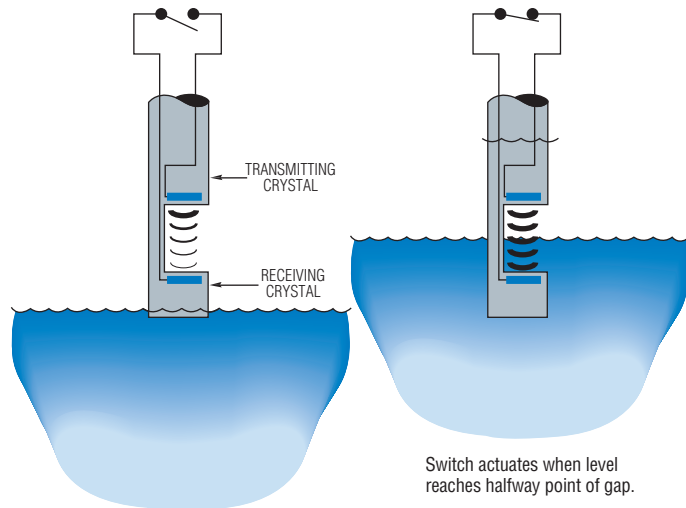
Ultrasonic Switch

Selection Guide

	ULS-1	ULS-10	ULS-100	ULS-11
Single Point Sensing	•	•	•	•
Input Power:				
115 VAC / 230 VAC		•	•	
12/24 VDC		•	•	
9-36 VDC				•
12-36 VDC	•			
Output:				
10 Amp DPDT		•	•	
1 Amp SPDT	•			•
5 mA (dry), 10 mA (wet)	•			
4 mA / 20 mA Single 2-Wire		•		
FM-Approved Explosion Proof Option			•	
Sensor Material Options:				
316 Stainless Steel (standard)		•	•	•
316L Stainless Steel			•	
Monel®			•	
Hastelloy B®			•	
Hastelloy C®			•	
Teflon®	•		•	
Kynar®			•	
CPVC			•	
Polypropylene	•			

General Operating Principle

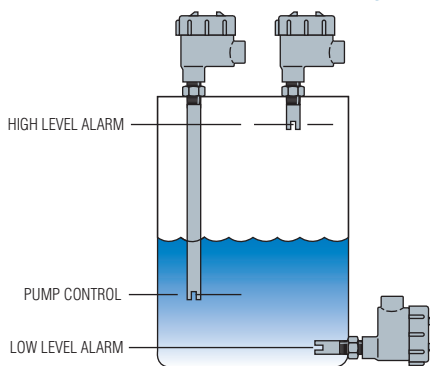
ULS Series switches operate using ultrasonic sound wave propagation. Ultrasonic sound waves are greatly attenuated when transmitted through air. Conversely, when liquid is present, transmission of the sound waves is greatly enhanced. The electronic control unit generates electrical signals that are converted to bursts of ultrasonic energy at the sensor. The ultrasonic bursts are transmitted across the liquid sensing gap. Upon receipt of a valid signal, the solid-state electronics generate a data enable condition, indicating liquid is present. This signal energizes a relay and provides an output condition.



Typical Installation

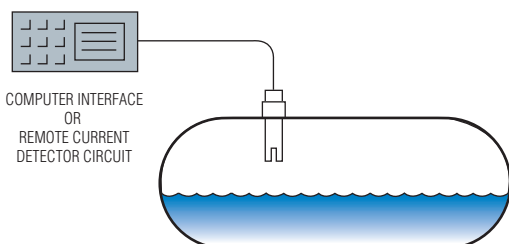
1. Drill a suitable hole in the vessel or pipe wall and tap for 3/4" NPT. In thin walled vessel or material not suitable for threading, weld or braze a bushing to accept the sensor.
2. Screw the sensor in the threaded section and make sure that there is a good seal. Use a pipe compound or sealing tape to avoid excessive tightening. Do not overtighten.
3. Run the power and control wiring cables to the electronics control unit.

Vertical or Horizontal Mounting



Advantages of GEMS ULS-10 2-Wire Output Switches

1. No A.C. Power
2. No Coaxial Cable Required
3. Up to 1000 ft. or Longer Distance
4. Reduces Installation Cost



Secondary Containment Tanks and Piping Systems

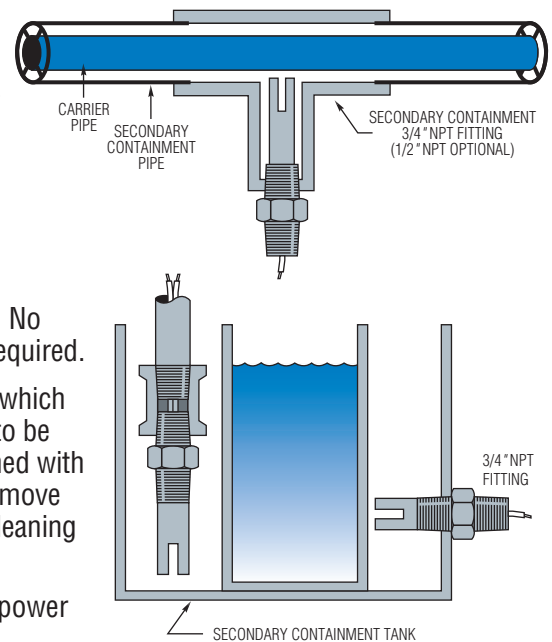
Maintenance

Electronics are constructed with solid-state components and epoxy-potted. Periodically, check and clean the sensor when used with liquids which cause a coating build-up on the sensor. No other maintenance is required.

If the pipe or vessel to which the unit is mounted is to be steam-cleaned or cleaned with abrasive detergents, remove the entire unit before cleaning by:

- (1) Disconnecting the power at source.
- (2) Opening the housing cover.
- (3) Removing power and control wiring cables.
- (4) Unthreading the sensor.

To reinstall, follow installation procedures.



LEVEL SWITCHES - SINGLE POINT

Contents	Page Start
ULS-1 Low Power Steel.....	A-34
ULS-10 & ULS-100 10 Amp Switches	A-35
ULS-11 Low Power Steel.....	A-37

ULS-1 Single Point Level Switches

- ▶ Compact 1/4" and 1/2" NPT versions
- ▶ All-Stainless Steel wetted materials
- ▶ IP68 construction for tanks or sumps

Gems ultrasonic switches are an excellent choice for a broad range of liquids including those with light coating or scaling type characteristics.

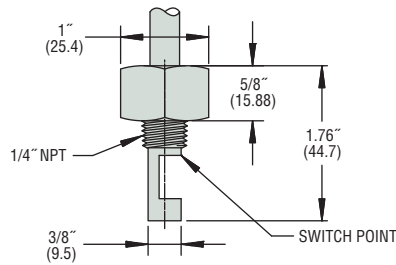
Relay output provides a reliable switch interface with remote devices such as a PLC, SCADA or alarm.

Specifications

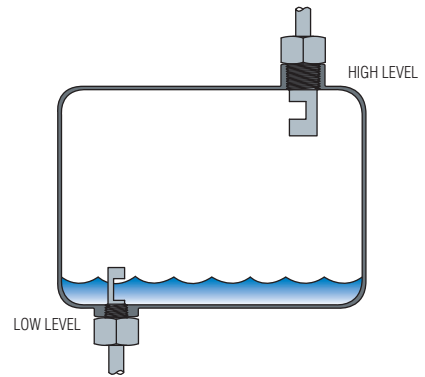
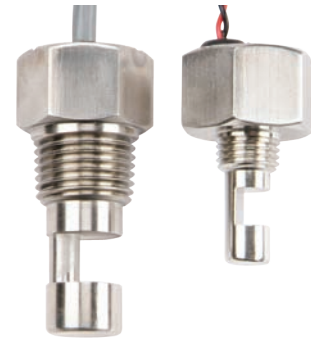
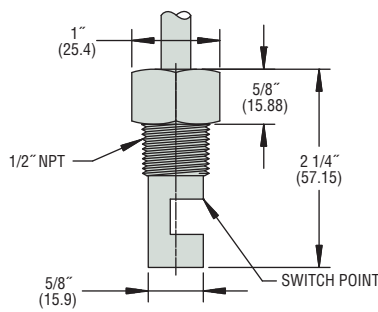
Wetted Material	316L Stainless Steel
Repeatability	2 mm (or better)
Protection	Transient Reverse Polarity
Leakage Current	<50µA
Delay	0.5 seconds
Input Power	5 VDC to 30 VDC
Output	See Ordering Table

Dimensions

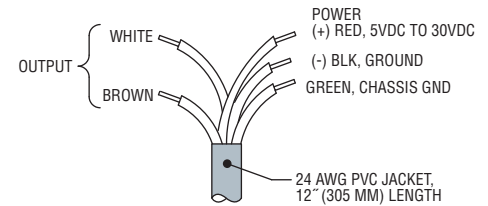
1/4" NPT Mounting



1/2" NPT Mounting



Wiring



How To Order

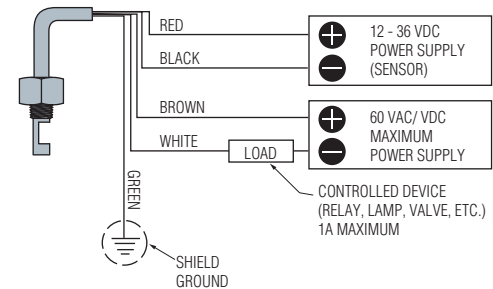
Select a Part Number based on Mounting Size and Output.

Mounting Size	Electronic Output	Part Number
1/4" NPT	Wet Sink	220901
	Wet Source	220902
	1A SPST Relay, Normally Closed	220903
1/2" NPT	Wet Sink	221485
	Wet Source	221486
	1A SPST Relay, Normally Closed	221487

Note: Other Electronic Output options are available. Please contact Gems.

Wiring Direct to a Load

N.C. Operation (Relay Signal Output)



ULS-10 Series and ULS-100 Series

High Performance Models with Explosion-Proof Housings

- ▶ 10 Amp Relay Output
- ▶ 115/230 VAC 12 VDC or 24 VDC Input
- ▶ High Gain
- ▶ No Calibration Necessary
- ▶ Temperatures to 300°F (149°C)
- ▶ Lengths to 99 inches (251.5 cm)

The ULS-100 Series features our high performance sensor probe for handling liquid temperature to 300°F (149°C) and pressure to 1000 psi. Explosion-proof and water-tight, cast aluminum enclosures are standard; FM Approved explosion-proof enclosures are also available.

The ULS-10 Series features a Tip Gap probe design for closer tank bottom access. The miniaturized, encapsulated electronic control unit may be supplied for remote mounting, or directly mounted on sensor in an explosion-proof, NEMA enclosure. FM-Approved, explosion-proof enclosures are also available.

Specifications

Input Power	115/230 VAC, 50/60 Hz; or 12/24 VDC
Gain	
ULS-10 Series	500:1
ULS-100 Series	1000:1
Output	
ULS-10 Series	10 Amp DPDT Relay, or 2-Wire, 4mA-Dry, 20mA-Wet (9-36 VDC)
ULS-100 Series	10 Amp DPDT Relay
Delay (On)	0.5 Seconds
Repeatability	2mm, Typical
Housing	NEMA 4/NEMA 7 Watertight, Explosion Proof Enclosure, Epoxy Coated Cast Aluminum Class I, Group C & D; Class II, Group E, F, & G; and Class III, Division 1 & 2.
Operating Temperature	
Sensor	
ULS-10 Series	-40°F to +300°F (-40°C to +149°C)
ULS-100 Series	-40°F to +300°F (-40°C to +149°C)
Electronics	-20°F to +170°F (-29°C to 77°C)
Pressure, PSIG, Max.	1000 @ 250°F

ORDER IT!
 Ordering is Easy! See Page A-38.
 Easy online ordering too!

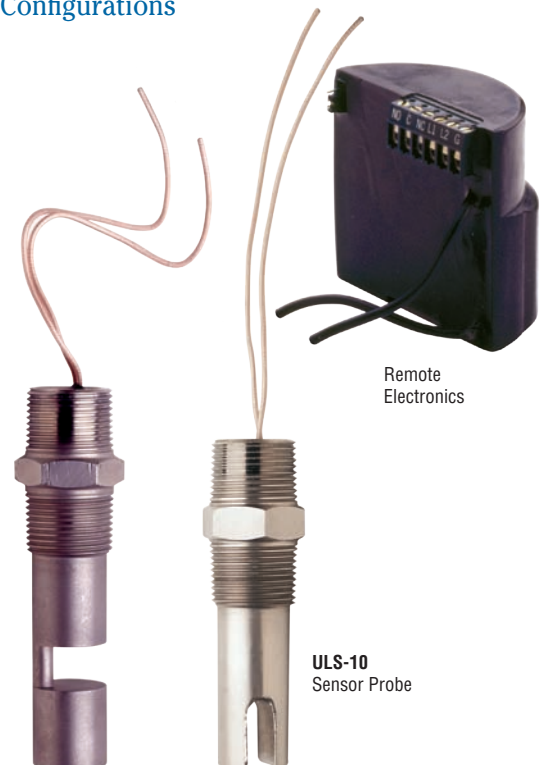


ULS-100 Series
 FM-Approved Explosion-Proof Enclosure may be ordered by specifying ULS-100-EP.



ULS-10 Series
 Will sense liquid to within 1/4" of tank bottom.

Remote Electronics Configurations



ULS-100
 Sensor Probe

ULS-10
 Sensor Probe

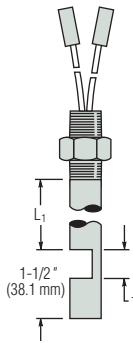
LEVEL SWITCHES – SINGLE POINT

1. Mounting Type*

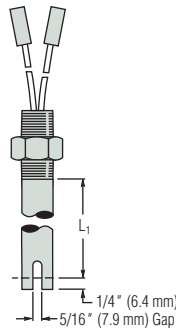
Integral Electronics 3/4" NPT		Remote Electronics 3/4" NPT	
ULS-100 Series	ULS-10 Series	ULS-100 Series	ULS-10 Series
Mounting and Sensor Materials		316 Stainless Steel (Standard) Consult Factory For Other Materials.	

*Flanges also available; consult factory for sizes and materials.

2. Actuation Level Dimensions



ULS-100 Series
Switch actuation level (L_1) is determined following the guidelines below.
 $L_1 = 1'' (25.4 \text{ mm})$ Minimum
 $99'' (251.5 \text{ cm})$ Maximum*

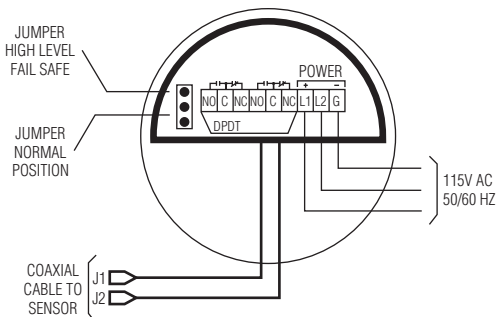


ULS-10 Series
Switch actuation level (L_1) is determined following the guidelines below.
 $L_1 = 2-1/4'' (57.2 \text{ mm})$ Minimum
 $99'' (251.5 \text{ cm})$ Maximum*

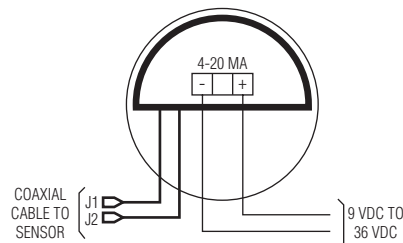
*Consult factory for longer lengths.

Wiring Diagrams

DPDT – ULS-10 and ULS-100 Series



4-20mA – ULS-10 Series only



Note:
For 24 VDC or 12 VDC Models
Connect Positive (+) to L1-Terminal
Connect GND (-) to G - Terminal

ULS-11 Series – Single Point Self-Contained Relay Saves Space

- ▶ 1 Amp SPDT Relay Output
- ▶ 9 to 36 VDC Input
- ▶ Temperatures to 160°F (71.1°C)
- ▶ Lengths to 99 inches (251.5 cm)

By integrating a 1 amp relay into the stem, we've made the ULS-11 our most compact ultrasonic unit. Yet, as unobtrusive as it is, the ULS-11 still delivers ultra-reliable solid-state performance in lengths up to 99 inches. Tip gap probe configuration places sensing point at 1/4 inch from probe tip for closer tank bottom sensing. Electronics are completely epoxy sealed for years of maintenance free service.

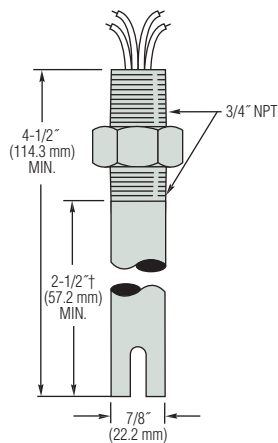
Specifications

Input Power*	9 VDC to 36 VDC
Leakage Current	<50 µA
Gain	300:1
Output	1 Amp, SPST Relay output N.O. or N.C.
Consumption	Relay 40mA energized; 10mA relay off
Repeatability	2mm typical
Delay (On)	0.5 Seconds
Operating Temperature	-20°F to +160°F (-29°C to +71°C)
Pressure, PSIG, Max.	1000
Protection	Transient Reverse Polarity
Lead length	12" PVC**

* Contact GEMS for optional AC input versions.
** Consult factory for longer lead lengths.

1. Mounting Type

Type 1
3/4" NPT



Mounting and Sensor Materials	316 Stainless Steel
--------------------------------------	---------------------

† 2-1/4" units are standard stock units. All other lengths are custom and require 5-piece minimum order. Contact factory.

How To Order

Specify ULS-11 Level Sensors by Part Number.

Description	Part Number
2.25" L ₁ , SPST N.O.	175387

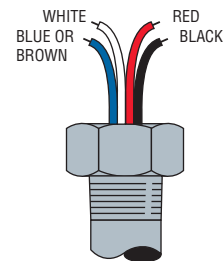
⚡ – Stock Items

ORDER IT!

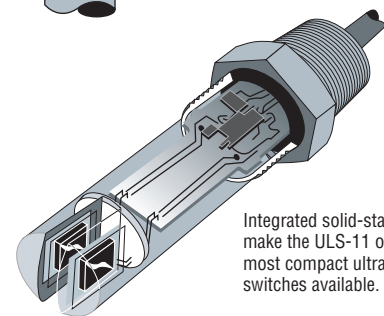
Ordering is Easy! See Page A-40.
Easy online ordering too!



Wiring Diagram

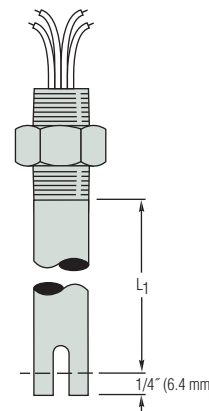


Color Code
Power: Red (+)
Black (-)
Relay: Common - White
N.O. - Blue
N.C. - Brown




Integrated solid-state electronics make the ULS-11 one of the most compact ultrasonic level switches available.

2. Actuation Level Dimensions



Switch actuation level (L₁) is determined following the guidelines below.

L₁ = 2-1/4" (57.2 mm) Minimum
99" (251.5 cm) Maximum

 <p>Photocopy This Form Use one form for each product type you are selecting. <small>This form may also be completed online at gemssensors.com for RFQ.</small></p>	This is a <input type="checkbox"/> Request for a Quote <input type="checkbox"/> Order P.O.# _____ Quantity Needed _____ Date Required ____/____/____ Shipping Method: _____ Partials Accepted: <input type="checkbox"/> Yes <input type="checkbox"/> No	Name _____ Company _____ Street _____ City _____ State ____ Zip _____ Phone (____) _____ Fax (____) _____
--	---	--

Ultrasonic Level Switches

Application Environmental Conditions

This information is essential to the accurate and proper operation of your GEMS configurable sensors. Please complete fully and accurately.

- | | |
|---|--|
| 1. Liquid Media: _____
2. Pressure: Minimum _____ psig Maximum _____ psig
3. Temperature: Minimum _____ °F Maximum _____ °F
4. Specific Gravity: Minimum _____ Maximum _____ | 5. Viscosity: _____ SSU
6. Tank Material: _____
Tank Depth: _____
7. Unit is Mounted In: <input type="checkbox"/> Tank Top <input type="checkbox"/> Tank Bottom |
|---|--|

1. Series (Page Number):

- ULS-11 (A-39) ULS-10 (A-37) ULS-100 (A-37)

2. Input Power:

ULS-10, ULS-100:

- 115 VAC 230 VAC 12 VDC 24 VDC

ULS-11:

- 9 to 36 VDC

3. Output (Check One Box Only):

ULS-11: SPST N.O. N.C.

ULS-10: DPDT 2-Wire, 4mA (Dry), 20mA (Wet)

ULS-100: DPDT

4. Mounting Type:

ULS-11: Type 1

ULS-10, ULS-100:

- Integral Electronics:
 NEMA 4 Enclosure: NEMA 7 Enclosure:
 Remote Electronics: Sensor Cable Length _____ inches

Please specify any non-standard material request here:

Standard sensor material is 316 Stainless Steel. See Table on Page A-34 for alternate materials available.

5. Actuation Level Dimension:

Actuation Level	Distance to Actuation Level – Inches*	Range		
		Series	Min.	Max.
L1		ULS-11	2-1/4"	99"
		ULS-10	2-1/4"	120"
		ULS-100	1"	120"

* Measure from bottom of mounting threads.

Please contact GEMS Sensors Inc. for any configuration or special requirements not covered on this form. **800-378-1600**

Quote \$ _____ Date Quoted ____/____/____



Gems Sensors & Controls
 One Cowles Road
 Plainville, CT
 06062-1198

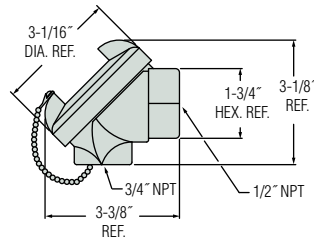
tel 860.747.3000
 fax 860.747.4244
www.gemssensors.com

Junction Boxes

GEMS offers optional CSA Listed and FM Approved, explosion-proof junction boxes for many level switch models. Compatible level switches are indicated throughout this catalog by the small icon—

NOTE: Explosion-proof ratings are available only when J-boxes are part of factory assembled sensor unit. J-boxes below, when ordered separately, do not carry explosion-proof ratings.

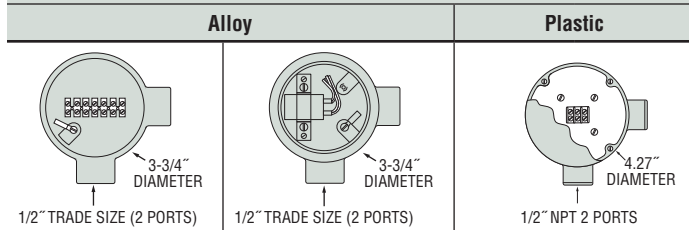
Explosion-Proof J-Boxes



	Aluminum	Iron
Materials	Die Cast Aluminum	Cast Iron
	Stainless Steel Chain and Pin	
	EPDM Rubber Gasket (300°F/149°C Max. Service Temp.)	
Finish	Polished	Electroless Nickel Plate
Weight (approx.)	.62 lbs.	.62 lbs.
NEMA Rating	4, 13	4
Part Number	192147	198848

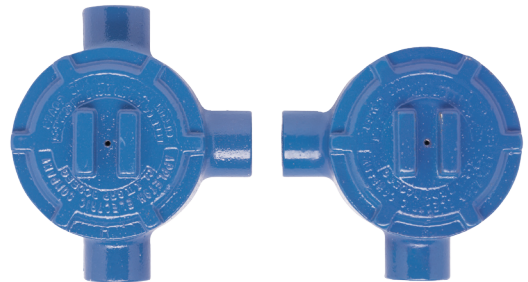


Non-Explosion Proof J-Boxes



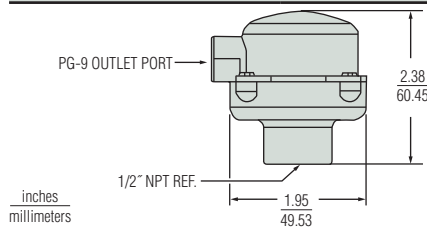
	Alloy		Plastic	
Type	3-pin	7-pin	3-pin	7-pin
Part Number	113873	113877	113850	118828

⚡ – Stock Items.



Junction boxes are CSA and FM approved for explosion proofing in Class I, Division 1, Groups B, C, D, E, F, G

Conduit/Cable Gland Connections



	Standard	5-Amp Relay
Specifications	Empty enclosure for lead wire splice connections.	120 VAC 50/60 HZ Contacts: 5A – 240 VAC Res 1/3 HP – 120 VAC 5A – 28 VDC Res.
Part Number	181410	180417



CAP-100 Series – Non-Contact, Capacitive Level Sensor

- ▶ For non-metallic containers
- ▶ Easy external mounting
- ▶ Compact – 30x45 mm (1.18" x 1.77")
- ▶ Potentiometer for sensitivity adjustment
- ▶ Power on and signal LED indicators

The CAP-100 series offers a unique level sensing solution for a wide variety of bottle types including plastic, glass and fiberglass. The non-contact sensor is ideally suited for medical applications such as waste, reagent or diluent liquids as well as dark, sticky or viscous fluids. The easy-to-calibrate sensor is available in both aqueous and non-aqueous versions and can be delivered with factory preset sensitivity for quick installation for OEM orders. The CAP-100 may also be used as a proximity sensor to detect the presence of solids such as paper or pulp.

Specifications

Performance	
Nominal Sensing Distance, Sn	0.39" (10mm)
Sensing Range	0-0.39" (0-10mm)
Repeat Accuracy - (% of Sn)	<10%
Hysteresis - (% of Sn)	<20%
Mechanical	
Enclosure Ratings	IP67, NEMA 1,3,4,6,13
Operating Temperature Range	-13°F to +158°F (-25°C to +70°C)
LED Signal Indicator	Yellow
Power On LED Indicator	Green
Potentiometer	Yes
Sensor Type	
Unshielded	L-Type, Non-Embeddable
Shielded	D-Type, Embeddable
Sensor Material	Glass Filled Nylon
Cable	78.74" (2 meter), 3 Wire PVC
Shock	30g, 11ms
Vibration	55Hz, 1mm amplitude in all planes
Electrical	
Supply Voltage	10-48 VDC
Continuous Switching Current	300 mA
Voltage Drop	<2 VDC
Current Consumption	<10 mA
Switching Frequency	100 Hz
Transient Protection	2kV, 1ms, 1 kOhm
Overload Protection	Yes
Short Circuit	Yes
Reverse Polarity Protection	Yes
Approvals	CE

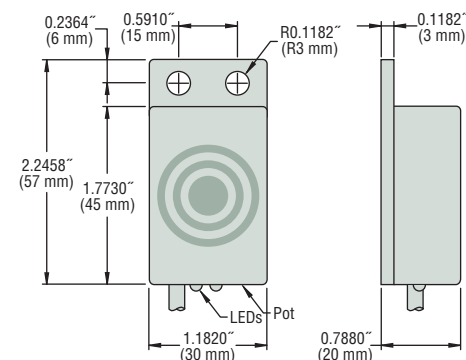


Typical Applications

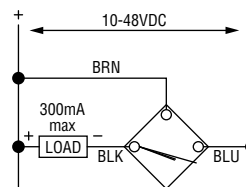
Fluid Monitoring:

- Waste
- Reagents
- Diluent
- Detergent/Wash
- Coolant
- Printing Ink

Dimensions



Wiring Diagram



How To Order

Select a Part Number based on Fluid Properties and Sink State.

Fluid Properties	Max. Container Wall Thickness	Wet/Dry Sink	Part Number
Water Based, Conductive (unshielded sensor)	5/8"	Wet	230079
		Dry	230081
Non-Water Based, Not Conductive (shielded sensor)	3/8"	Wet	228830
		Dry	229855

CAP-200 Series – Compact, 1/2" NPT Mount

- ▶ For metallic and non-metallic containers
- ▶ Food grade plastic housing
- ▶ No sensor well required
- ▶ Potentiometer for sensitivity adjustment

The CAP-200 Series is easily threaded directly into 1/2" NPT fittings for an easy level sensing solution within a wide variety of metal and non-metal tanks. The highly accurate sensor is built from durable Delrin® material, and is available in both aqueous and non-aqueous versions. The easy to calibrate sensor can be delivered with factory preset sensitivity for quick installation by OEM. The CAP-200 may also be used as a proximity sensor to detect the presence of solids such as paper or pulp.

Specifications

Performance	
Nominal Sensing Distance, Sn	0.39" (10mm)
Sensing Range	0-0.39" (0-10mm)
Repeat Accuracy - (% of Sn)	<10%
Hysteresis - (% of Sn)	<20%
Mechanical	
Enclosure Ratings	IP67, NEMA 1,3,4,6,13
Operating Temperature Range	-13°F to +158°F (-25°C to +70°C)
LED Signal Indicator	Yellow
Power On LED Indicator	Green
Potentiometer	Yes
Sensor Type	
Unshielded	L-Type, Non-Embeddable
Shielded	D-Type, Embeddable
Barrel Material	Delrin®
Termination	78.74" (2 meter), 3 Wire PVC
Shock	30g, 11ms
Vibration	55Hz, 1mm amplitude in all planes
Electrical	
Supply Voltage	10-48 VDC
Continuous Switching Current	300 mA
Voltage Drop	<2 VDC
Current Consumption	<10 mA
Switching Frequency	100 Hz
Transient Protection	2kV, 1ms, 1 kOhm
Overload Protection	Yes
Short Circuit	Yes
Reverse Polarity Protection	Yes
Approvals	CE pending

How To Order

Select a Part Number based on Fluid Properties and Sink State.

Fluid Properties	Min. Container Wall Thickness	Container Material	Wet/Dry Sink	Part Number
Water Based, Conductive (unshielded sensor)	5/8"	Non-Metallic	N.O. Wet	230077
			N.C. Dry	230078
Non-Water Based, Not Conductive (shielded sensor)	3/8"	Non-Metallic or Metallic	N.O. Wet	230082
			N.C. Dry	230083

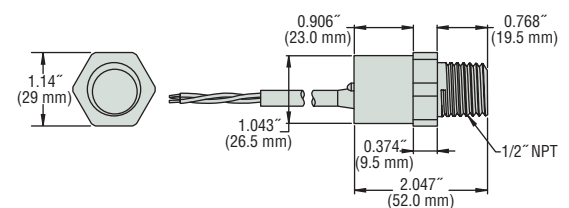


Typical Applications

Fluid Monitoring:

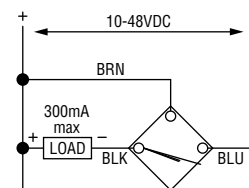
- Waste
- Reagents
- Diluent
- Detergent/Wash
- Coolant
- Printing Ink

Dimensions



Wiring Diagram

Normally Open



Normally Closed

