

Liquid **Level** and **Flow** Sensors

Gems
Sensors

Welcome to Gems Sensors

Liquid Level and Flow Catalogue

Gems is the preferred fluid sensor supplier of OEMs in hundreds of different industries for three very important reasons:

1. We bring an innovative design, application and problem-solving approach to meet your needs;
2. We provide exceptional service to our customers;
3. We offer the most comprehensive selection of fluid sensing components.

We believe that you can make a better sensor decision when you have a true choice of sensing technologies. With GEMS Products you are not forced to "accommodate" a sensor into your application - we have the selection to allow an ideal sensor/capability match for all your specific requirements.

GEMS offers technologies ranging from solid-state, electro-optic and conductivity sensors to magnetically actuated reed switches, from chemical vapour deposition (CVD) strain gauges to hall-effect sensors. Five decades of application experience provides us with the knowledge of how best to put these technologies to work for you.

For the last 50 years we have listened and responded to our customer needs, helping our OEM customers to maintain a competitive edge and providing end users with reliable solutions to the most demanding level and flow measuring problems.

Whether you contact us first or last, you'll find your sensor solutions at GEMS! Please call, or visit us online, to find out why GEMS is the supplier-of-choice for key OEMs around the world.



Visit us at: www.gems-sensors.co.uk or www.gemssensors.com

The fastest way to more information:

...just complete the form below and fax it to your nearest sales office (address on back page)

From:

Name Company

Department..... Street/PO Box

Post Code/City..... Telephone

Email Fax

I have the following application.....

.....

.....

.....

and I would like to talk with one of your sales engineers. Please call me (date/time)

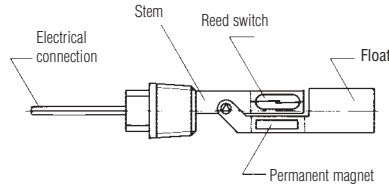
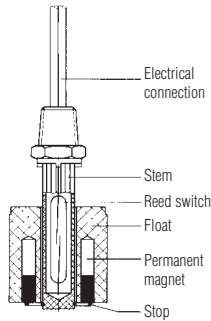
Please send me more information on:

- GEMS Pressure Transducers
- GEMS Pressure switches
- GEMS Magnetic Level Indicators
- GEMS Diptape Indicators
- GEMS Tank Level Indicating Systems TLI

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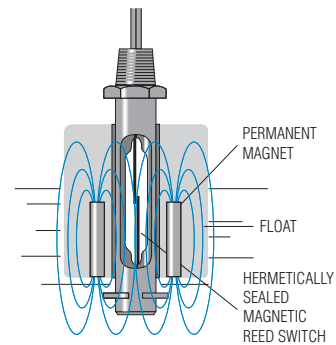
Operating Principle of Gems Level Switches



General Operating Principle

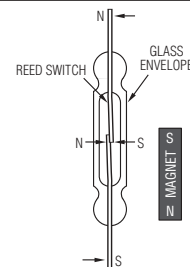
GEMS Level Switches operate on a direct, simple principle. In most models, a float encircling a stationary stem is equipped with powerful, permanent magnets. As the float rises or lowers with liquid level, the magnetic field generated from within the float actuates a hermetically sealed, magnetic reed switch mounted within the stem. The stem is made of non-magnetic metals or rugged, engineered plastics. When mounted vertically, this basic design provides a consistent accuracy of $\pm 2\text{mm}$. 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 minimised, 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" on page 7 for information on extending the life of GEMS Level Switches.



Acceptance and Approvals

Various Civil, Military, Naval and Coast Guard approvals have been attained for special products. Some switches have been developed for applications in ships and have passed shock and vibration tests, seismic shock tests and other quality tests. Please ask for further details.

Contact Sales Office for detailed ordering information.

Approvals available on selected products:



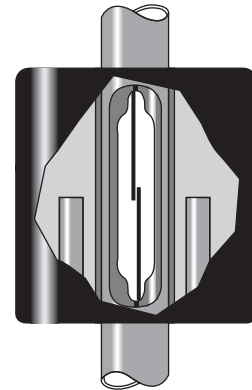
CE Products supplied as standard.
Consult Sales Office for further details.

Reed Switch Protection

The hermetically-sealed reed switch used in GEMS level switches are extremely rugged and designed to operate reliably for many years – 2 million cycles under ideal conditions. To achieve the maximum service life, reed switches benefit from protected electrical supply.

IMPORTANT:

- ▶ Don't be misled by the resistive ratings of the switches. Most applications involve inductive loads.
- ▶ Don't be misled by the wattage ratings of loads. Low wattage loads are often high inductive devices, making contact protection very important.



The dependable reed switch is at the heart of each level switch shown in this catalogue.

Contact Protection Requirements

When switching inductive loads such as relays, solenoids and transformers, reed switch contacts require protection in order to ensure long, dependable life. When current is interrupted, the inductance or electrical inertia of the load generates a large high frequency voltage, which appears across the switch contacts. If the voltage is large enough, it can break down the medium in the gap between them, making a conductive path. This phenomenon, called "arcing," is the spark you see. Arcing can cause the contacts to burn, weld together or stick; thus, giving unreliable performance. The purpose of protection circuits is to prevent arcing, by shorting this voltage through an alternate path.

Recommended Protection

D.C.

A 1N4004 diode (or equivalent) connected cathode-to-positive, as shown in Figure 1, is recommended. The diode does not conduct when the load is energised, but conducts and shorts out the generated voltage when the switch opens. The generated voltage always acts in series with the applied voltage.

A.C.

A resistor and capacitor, connected in parallel with the switch, as shown in Figure 2, is recommended. The capacitor is a high impedance to 60 hertz, but is essentially a short circuit to high frequencies of generated voltages.

Transient suppressors or varistors may also be used to dissipate the transient and protect the switch contacts.

Notes:

1. Don't be misled by low voltage $\leq 10V$, low current $\leq MA$ type of loads. These loads may require special gold plating on contact surfaces to operate reliably at these low voltage/low current levels. For long term reliable low current switching action, Gems 20VA switches should be operated at a minimum of 12V to assure contact make; e.g., break through an oxide film which may form over long periods of time.
2. Capacitive loads and lamp loads - Inrush currents of up to 15 times the normal current can occur with inductive loads, especially with lamp loads. In the worst case, inductive loads can cause welding or destruction of the reed switch contacts. Therefore, a protection resistor should be connected in series to the reed switch to limit the current, when switching capacitive loads, filament lamps and other circuits via long cables (fig. 3).
3. The following rating may be used for selection.

$V_{RMS} = 130$ volts Energy = 30-50 joules Peak Amps = 4000-6000

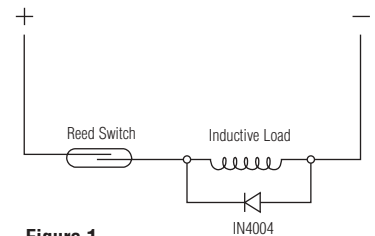


Figure 1
D.C. Contact Protection (Drain the Load)

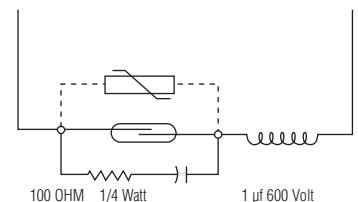


Figure 2
A.C. Contact Protection (Protect the Switch)

Single, Multi Point Level and Continuous Output Selection Chart

Type	Installation	Max. length	Material	Model	Page	*Max Temp °C	*Max Pressure bar
Conductivity	Any	-	Metal	CLS-1200	8	125	170
	Any	-	Plastic	ELS-900	11	125	17
	Any	-	Plastic	ELS-1100/HTS	12	100	10
Electro-Optic	Horizontal	-	Metal	ELS-1150	15	100	170
	Horizontal	-	Metal	ELS-1200	16	116	170
	Vertical	380mm	Plastic	ELS-300	17	80	10
Single Level Switches 1 Switch point	Horizontal	-	Plastic	LS-6	21	107	7
	"	-	Plastic / Metal	LS-7	20	149	20
	"	-	Metal	LS-1050E	23	100	166
	"	-	Plastic / Metal	LS-2050E	23	110	106
	"	-	Metal	LS-2050E	23	150	60
	"	-	Metal	LS-52100E	23	150	35
	"	-	Plastic / Metal	LS-77700	27	150	10
	Vertical	-	Plastic / Metal	LS1750E	27	80	10
	(±30°)	-	Plastic	LS-3	25	121	10
	"	-	Plastic / Metal	LS-800-5 Bottle	30	150	50
	"	-	Plastic / Metal	LS-1700	27	110	70
	"	-	Metal	LS-1750E	27	150	20
	"	-	Plastic / Metal	LS-1800	27	110	10
	"	-	Plastic / Metal	LS-1900	28	110	10
	"	-	Plastic	LS-1900T	28	150	3
	"	-	Metal	LS-1950E	28	150	30
"	-	Plastic	LS-74780	28	80	1	
"	-	Plastic / Metal	LS-159000 Bottle	30	150	27	
Bi-ge Water Level Switches	Bracket	-	Plastic / Metal	LS-240E	29	80	10
	(±30°)	-	Metal	LS-270E	29	80	10
Pear Drop Float	Vertical	-	Plastic	M	31	60	1
	Vertical	-	Plastic	G & GM	32 & 33	55	2
Multiple Level Switches 1 ... 7 Switch points	Vertical (±30°)	400mm	Plastic	LS-300	35	105	17
		800mm	Plastic / Metal	LS-400E	38	110	20
		3000mm	Plastic / Metal	LS-800E	41	150	30
		2000mm	Plastic	LS-800-PVC	44	60	1
Continuous	Vertical	2000mm	Metal	MIR-800	48	65	7
	Vertical	3500mm	Metal	MIR-900	49	65	7

Single and Multiple Level Switches for Ex-applications: Please request a Hazardous Area catalogue * Some material/media combinations will result in reduced specification. Please refer to full product specifications

Solid State Level Sensors - CLS-1200

SOLID STATE

CLS-1200 Series Conductance Type Level Sensors are the Modern Solution for Nightmare Fluid Monitoring Applications

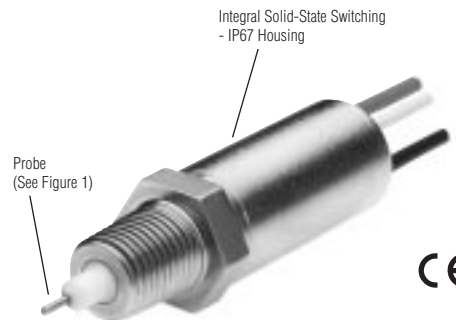
- ▶ No Moving Parts
- ▶ Integral Electronic Switching
- ▶ 172 bar Max. Pressure
- ▶ 125°C Max. Temperature
- ▶ Built-In Slosh Dampening

Offering unequaled dependability and longevity in a wide range of demanding fluid monitoring applications, CLS-1200, solid-state sensors have no moving parts and are free from maintenance or calibration requirements. Built-in switching electronics withstand 125°C temperatures eliminating the need for a remotely mounted controller, reducing time and cost associated with installation.

High-pressure, leak-free operation is ensured by an exclusive fused ceramic sealing process that eliminates o-rings and compression fittings at the sensor tip. Rugged, CLS-1200 sensors feature built-in protection against reverse polarity, overvoltage and load-dump to deliver long-term reliability.

Typical Applications

- ▶ Coolant level monitoring in radiators & expansion reservoirs
- ▶ Waste water level monitoring
- ▶ Leak detection
- ▶ Water level monitoring in oil separators
- ▶ Steam boilers



PATENT PENDING

LEVEL SWITCHES

Specifications

Operating & storage temperature

Process fluid & electronics -40 to 125°C

Input voltage 8–32 VDC

Signal output options
 A: Wet Sink (open collector output, ON in liquid)
 B: Dry Sink (open collector output, ON in air)

Maximum load capability*

Outputs A & B 250 mA

Outputs C & D 0.5 mA

Maximum pressure* 170 bar

Slosh dampening 5 ±2 Seconds (standard)

Sensitivity 10,000 Ohms (fluid resistance)

Wetted materials 330 SS, 304L SS and Ceramic

Moisture entry protection rating IP67 (NEMA 6 equivalent)

Mounting 1/4" NPT

Electrical termination Lead Wires, 18 AWG, Polymeric, 0.6m Extended

Approvals CE

Additional circuit protection
 Reverse Voltage (-45 VDC for 1 hr)
 Over Voltage (80 VDC for 2 min)
 Load Dump (123 VDC pulse every 15 sec for 2 hrs)

* Applicable across entire operating temperature range. Designed for use only in electrically conductive liquids having a resistance of 10,000Ω or less.

Dimensions (in mm)

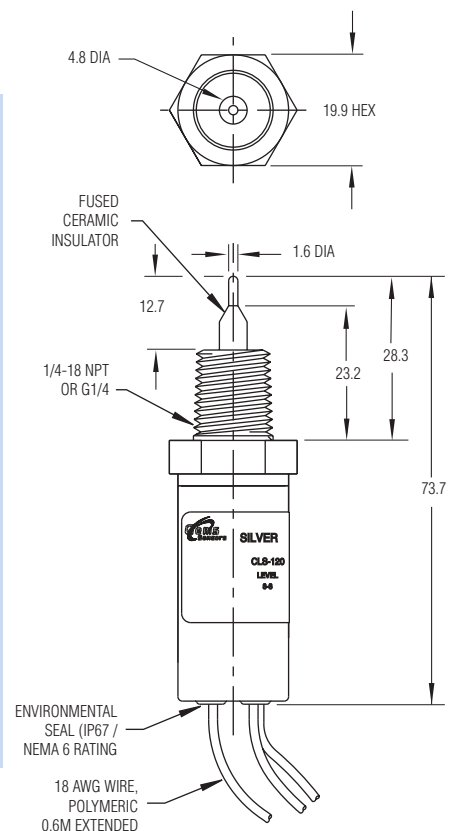
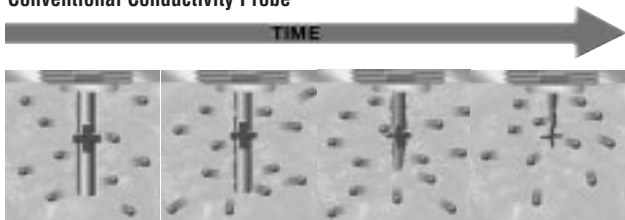


Figure 1

CLS-1200 - Not Your Typical Conductivity Sensor!

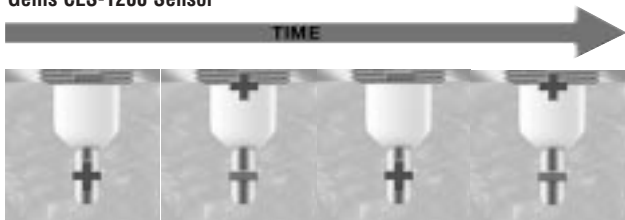
Users of conventional conductivity-based liquid level sensors know that erosion of the probe often renders them inoperable after a short time. CLS-1200 sensors are immune to this erosion due to their unique **alternating potential electronics**.

Conventional Conductivity Probe



When a single potential (DC voltage) is applied to a probe submerged in a conductive liquid, the metal from that probe will be removed in a chemical process known as electrolysis.

Gems CLS-1200 Sensor



CLS-1200 liquid level sensors use an alternating potential configuration (AC voltage or frequently reversing DC voltage) which allows it to perform flawlessly over time without degradation. When an alternating potential is applied, the metal removed in the first half cycle is replaced in the second half cycle resulting in virtually zero probe material loss.

How to Order

Select a Part Number based on Thread and Output desired.

Output	Thread	Description Code	Part No.
ON in Liquid	NPT	CLS1200NPTA05	195223
Wet Sink (open collect for output)	BSP	CLS1200BSPA05	195227
ON in Air	NPT	CLS1200NPTB05	195224
Dry Sink (open collect for output)	BSP	CLS1200BSPB05	195228

(wet = NO, Dry = NC)

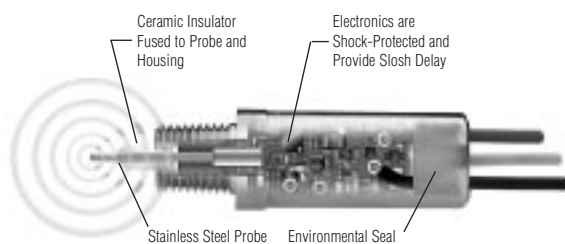
Notes:

CLS-1200 with G1/4 thread fitting will require face to face seal. We offer Industrial Bonded Seals Part Number 499207-0002 (Viton in cadmium plated steel) suitable for temperatures up to 200°C.

For alternatives, and/or material compatibility, contact Sales Office.

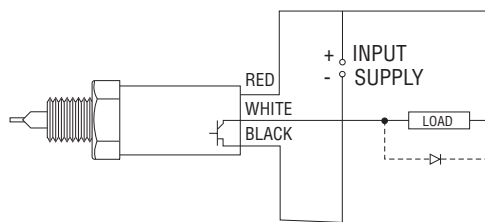
Operating Principle

Gems CLS-1200 liquid level sensors are solid-state devices designed to detect the presence or absence of an electrically conductive liquid. Each sensor contains integral, high-temperature-rated electronics that generate an alternating voltage to the stainless steel tip. The presence of an electrically conductive liquid completes the circuit which, in turn, changes the condition of the transistor output. Output options vary and can be used to actuate relays, indicator lights or LEDs, as well as to interface with CMOS/TTL logic, PLCs or microprocessors.



Typical Wiring Diagrams

Output Options A & B (Wet or Dry Sink)



Notes:

1. Sensor housing is internally grounded, black (negative) to case.
2. Inductive loads must be diode suppressed.
3. External load supply (40 VDC, max.) may be used as long as it is using the same system ground.

Electro-Optic Level Sensors

ELECTRO OPTIC

LEVEL SWITCHES

Let GEMS keep an 'Eye' on your Liquid Level: Compact, Electro-Optic Liquid Level Switches and Controllers

- ▶ Small size
- ▶ Economically priced
- ▶ Built in, solid-state electronics
- ▶ No moving parts
- ▶ Triangular prism, not susceptible to droplets
- ▶ Simple, one-unit installation

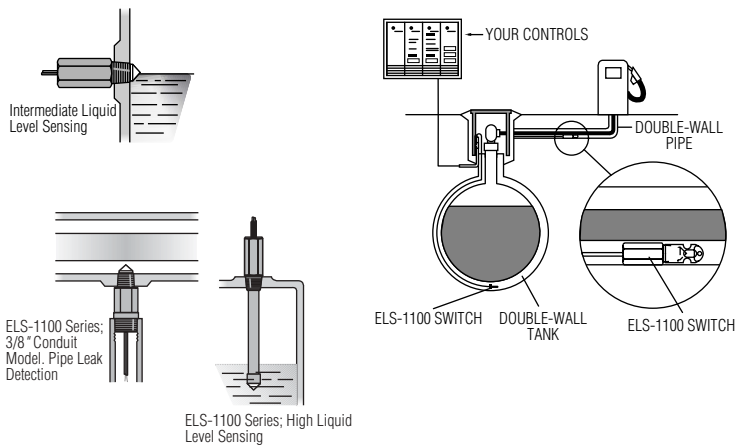
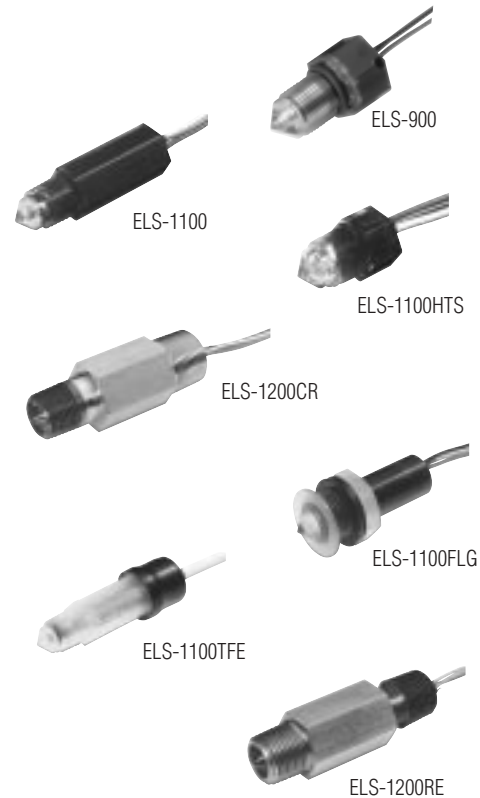
ELS Series Level Switches are low cost, compact, optical level sensors with built-in switching electronics. With no moving parts, these small units are ideal for a variety of point level sensing applications - especially where dependability and economy are a must.

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

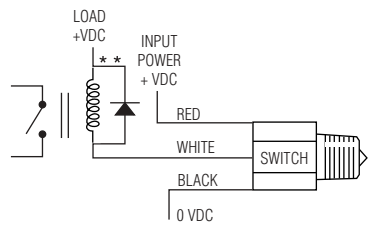
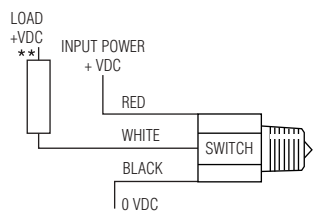
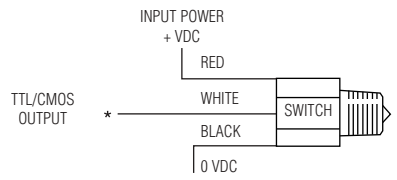
Level switches are suitable for high, low or intermediate level detection in practically any tank, large or small. Installation is simple and quick through the tank top, bottom or side. Solid state switching ensures dependability over long service life.

Typical Applications

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



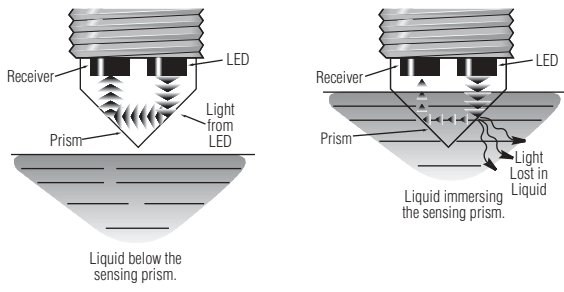
Typical Wiring Diagrams - ELS-1100 and ELS-300 Series



Simple Operating Principle

The electro-optical 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.



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

Reflective Surface

Any optical sensor may be affected by reflective surfaces. Consult GEMS if prism is to be less than 50mm from any reflective surface.

ELS-900 Series

The smallest electro optic sensor in our arsenal, the ELS-900 also carries the highest temperature capability of any of our optic sensors. Its Polyethersulfone housing extends this sensor's compatibility and is very affordable in high volumes. Excellent for industrial OEMs preferring optics with high temperature and small space requirements.

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

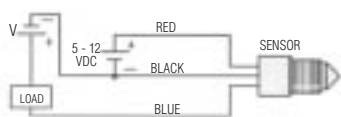
Specifications

Materials	
Housing	Polyethersulfone
O-Ring	Viton® (1/2" SAE #5 and M 12x1-8)
Operating pressure	17 bar (0 to 250 PSI), maximum
Operating temperature*	-40°C to +125°C (-40°F to +257°F)
Current consumption	4 mA, for 5 Vdc (No Load) 10 mA for 12 Vdc (No Load)
Output	May Sink 40 mA. max., up to 30 VDC.
Repeatability	±1 mm
EMI	CE approved per EN 61000
Shock tested	Per MIL-Std-202 Method 204
Vibration tested	Per MIL-Std-202 Method 213B

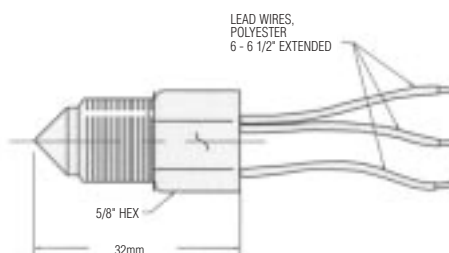
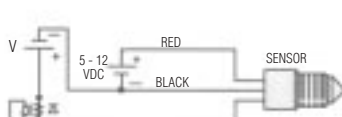
* These switches are not for use in freezing liquids, Leads +120°C

Typical Wiring Diagrams

External Load



Relay Output



1/2" - 20 SAE #5 Mounting



1/4" - NPT Mounting



U.L. pending **M12 x 1 Mounting**



How To Order

Specify Part Number based on Input and Output Condition required.

Input Power	Condition	1/4" NPT	1/2"-20 SAE #3	M12 x 1
5 V	Wet	207200	208993	208997
	Dry	207300	208994	208998
12 V	Wet	205200	208991	208995
	Dry	205300	208992	208996

(Wet = NO, Dry = NC)

Standard Products in **bold**

ELECTRO OPTIC

LEVEL SWITCHES

www.gems-sensors.co.uk

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	10 bar Maximum
Operating temperature*	-18°C to 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).



U.L. Recognised

* These switches are not for use in freezing liquid
 ** Not suitable for long term immersion in water

Dimensions (in mm)

	1/4" NPT Mounting	1/4" NPT Mounting 3/8" Conduit	1/2" UNF Mounting with O-ring	M12x1-8g Straight Thread with O-Ring	"Fish" Pull Ring
Electrical Termination	Lead Wires, 22 AWG, PVC Jacketed, 0.3m				0.6m Cable, 22 AWG, PVC Jacketed

How To Order

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

Supply	Probe Condition at Current Sink	Mounting Type						
		1/4" NPT	1/4" NPT & 3/8" Conduit		1/2" UNF	M12x1		"Fish" Pull Ring
		Polysulfone	Polysulfone	Nylon**	Polysulfone	Polysulfone	Nylon**	Polysulfone
5 VDC	Wet	138167	144225	175631	144235	166541	175630	—
10-28 VDC	Wet	142700	143585	157750	143580	169555	175620	143577
	Dry	143570	143590	175632	143575	169556	175610	148973

(Wet = NO, Dry = NC)

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.

Standard Products in **bold**

ELS -1100HT Handles Temperatures to 100°C

ELECTRO OPTIC

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 100°C. They feature 3/8" NPT mountings and the shortest of any of our electro-optic switch bodies—HTS versions are a mere 13mm long with the option of M16 mounting

Typical Applications

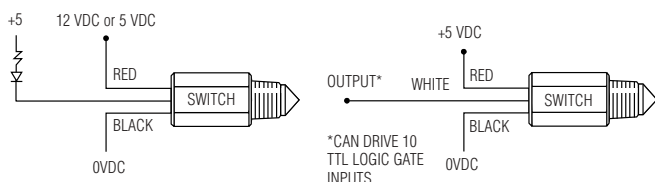
- ▶ Coolant reservoir monitoring
- ▶ Medical diagnostic and steriliser equipment
- ▶ Low lubricant warning on machine tools
- ▶ Low level warning in food warmers

Specifications

Materials	Isoplast®
Housing and prism	Isoplast®
Operating pressure	10 bar, Maximum
Operating temperature*	-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

Wiring Diagrams



How To Order

ELS-1100 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 max 5 VDC on output

ELS-1100 HTS Series - 5 VDC Input Only

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

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

(Wet = NO, Dry = NC)



ELS-1100HT

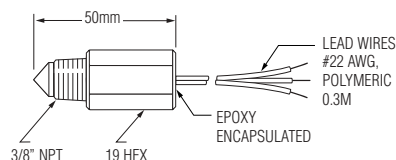


ELS-1100HTS

Dimensions (in mm)

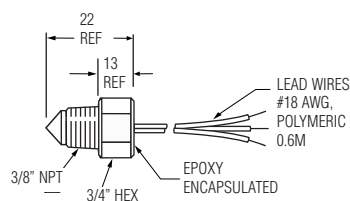
HT Series

3/8" NPT Mounting



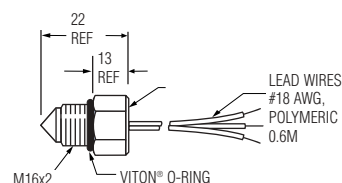
HTS Series

3/8" NPT Mounting



M16 X 2 Straight Thread

Mounting with O-Ring



Extended Power and Switching Capabilities of 10-28 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 17

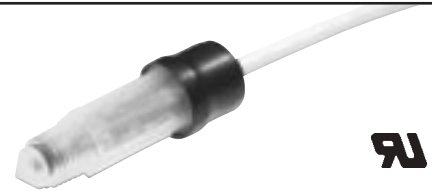


LEVEL SWITCHES

www.gems-sensors.co.uk

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

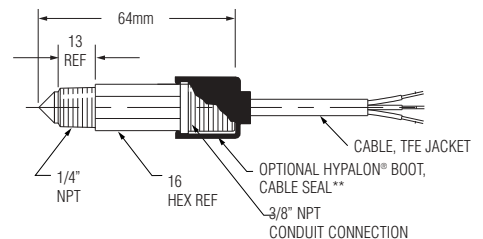
Materials	
Housing and prism	Teflon®
Operating pressure	10 bar Maximum
Operating temperature*	-18°C to 80°C
Input voltage	10 - 28 VDC
Current consumption	18 mA, Approximately
Output†	TTL/CMOS Compatible. Open Collector Output May Sink 40 mA Up to 30 VDC.
Repeatability	±1 mm
EMI susceptibility	Meets (MIL-STD-461B 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

† See Page 10 for Wiring Diagrams

** Optional Boot for ELS-1100TFE - PN 185551

Dimensions (in mm)



How To Order

Specify Part Number based on Output Condition and Boot Option

Probe Conditions at Current Sink	Part Number	
	With Boot	Without Boot
Wet	187595	173800
Dry	185600	173700

ELS-1100FLG Flange Mounting for Installations Without Threaded Holes

The easy solution for thin wall tanks (≤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, moulded plastic tanks and medical applications where elimination of exposed threads removes potential bacterial breeding grounds.



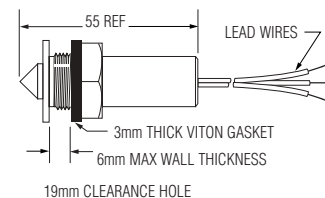
Specifications

Materials	
Housing and Prism	Polysulfone
Operating Pressure	10 bar Maximum
Operating Temperature*	+18°C to 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 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

† See Page 10 for Wiring Diagrams

Dimensions



How To Order

Specify Part Number based on Input Power and Output Condition Required

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

(Wet = NO, Dry = NC)

ELS-1150 Series Features Best Performance-to-Size Ratio

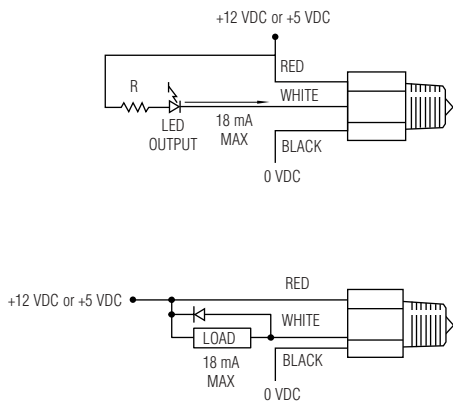
The ELS-1150 electro-optic level switches maintain the top-performing environmental capabilities of their larger family members while featuring an overall size that is 50% smaller. At just 1.38" long, the nickel-plated carbon steel ELS-1150 represents the smallest electro-optic level sensor in its performance class, and by far the most economical. ELS-1150 switches utilise a strong, glass prism fused to a carbon steel housing to easily monitor vessels pressurized up to 172 bar. Their compact package size makes them the ideal candidate for monitoring the small, pressurised vessels found in HVAC, refrigeration and hydraulic applications. They are most commonly used for low, high and intermediate level detection.

Specifications

Mounting	1/2" NPT
Materials	
Housing	Nickel-Plated Carbon Steel
Prism	Fused Glass
Operating pressure	170 bar Maximum
Operating temperature*	-40°C to +100°C
Current consumption	~45 mA
Output	Open Collector Output, 18 mA Sink, Max.
Electrical termination	22 AWG, Polymeric, 0.3m
Repeatability	±1 mm
Approvals	CE, UL

* These switches are not for use in freezing liquid

Typical Wiring Diagrams



Note: Inductive loads must be diode suppressed.

How To Order

Specify Part Number based on Input Power and Output Condition Required

Input Power	Probe Conditions at Current Sink	Part Numbers
5 VDC	Wet	194469
	Dry	194470
12 VDC	Wet	194471
	Dry	194472
24 VDC	Wet	203385
	Dry	205600

(Wet = NO, Dry = NC)

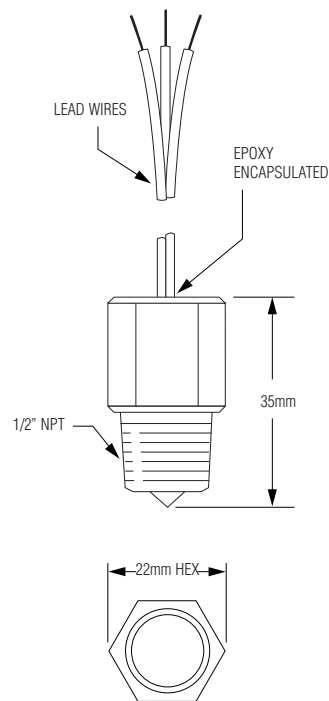


ELS-1150



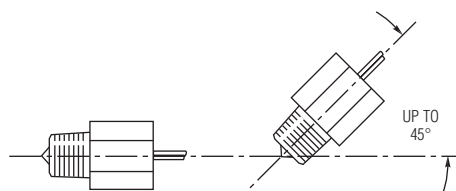
Dimensions

ELS-1150 Series



Mounting Attitude

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



ELS-1200 Series

ELECTRO OPTIC

LEVEL SWITCHES

Integral Electronics

High pressure liquid processes can now be monitored effectively with very little intrusion into tanks or piping. ELS-1200 switches feature fused glass prisms fused to zinc/nickel plated, carbon steel housings. You will find them to be a compact, reliable and durable solution to liquid level monitoring of refrigerant, compressor oil, hydraulic system reservoirs and machine tools.

Removable Electronics

These electro-optic switches feature a one piece removable electronics module with 1/2" NPT conduit connection and an internal O-ring seal to protect against external moisture intrusion. Simply unthread the 1/2" NPT conduit connection for easy replacement of the electronics module without the inconvenience of emptying or depressurising tanks. ELS-1200 switches feature glass prisms fused to zinc/nickel plated, carbon steel housings. Select from either 1/2" NPT mounting connections, or 3/4"-16 UNJF-3A straight thread connections with an external O-ring seal. They monitor high pressure liquid processes with very little intrusion into tanks or piping.

Specifications

Mounting	1/2" NPT or 3/4"-16 UNJF-3A Thread (Viton 'O' ring)
Materials	
Housing	Zinc/Nickel Plated Carbon Steel ^①
Prism	Fused Glass
Operating Pressure	172 bar, Maximum*
Operating Temperature***	
5/12 VDC	-40°C to +100°C
24/120 VAC	-29°C to +116°C (Prism tip) -29° to 75°C (Electronics)
Current Consumption	
5/12 VDC	~45 mA
24/120 VAC	~6 mA
Output	
5/12 VDC	TL/CMOS compatible. Transistor output with 10K pull up Resistor may sink 18mA. 12 VDC Input power units switch a maximum 5 VDC on output
24/120 VAC	Normally Open: SPST (10 VA Resistive) Max. Switching Volts: V in ±10% Max. Switching current: 225 mA @ rated voltage @ 25°C
Electrical Termination**	
5/12 VDC	22 AWG, Polymeric, 0.3m extended lead wires
24/120 VAC	20 AWG, Polyester, 0.3m extended lead wires
Repeatability	±1mm

* For straight thread mounting units when installed with tube fitting per MS 33649
 ** Consult GEMS for cable options
 *** These switches are not for use in freezing liquids. Consult factory for higher temperature units.
 ① Hastelloy thread with Stainless Steel body is available for harsh environments. Contact Sales Office for details

How To Order

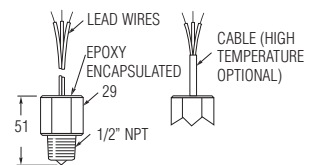
Input Power	Probe Condition at Current Sink	Electronics	Mounting Style	
			1/2" NPT	3/4"-16 UNJF
5 VDC	Wet Dry	Integral	153842 154177	--- ---
		Removable	171574 160953	161431 161432
12 VDC	Wet Dry	Integral	153843 154178	--- ---
		Removable	160646 160954	161433 161434
24 VAC	Wet Dry	Removable	166852 166854	168174 168422
		Removable	164219 164222	166848 166850

(Wet = NO, Dry = NC)

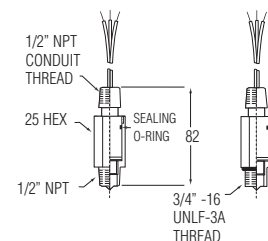


Dimensions

ELS-1200 Integral Electronics

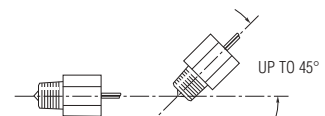


ELS-1200 Removable Electronics



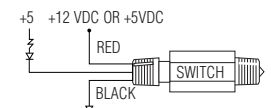
Mounting Attitude

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

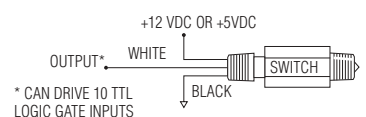


Wiring Diagrams

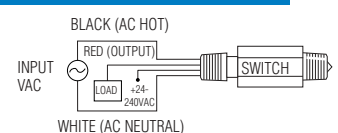
Transistor Output



TTL Compatible Output



SPST, 24 or 120 VAC Output



ELS-300 Series Switches With Customised Lengths to 380mm

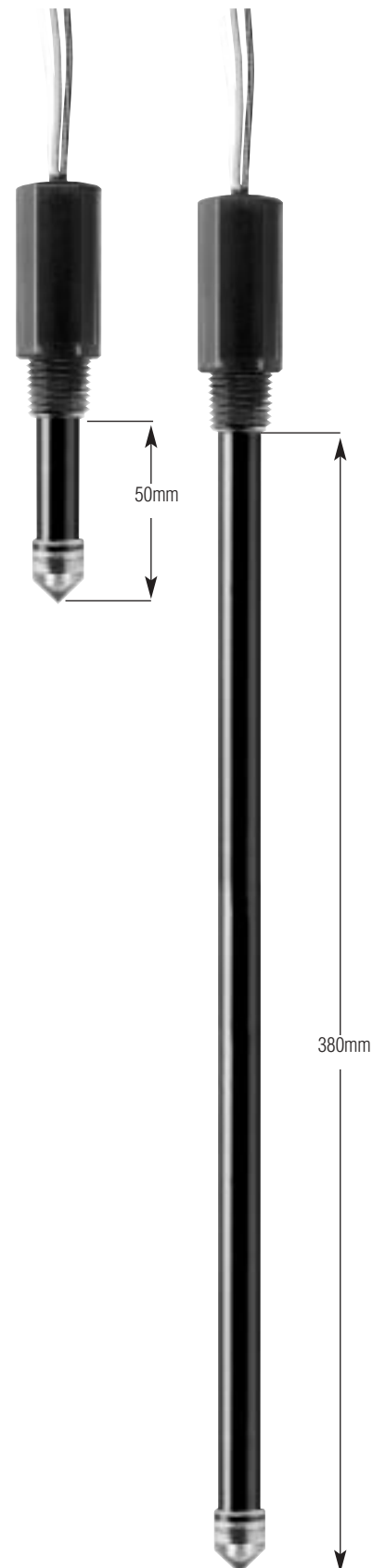
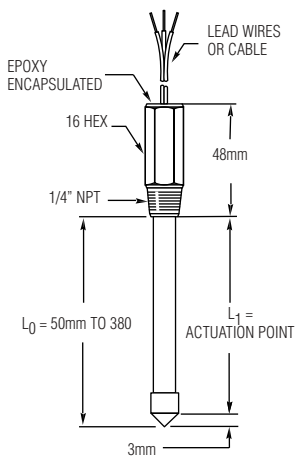
Stretch out and take a dip with the custom length ELS-300 Series. They feature the same materials and performance of our ELS-1100 Series and are suitable for general purpose use where a top or bottom mount is required. They provide the ability to detect liquid levels within 380mm of the top or bottom on a tank.

Specifications

Materials	
Housing and prism	Polysulfone
Operating pressure	0 to 110 bar Maximum
Operating temperature*	-18°C to +80°C
Input power	5 VDC or 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 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).
Electrical termination	Lead Wires, 22 AWG, PVC 0.3m Cable, 22 AWG, PVC 0.3mm

* These switches are not for use in freezing liquids

Dimensions



ELECTRO OPTIC

LEVEL SWITCHES

How to Order

Ask Gems for order sheet

www.gems-sensors.co.uk

Opto-Pak® Controllers for GEMS Electro-Optic Switches

ELECTRO OPTIC

Extend power and switching capabilities of 10 to 28 VDC Electro-Optic switches

- ▶ Operates with 10-28 VDC ELS-1100, ELS-1100HT*, ELS-1200* and ELS-300 Series Electro-Optic Switches.
- ▶ Converts TTL output signal to an SPDT 5 Amp relay output.
- ▶ Available as open board or mounted in IP65 junction box.

GEMS Opto-Pak Controllers convert standard 220 VAC line current to the 10-28 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, IP65 model pictured here.

*12 VDC versions only.



Green and Red LEDs indicate power and output status

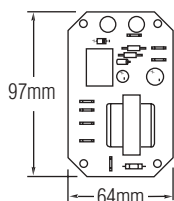
Specifications

Voltage input	220 VAC ±10%, 50/60 Hz
Maximum current draw	70 mA @ 220 VAC
Relay output	SPDT; 5 Amps @ 115 VAC, 5 Amps @ 30 VDC
Operating temperatures	-25°C to + 70°C
Electrical connections	1/4" Male Spade Terminals*

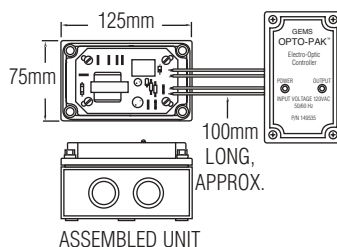
*Ten (10) 1/4" female spade connectors (not shown) shipped loose with each unit.

Dimensions (in mm)

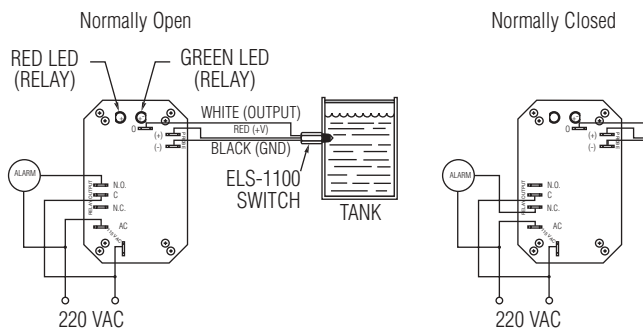
Open Circuit Board Type



NEMA 4X Type



Typical Wiring



How To Order

Specify Opto-Pak™ Controllers by Part Number

Description	Part Number
Open Board	162171
IP65 Enclosure	177714

Standard Products in **bold**

LEVEL SWITCHES

Float Type Level Switches

SINGLE POINT

Standard or Custom Length Versions

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

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

Unique Variations and Options

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


LEVEL SWITCHES

Electrical Data

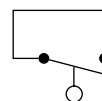
Standard reed switches in GEMS level and flow switch units are hermetically-sealed, magnetically actuated, make-and-break type. Switches are SPST or SPDT, and rated 20 VA. See the chart below for maximum load characteristics of GEMS level switches.

Switch Rating - Maximum Resistive Load

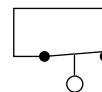
VA	Volts	Amps AC	Amps DC
10 General Use	0-50	.2	.13
	120	.08	N.A.
	100	N.A.	.1
20 Pilot Duty	0-30	.4	.3
	120	.17	.13
	240	.08	.06
50 General Use	0-50	0.5	0.5
	120	.4	.4
	240	.2	.2
100*	120	.8**	N.A.
	240	.4	N.A.

Typical Wiring Diagrams

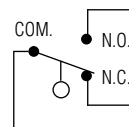
SPST, Normally Open - Dry



SPST, Normally Closed - Dry



SPST, Shown Dry (Change over)



* Level switch units with 50 VA and 100 VA switches are not U.L. recognised or CSA approved.

** Limited to 50,000 operations.

Single level switches made of plastic or metal for horizontal installation

SINGLE POINT

LEVEL SWITCHES

Applications

GEMS level switches can actuate visual or acoustic alarms, control pumps automatically or activate shut down protectors.

Typical applications:

- ▶ Vending machines
- ▶ Water purifiers
- ▶ Medical equipment
- ▶ Hydraulic-oil-tanks
- ▶ Cleaning systems
- ▶ Marine
- ▶ Food and beverage industry

- ▶ LS-6
- ▶ LS-7
- ▶ LS-1050E
- ▶ LS-2050E
- ▶ LS-52100E
- ▶ LS-77700

Construction

By selecting an appropriate construction material for the float, stem and retainer, media compatibility can be ensured. Tight tolerances are held on the air gap dimensions between the float and the stem to give maximum operational reliability and long service.

Installation and Maintenance

For ease of installation standard pipe threads are used throughout. Typical installations are shown in the examples on the right. Maintenance is virtually unnecessary and consists of cleaning off residues from the stem and float if necessary.

General specifications and notes

Max. resistive contact loads of the reed switch:

- SPST 100 VA: 0.5 A; 250 V AC
- SPST 50 VA: 0.5 A; 250 V AC
- SPST 20 VA: 0.5A; 250 V AC
- (normally closed NC/normally open NO)
- SPDT 20 VA: 0.5 A; 250 V AC
- (change-over contact)

DC ratings on request.

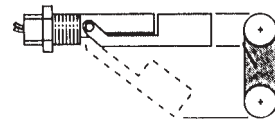
Abbreviations

- NO = Normally open
- NC = Normally closed

- SPST = Single-pole-single throw
- SPDT = Single-pole-double throw (Change-over contacts)

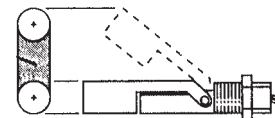
	fly lead	cable	
	red	white	SPST normally open/NO
	red	brown	normally closed/NC
	red	white	SPDT change-over contact
	brown	brown	
	red	green	

Normally Open



When the switch is mounted so that the float lowers with the liquid level, the switch is NO

Normally Closed



When the switch is mounted so that the float rises with the liquid level, the switch is NC



The Type 12 features a "dropped float" with elevated hinge points keeping the hinge and float pivot out of the media eliminating float hang-up problem due to liming and calcium build up. Media Level at switch point is approximately 8mm below pivot.

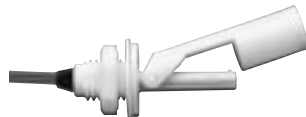
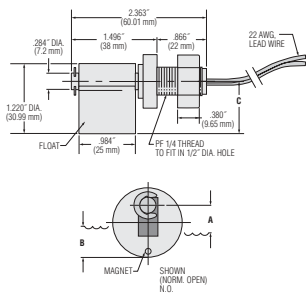
Single Point Level Switches LS6/LS-7

Small Size - Engineered Plastics, Side Mount

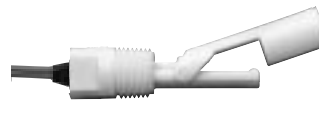
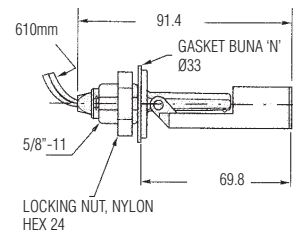
LS-7 Series - Compact side mounts are the solution to many small tanks. These low-cost units are ideal for high volume use in small tanks and vessels. Engineered plastics construction offers broad compatibility in water, oils and chemicals. The high temperature capability of Versaplast offers an alternative to high cost stainless steel switches.



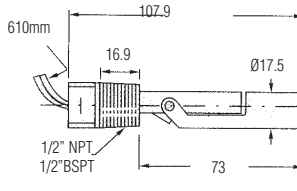
LS-6
Horizontal Mounting through a 1/2" diameter hole in the tank wall



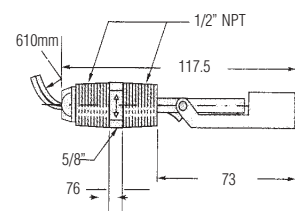
LS-7 Type 3
Internal Mounting



Type 5
External Mounting



Type 7
External Mounting



Specifications

	LS-6	LS-7 Type 3	Type 5	Type 7
Materials				
Stem/mounting	Polypropylene**	Versaplast Polypropylene** Nylon*	Versaplast Polypropylene** Nylon*	Versaplast Polypropylene** Nylon*
Float option	Polypropylene**		Stainless Steel	
Lead wire jacket	TPE***	TPE***	PVC	TPE***
Min. specific gravity of the liquid	Versaplast PP Nylon	0.80 0.55 0.65	0.80 0.55 0.65	0.55 0.65
Operating temperature -40°C to	Versaplast PP Nylon	107° 121°C**** 107°C 121°C	150°C 107°C 121°C	150°C C 107°C 121°C
Operating pressure Max @ 25°C	7 bar	7 bar	7 bar	7 bar
Switch SPST	SPST, 50 VA	20 VA	20 VA	20 VA
Lead wire gauge (Approx 0.6m long)	22 AWG	22 AWG	22 AWG (18 AWG Nylon)	18 AWG
Float arc	23mm	55mm	32mm	38mm
Protection rating	IP65	IP64	IP64	IP65
Weight approx.	30g	80g	60g	70g

* Not suitable for long term use in water.

** Not suitable for Hydrocarbons

*** Thermoplastic Elastomer Zip Cord

**** Limited by gasket to 121°C

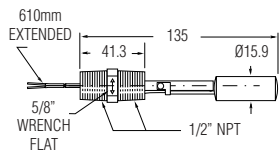
Versaplast (Ryton [80%] + Nylon [20%]) is suitable for both water and Hydrocarbons

How To Order

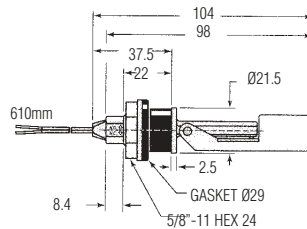
	LS-6	LS-7 Type 3	Type 5 NPT	R1/2 (BSPT)	Type 7 NPT
Polypropylene Float	203740	164520	131100	189423	160450
Nylon Float	-	165570	140620	189421	160460
Versaplast Float	-	182600	177100	189422	188800
Stainless Steel Float	-	-	181625	NA	-



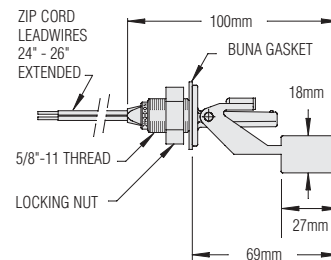
Type 9
External Mounting



Type 10
External Mounting
Mounts and seals through non-threaded hole Ø22 using an HNBR compression gasket. Wall thickness 0.5 to 4mm



Type 12
External Mounting (NC only)



Specifications

	Type 9	Type 10	Type 12
Materials			
Stem/mounting	316 Stainless Steel	Versaplast Polypropylene** Nylon*	Noryl** 27mm
Float option	316 Stainless Steel/Nylon*/Polypropylene**		
Lead wire jacket	TPE***	TPE***	TPE***
Min. specific gravity of the liquid	0.80 Stainless Steel 0.65 Nylon 0.55 PP	0.80 Versaplast 0.55 PP 0.65 Nylon	0.80 Noryl
Operating temperature -40°C to	149°C Stainless Steel 121°C Nylon 107°C PP	121°C **** Versaplast 107°C PP 121°C Nylon	107°C
Operating pressure Max @ 25°C	20 bar Stainless Steel 7 bar Nylon / PP	3.5 bar	7 bar
Switch SPST	20 VA	20 VA	20 VA
Lead wire gauge (Approx 0.6m long)	18 AWG	22 AWG	22 AWG
Float arc	36mm	53mm	18mm
Protection rating	IP65	IP65	IP65
Weight approx.	150g	90g	70g

* Not suitable for long term use in water.
 ** Not suitable for Hydrocarbons
 *** Thermoplastic Elastomer Zip Cord
 **** Limited by gasket to 121°C
 Versaplast (Ryton [80%] + Nylon [20%]) is suitable for both water and Hydrocarbons)

How To Order

	Type 9	Type 10	Type 12
Nylon Float	164850	165900	
Polypropylene Float	164860	165800	—
Stainless Steel Float	164870	—	—
Noryl Float	—	—	191080
Versaplast Float		182700	—

Standard Products in **bold**

Single Level Switches, side mounted LS-1050E, LS-2050E, LS-52100E

LEVEL SWITCHES

SINGLE POINT

LEVEL SWITCHES



LS-1050E

External/Internal Mounting
For up to 20mm wall
(Hole Ø 17mm Internal Mount)



LS-2050E Brass/Buna N

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



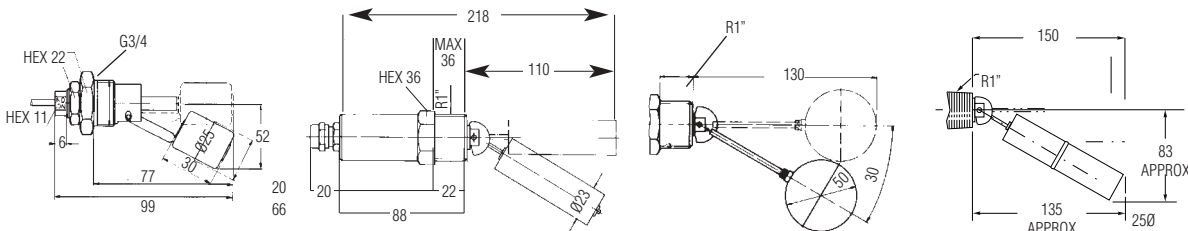
LS-2050E Stainless Steel

Ultimate strength; for pressure up to 60 bar and temperatures to 150°C



LS-52100E

Rugged, all stainless steel unit offers a broad chemical compatibility at temperatures to 150°C



Specifications

	LS-1050E	LS-2050(E) Brass/Buna N	LS-2050(E) SSteel/SSteel	LS-52100E
Materials				
Stem/mounting	Brass	Brass	Stainless Steel	Stainless Steel
Float option	Stainless Steel	Buna N	Stainless Steel	Stainless Steel
Lead wire jacket	PVC			
Min. specific gravity of the liquid	0.7 Stainless Steel	0.8	0.9	0.85
Operating temperature -40°C to	+100°C	80°C Water 110°C Oil	+150°C	+150°C
Operating pressure Max @ 25°C	16 bar	10 bar	60 bar	35 bar
Switch SPST	50 VA	SPDT 20 VA	SPDT 20 VA	SPDT 20 VA
Lead wire gauge (Approx 1m long)	Cable 0.34mm ²	Cable 0.34 mm ² PVC Terminal box	Cable 0.5mm ² silicone Terminal Box	Cable 0.5mm ² silicone Terminal Box
Float arc	36mm			
Protection rating	IP64	IP65	IP65	IP65
Weight approx.	300g	300g	350g	300g

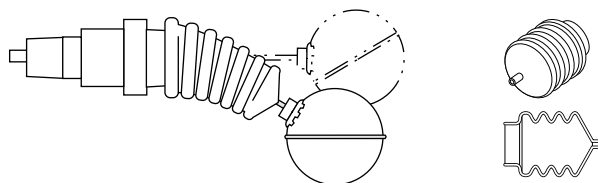
How To Order

Materials	LS-1050E	LS-2050E Brass/Buna N	LS-2050 Stainless Steel	LS-52100E Stainless Steel
Cable	011 - 1050	010 - 3465	010 - 3466	010 - 3461
Terminal Box		010 - 3463	010 - 3464	010 - 3462
Cable + Bellows	-	-	010 - 3468	-
T. Box + Bellows	-	-	010 - 3469	-

With Optional Bellows

Seals moving parts from debris and particulates that might impede shuttle movement. Available for all stainless steel LS-205E with 50mm float.

Temperature: 120°C max, Pressure; 1 bar max; Material; Buna N (Nitrile)



Switch with bellows. Bellows are not sold separately.

Standard Products in **bold**

www.gems-sensors.co.uk

Single level switches made of plastic or metal for vertical installation

SINGLE POINT

Applications

GEMS level switches can actuate visual or acoustic alarms, control pumps automatically or activate shut down protectors.

Typical applications:

- ▶ Vending machines
- ▶ Water purifiers
- ▶ Medical equipment
- ▶ Hydraulic-oil-tanks
- ▶ Cleaning systems
- ▶ Marine

Plastics

- ▶ LS-3
- ▶ LS-1900-T
- ▶ LS-74780
- ▶ Pear Drop
- ▶ LS-300

Metals

- ▶ LS-1700
- ▶ LS-1800
- ▶ LS-1900
- ▶ LS-1750E
- ▶ LS-1950E
- ▶ LS-270E/240E
- ▶ LS-750
- ▶ LS-800-5
- ▶ LS-159000
- ▶ LS-400
- ▶ LS-800

Construction

By selecting an appropriate construction material for the float, stem and retainer, media compatibility can be ensured. Tight tolerances are held on the air gap dimensions between the float and the stem to give maximum operational reliability and long service.

Installation and Maintenance

For ease of installation standard pipe threads are used throughout. Operation will not be impaired if mounting is up to 30° inclination from the vertical axis. Depth may be varied by installing extension tubes (to be supplied by the customer). Side mounting may be achieved in the same way using standard 90° elbows and extensions. Typical installations are shown in the examples on the right.

Maintenance is virtually unnecessary and consists of cleaning off residues from the stem if necessary.

General Specifications and Notes

Max. resistive contact loads of the reed switch:
 SPST 100 VA: 3.0 A; 250 V AC
 SPST 50 VA: 0.5 A; 250 V AC
 SPST 20 VA: 0.5 A; 250 V AC
 (normally closed NC/normally open NO)
 SPDT 20 VA: 0.5 A; 250 V AC
 (change-over contact)

DC ratings on request.

The contact configuration indicated for each part (NO/NC) is defined as follows:

- ▶ tank empty
- ▶ rising level

Contact Configuration

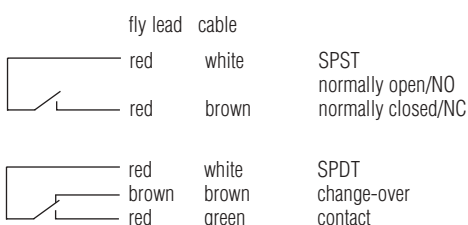
NO/NC is Normally Open (NO) when supplied from the factory unless otherwise requested.

Normally Closed (NC) may be selected by inverting the float. NO or NC only, may not be changed in this way.

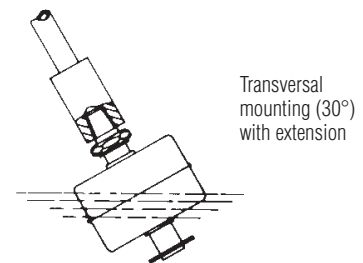
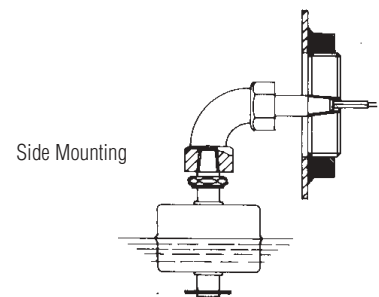
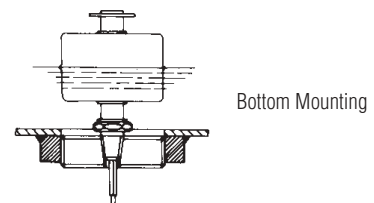
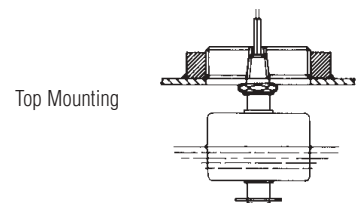
Location of the switch point is approx. in the middle of the stem.

Abbreviations

NO = Normally Open
 NC = Normally Closed
 SPST = Single-pole-single-throw
 SPDT = Single-pole-double-throw (Change-over contracts)



Installation Examples



LEVEL SWITCHES

Single level switch LS-3

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

Polysulfone Float



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

Buna N Float



Ideal for oils and fuels

Polypropylene Float (Solid)

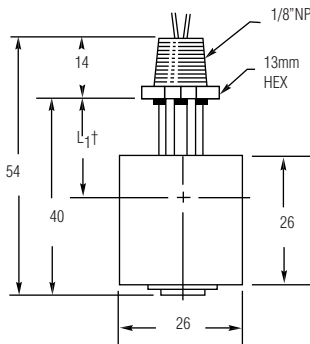


With Polypropylene stem and float, switch offers broad chemical compatibility

Polypropylene Float (Hollow)



Features a low specific gravity float offering broad chemical compatibility to satisfy a wide variety of applications



L_1 † Switch actuation level, nominal (based on a liquid specific gravity of 1.0).
 Polysulfone Float: 19.0mm
 Polypropylene Float (Hollow): 20.6 mm
 Polypropylene Float (Solid): 14.3 mm
 Buna N Float: 20.6mm

Alternate Mountings

3/8"-16 UNC	G1/8"	M12x1.75
Supplied with mating nut		

Specifications

	Polysulfone	Nylon/Buna N	Polypropylene	Polypropyl. (hollow)
Material stem:	Polysulfone	Nylon*	Polypropylene**	Polypropylene**
Material float:	Polysulfone	Buna N	Polypropylene (solid)	Polypropylene (hollow)
Operating pressure:	3 bar	10 bar	10 bar	3 bar
Temperature: cable	-40°C...+80°C	-20°C...+80°C	-40°C...+65°C	-40 °C...+80°C
leads	-40°C...+107°C	-20°C...+121°C	-40°C...+65°C	-40°C...+107°C
Depth of immersion at a density of 1:	~15 mm	~9 mm	~19 mm	~13 mm
Min. specific gravity of the liquid:	0.75	0.45 (0.85 19mm)	0.90 (0.85 19mm)	0.60
Type of reed switch:	SPST 50 VA cable SPST 20 VA leads	SPST 50 VA (cable) SPST 20 VA (leads)	SPST 50 VA (cable) SPST 20 VA (leads)	SPST 50 VA (cable) SPST 20 VA (leads)
Electrical connection: (Length: appr. 0.6 m)	Cable: 0.34 mm ² PVC Fly lead: AWG 22 PVC	Cable: 0.34 mm ² PVC Fly lead: AWG 22 PVC	Cable: 0.34 mm ² PVC Fly lead: AWG 22 PVC	Cable: 0.34 mm ² PVC Fly lead: AWG 22 PVC
Mounting thread:	1/8" NPT	1/8" NPT, G1/8", M12x1.75, 3/8x16		
Protection rating :	IP64	IP64	IP64	IP64
Weight: approx	20 g	20 g	20 g	20 g

How To Order

	Mounting	Polysulfone	Nylon/Buna N 25mm 19mm	Polypropylene 25mm 19mm	Polypropylene
Cable	G1/8	010 - 2919(1/8 NPT)	171512	177820	171515
	M12 + NUT	-	189786	-	189787
Leads	1/8 NPT	42295	162745	177818	116826
	3/8 UNC	-	171511	177819	201540

* Not suitable for long term use in water. ** Not suitable for Hydrocarbons Standard Products in **bold**

LS-3 Specials

SINGLE POINT

Unique features make these LS-3 Models special. These small switches feature unique configurations for special applications.



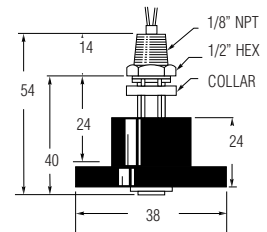
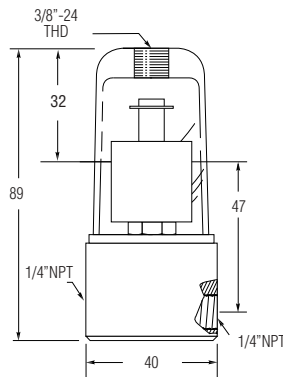
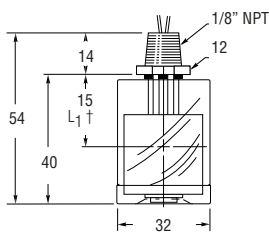
LS-3 Slosh Shield
Compact, all-polypropylene switch with slosh shield is ideal for use with turbulent liquids in small tanks. FDA approved materials.



LS-3 Bottle Level
For external mounting on tanks too small to accommodate internally mounted switches. (See note below)



LS-3 Low Level
For detecting levels as low as 16mm from tank bottom. Use in water, gasoline, some oils and chemicals.



Specifications

	LS-3 Slosh Shield	LS-3 Bottle Level	LS-3 Low Level
Materials			
Stem and mounting	Polypropylene ††	Polysulfone	Polysulfone
Float	Polypropylene	Polysulfone	Buna N
Other wetted	—	Brass, Aluminium,	Epoxy Polycarbonate, Viton A
Min. liquid Sp.Gr.	.90	.75	—
Operating temperature	-40°C to +65.6°C	-40°C to +48.9°C	-40°C to +82.2°C
Pressure, bar, Max. ***	10	3	3
Switch, SPST	20 VA, N.C./N.O. Dry**	20 VA, N.C. Dry	20 VA, N.C. Dry
Material compliance			
Electrical termination	No. 22 AWG, 0.6m L., PVC Lead Wires	No. 22 AWG, 1.8m L., Polymeric Lead Wires	No. 22 AWG, 1.8m L., PVC Lead Wires
Mounting	1/8" NPT	3/8 UNF/1/4NPT	1/8" NPT
Protection rating	IP64	IP64	IP64
Weight aprox.	80g	170g	60g

** Switch operation is selectable, N.O. or N.C.. by inverting the float on the unit stem.
 *** Maximum pressure at 70°F (30°C).
 † L₁= Switch actuation level, nominal (based on a specific gravity of 1.0).
 †† Consult factory for other available materials.

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

How to Order

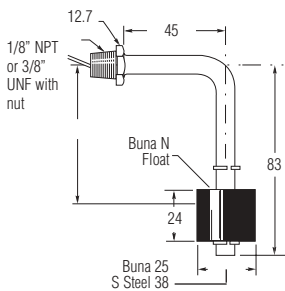
LS-3 Slosh Shield	LS-3 Bottle Level	LS-3 Low Level
142545	46999	76707

Standard Products in **bold**

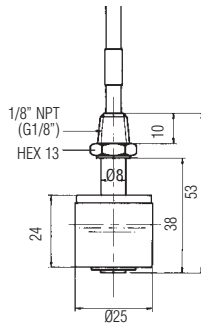
Single level switches LS-77700, LS-1700, LS-1750E, LS-1800


LS-77700 - Bent Stem

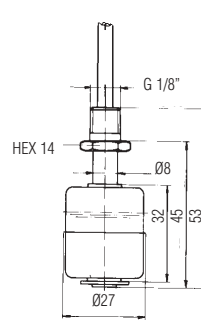
These units perform in liquids with specific gravities as low as .45; switches protrude into tank less than 75mm.


LS-1700

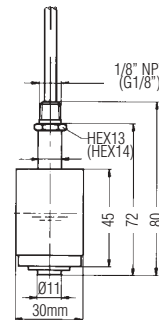
Offer broad chemical compatibility for general purpose use. Also ideal for oils and water.


LS-1750E

Rugged construction suitable for most corrosive liquids, and for high temperatures and pressures.


LS-1800

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


Specifications

	LS-77700	LS-1700	LS-1750E	LS-1800
Materials				
Stem and mounting	Brass or S Steel	Brass or S Steel	S Steel	Brass or S Steel
Float	S Steel or Buna N	Buna N or PTFE	S Steel	Buna N
Operating pressure	10bar 7 bar S Steel Float	10 Bar 70 bar PTFE Float	20 bar	10 bar
Temperature				
-40°C to	+80°C Water +110°C Oil Limited to +80°C Ambient	+80°C Water +110°C Oil +100°C PTFE	+150°C	+80°C Water +110°C Oil
Depth of immersion at a density of 1	Buna N: ~9mm S Steel: ~15mm	Buna N: ~9mm PTFE: ~13mm	~21mm	~24mm
Minimum specific gravity of the liquid	Buna N: 0.45 S Steel: 0.7	Buna N: 0.45 PTFE: 0.85	0.85	0.7
Type of reed switch	SPST 20 VA	SPST 50 VA	SPST 50 VA	SPST 100 VA SPDT 20 VA
Electrical connection (Length approx. 1m)	22 AWG 0.6m L., Teflon® Lead wires	Fly lead: AWG 20 FEP Cable: 0.34 mm ² PVC	Fly lead: AWG 20 FEP Cable: 0.34 mm ² PVC	Fly Lead: AWG 20 FEP Cable: 0.34 mm ² PVC
Mounting thread	1/8" NPT 3/8" UNF with nut	1/8" NPT G 1/8	G 1/8	1/8" NPT G 1/8
Protection rating	IP64	IP64	IP64	IP64
Weight approx	150g	30g	50g	80g

- Consult factory for De-min water applications

How to Order

Stem, Float, Mounting Electrical Connection	LS-77700	LS-1700	LS1750E	LS-1800
Brass/Buna, NPT, cable		010-2921 NO/NC		010-2930 NO/NC 010-3011 SPDT
Brass/Buna, NPT, leads	118125	010-1701 NO/NC		013-5651 NO/NC 013-0272 SPDT
Brass/Buna, G, cable		011-1700 NO/NC		011-1800 NO/NC
SSteel/Buna, NPT, cable		010-2922 NO/NC		010-2931 NO/NC 010-3013
SSteel/Buna, NPT, leads		010-1702 NO/NC		013-5657 NO/NC 012-4367 SPDT
SSteel/PTFE, NPT, leads		012-6791 NO 012-7980 NC		
SSteel/PTFE, NPT, cable		010-2924 NO 010-2923 NC		
Brass/Buna, 3/8" UNF, leads	118127			
SSteel/SSteel, 3/8" UNF, leads	117716			
SSteel/SSteel, G, cable PVC			011-1750 NO/NC	
SSteel/SSteel, G, leads			010-0340 NO/NC	
SSteel/SSteel, G, cable Silicon			010-0554 NO/NC	

 Standard Products in **bold**

SINGLE POINT

LEVEL SWITCHES

www.gems-sensors.co.uk

Single level switches LS-1900, LS-1900T, LS-1950E, LS-74780

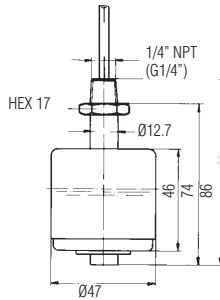
SINGLE POINT

LEVEL SWITCHES



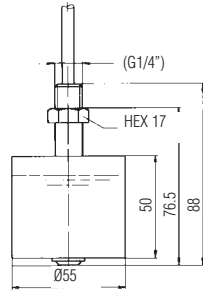
LS-1900

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



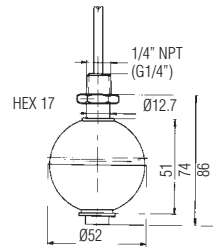
LS-1900T

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



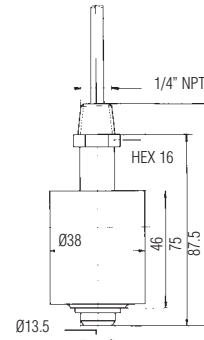
LS-1950E

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



LS-74780

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



Specifications

	LS-1900	LS-1900T	LS-1950	LS-74780
Materials				
Stem	Brass or S Steel	PTFE	S Steel	CPVC
Float	Buna N	PTFE	S Steel	CPVC
Operating pressure	10 bar	3 bar	30 bar	1 bar
Temperature: -40°C to (Note: PVC cable Limited to +80°C Ambient)	+80 °C Water +110°C Oil	+150°C	+150°C Hi-temp. version - Fly lead: +200°C	+80°C
Depth of immersion at a density of 1	~19 mm	~ 34 mm	~ 30 mm	~ 28 mm
Min. specific gravity of the liquid	0.55 g/cm ³	0.80 g/cm ³	0.75 g/cm ³	0.85 g/cm ³
Type of reed switch	SPST 100 VA; SPDT 20 VA	SPST 100 VA; SPDT 20 VA	SPST 100 VA; SPDT 20 VA	SPST 20 VA
Electrical connection (Length approx. 1m)	Fly lead: AWG 20 FEP Cable: 0.34mm ² PVC	Fly lead: AWG 20 FEP Cable: 0.5mm ² silicone Cable: 0.34mm ² PVC Hi-temp. version - AWG 18 PTFE	Fly lead: AWG 20 FEP Cable: 0.5mm ² silicone*	Fly lead: AWG 18 PVC (Length appr. 0.6m)
Mounting thread	1/4" NPT*; -G 1/4	G 1/4	G 1/4	1/4" NPT
Protection rating	IP64	IP64 Hi-temp IP60	IP64	IP64
Weight approx.	110 g	120g	125g	65g

How to Order

Stem, Float, Mounting Electrical Connection	LS-1900	LS-1900T	LS-1950E	LS-74780
Brass/Buna, NPT, cable	010-2934 NO/NC	010-2936 SPDT		
Brass/Buna, NPT, leads	013-5676 NO/NC	010-2575 SPDT		
Brass/Buna, G, cable	011-1900 NO/NC			
SSteel/Buna, NPT, cable	010-2935 NO/NC	010-2937 SPDT		
SSteel/Buna, NPT, leads	013-5682 NO/NC	010-2576 SPDT		
SSteel/SSteel, G, cable PVC			011-1950 NO/NC	
SSteel/SSteel, G, leads			014-1254 NO/NC	010-3109 SPDT
SSteel/SSteel, G, cable Silicon			010-3457 NO/NC	010-3089 SPDT
SSteel/SSteel, NPT, leads, Hi-Temp			013-6186 NO/NC	
SSteel/SSteel, G, leads, Hi-Temp			010-0391 NO/NC	
SSteel/SSteel, NPT, cable Silicon			010-2942 NO/NC	010-2943 SPDT
SSteel/SSteel, NPT, leads			012-6717 NO/NC	012-3498 SPDT
PTFE/PTFE, G, cable		010-2697 NO	010-2866 NC	
PTFE/PTFE, G, leads		010-3451 NO	010-3450 NC	
PTFE/PTFE, G, cable		010-3054 SPDT		
PTFE/PTFE, G, leads		010-3452 SPDT		
CPVC/CPVC, NPT, leads				74780 NO/NC

Standard Products in **bold**

Bilge water level switches

SINGLE POINT

The design of GEMS bilge water level switches combines reliable switching in contaminated liquids with compact dimensions. These switches have been developed for general naval and industrial applications. They have protective housings which dampen the movements and turbulence of the medium and maintain their reliable operation even if there is solid matter in the bilge water.

Acceptance and Approvals

Various civil, military and naval approvals are on hand for many of these products. Please ask for further details.

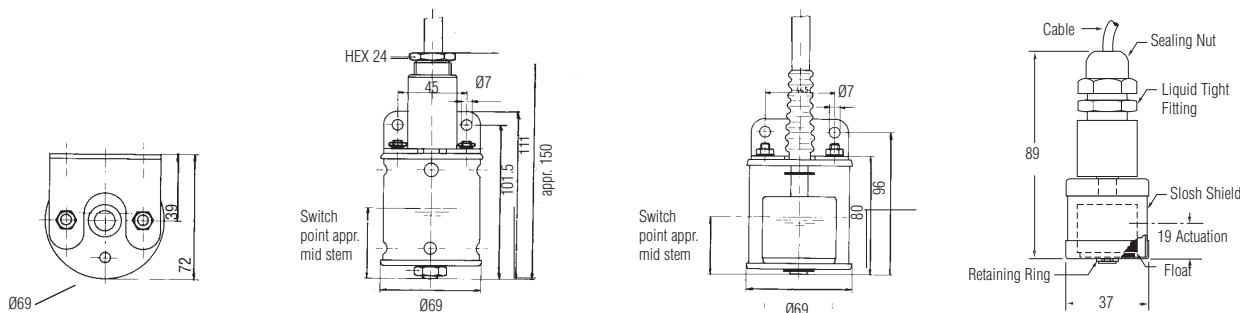


Applications

LS-240-3E: This switch has extremely robust construction. It is perfectly suitable for applications on ships and wherever heavy mechanical loads occur. The LS-240-3E has been accepted by the Germanischer Lloyd, among others, and approved for application by the German Navy.

LS-270-E: This bilge water level switch has been developed especially for low level alarms and can monitor levels as low as 35 mm. As the cable is vulcanized the switch is submersible to "IP67". The float can also be constructed as an interface level indicator. The LS-270-E has been accepted by the Germanischer Lloyd, among others, and approved for application by the German Navy.

LS-750: 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 7.5m of waterproof cable.



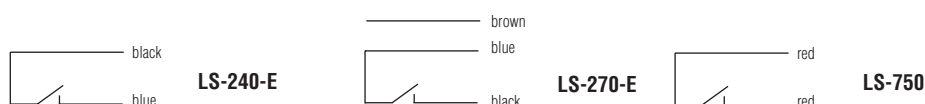
Specifications

	LS-240-3E	LS-270-E	LS-750
Material stem	S Steel	S Steel	Brass
Material float:	Buna N	Buna N	Buna N
Stilling chamber	S. Steel	Lucite	Brass
Bracket	S Steel	S Steel	
Operating pressure	10 bar	10 bar	10 bar
Temperature -40°C to	+80°C	+80°C	+80°C Water
Min. specific gravity of the liquid	0.53	Standard: 0.58 Interface level: 0.85/1	0.45
Protection rating	IP67	IP67	IP68 to 8m
Type of reed switch	SPST 100 VA	SPST 100 VA	N.C., 20VA
Electrical connection	(Length 2m) Cable: LMGSGo 2 x 1.5mm2	(Length 2m) Cable: CR 3x1.5mm2	(Length 7.5m) PVC Cable Jacket 22 AWG
Weight	650 g	530 g	830 g

How to Order

STD Float	010-3433 NO.	010-3434 NC	010-0349 NO	010-0350 NC	149350 NC
Interface Float Oil/Water			010-0351 NO	010-0352 NC	

Connecting Diagram



Standard Products in **bold**

Large Size - Alloys

SINGLE POINT

When a Switch won't fit in the tank, use a non-intrusive Bottle Type

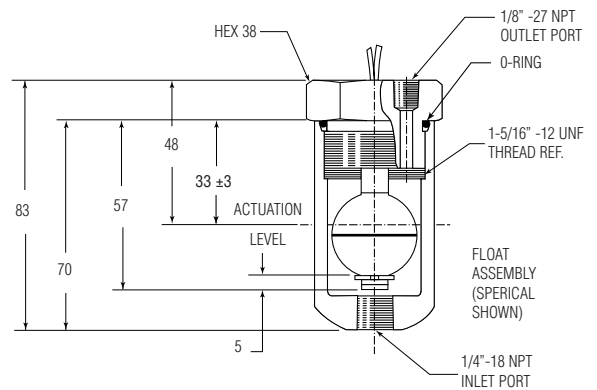
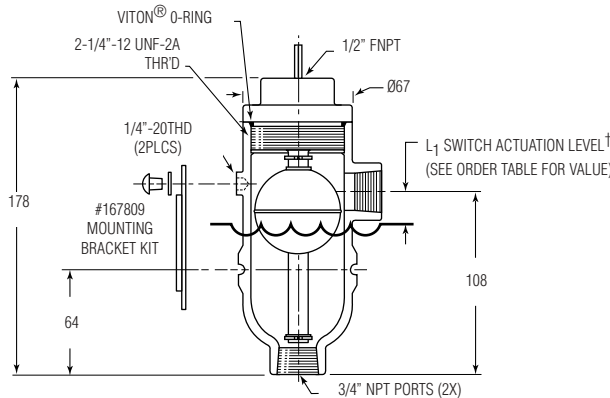
Bottle type level switches are ideal for large or small tanks or where access to the inside is impractical or impossible. These units mount completely outside of the tank, at the level actuation point.



LS-800-5



LS-159000



Specifications

	LS-800-5		LS-159000	
Materials, Housing	Brass	S Steel	Alumium	Alumium
Stem	Brass	S Steel	Brass	Brass
Float	S Steel	S Steel	S Steel	Buna N
Operating pressure	35 bar	50 bar	27 bar	17 bar
Temperature	-40 °C to +150°C	-40 °C to +150°C	-40°C to +150°C	-40°C to 120°C Oil -40°C to 80°C Water
Actuation Level at a density of 1	LI=19mm (mid port)	LI=11mm (mid port)	48mm from top of unit	48mm from top of unit
Min. specific gravity of the liquid	0.75	0.75	0.75	0.50
Type of reed switch	SPST 20 VA	SPST 20 VA	SPST 20 VA	SPST 20 VA
Electrical connection* approx 0.6m	Fly Lead: AWG 18 Polymeric	Fly Lead: AWG 18 Polymeric	Fly Lead: AWG 18 Polymeric	Fly Lead: AWG 18 Polymeric
Mounting thread	3/4" NPT	3/4" NPT	1/4" NPT and 1/8" NPT	1/4" NPT and 1/8" NPT
Protection rating	IP64	IP64	IP64	IP64
Weight approx.	1.65kg		400g	

How to Order

	172625	172635	144080	160405
--	--------	--------	--------	--------

* K6 J.box option for LS-800-5, consult Sales Office

* Customer selectable switching NO/NC

Series G-Pear Drop Float Switches

PEAR DROP

The Gems Sensors Pear Drop Float Switch is designed for use in various applications such as filling and discharging of pumps, and high and low level alarms. The large float casing option has buoyancy, which guarantees smooth, trouble free operation. The Mini unit has a diameter of 76mm and is suitable for confined areas.

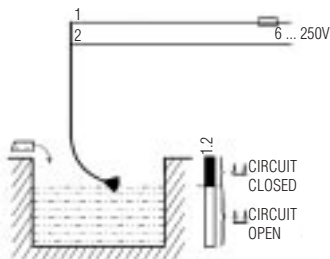
The position of the floats changes with increase or decrease in level, so that the contacts open or close at a defined level. Pump control units are supplied with a 400mm weight.

Specifications

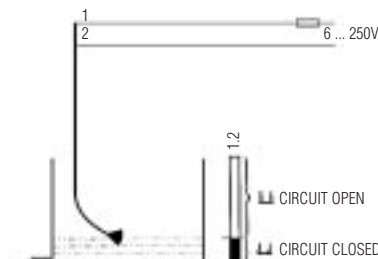
Switching element	Microswitch
Electrical rating	3A @ 240 VAC Inductive Load 6A @ 240 VAC Resistive Load
Contact material	Silver (Optional Gold Plated)
Maximum pressure	2 bar G
Maximum temperature	55°C
Adjustment range	20 to 120cm standard
Float material	Polypropylene
Cable material	PVC (standard)
Cable length	5 metres standard
Standard float diameter	170mm



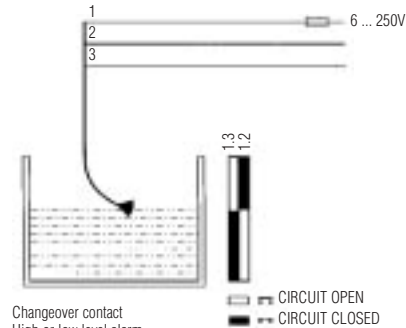
Alarms



N/O closes on rising.
High Level alarm
P.No. G1H



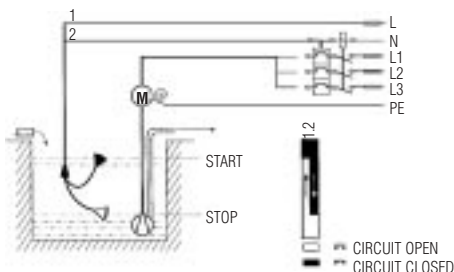
N/C opens on rising.
Low Level alarm
P.No. G1L



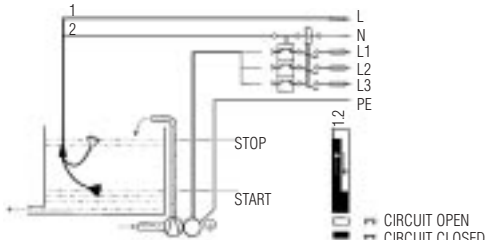
Changeover contact
High or low level alarm
P.No. G1C

Pump Controls

400g weight is used to adjust the pump differential between 250mm to 1200mm, refer to instruction manual for set-up.



Pump emptying control.
Contact closes once the upper level is reached, pump switches on until the pre-set stop is reached.
P.No. G2H



Pump filling control opposite to 2H
P.No. G2L

Options (non standard part code)

Standard Part numbers

- G1H** = high level alarm, N/O switches on rising
- G1L** = low level alarm, N/C switches on rising
- G1C** = high or low level alarm, changeover contact
- G2H** = pump emptying control
- G2L** = pump filling control

Cable material option

- 1 = PVC (Standard)
- 2 = Oil proof TPU
- 3 = Rubber
- 4 = Teflon

Cable length

(01 = 1 metre 99 = 99 metres etc) **05** = standard

Contact material

- 1 = Silver (standard)
- 2 = Gold plated

Examples:

- G1H** = standard unit
- G1H-1101** = standard unit with 10m pvc cable

GXX-X XX X

LEVEL SWITCHES

www.gems-sensors.co.uk

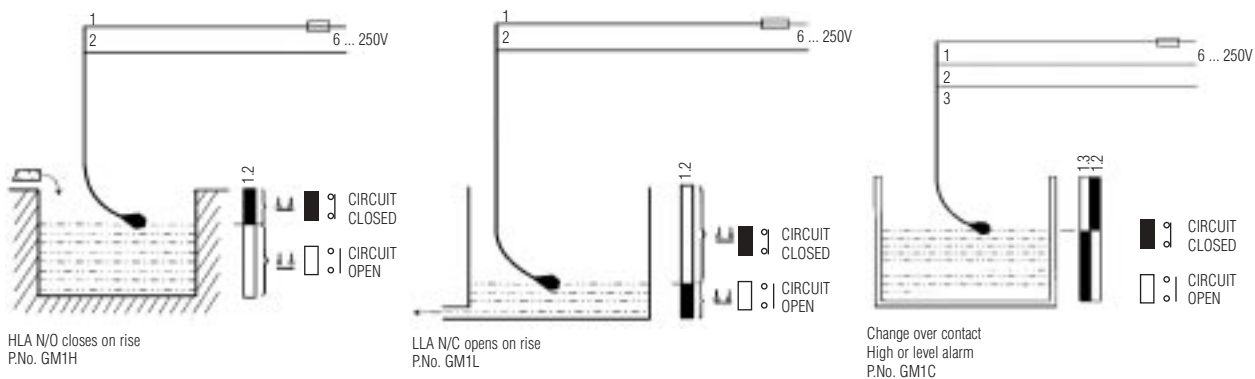
Series GM-Pear Drop Float Switches

Mini Float Pear Drop

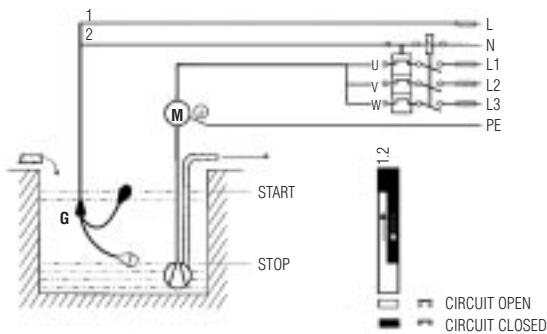
The Gems Sensors Pear Drop Float Switch is designed for use in various applications such as filling and discharging of pumps, and high and low level alarms. The large float casing option has buoyancy, which guarantees smooth, trouble free operation. The Mini unit has a diameter of 76mm and is suitable for confined areas.

The position of the floats changes with increase or decrease in level, so that the contacts open or close at a defined level. Pump control units are supplied with a 400grams weight.

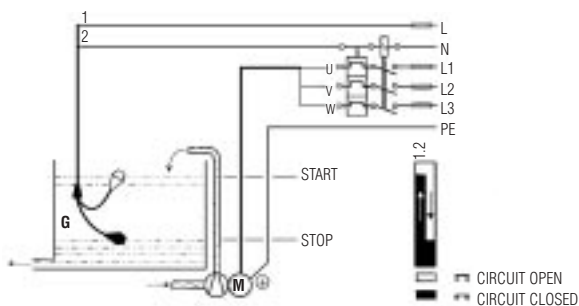
Alarms



Pump Control



Wiring for emptying of subsoil water pumps etc.
P.No. GM2H



Wiring for filling of storage tanks etc.
P.No. GM2L

Options (non standard part code)

Standard Part numbers

- GM1H = Mini float high level alarm, N/O switches on rising
- GM1L = Mini float low level alarm, N/C switches on rising
- GM1C** = Mini float high or low level alarm, changeover contact
- GM2H = Mini float pump emptying control
- GM2L = Mini float pump filling control

Cable material option

- 1** = PVC (Standard)
- 2 = Oil proof TPU
- 3 = Rubber
- 4 = Teflon

Cable length

(01 = 1 metre 99 = 99 metres etc) **05** = standard

Contact material

- 1** = Silver (standard)
- 2 = Gold plated

Examples:

- GM1H** = standard unit
- GM1H-1101 = standard unit with 10m pvc cable

GXXX-X XX X

Multiple level switches series,
 LS-300 (1...5 switch points),
 LS-400E (1...4 switch points),
 LS-800E (1...7 switch points)

LEVEL SWITCHES

MULTI POINT

GEMS level switches LS-300, LS-400E, LS-800E, LS-800E-PVC series provide an excellent method of controlling liquid levels in tanks.

The units are made to the customer's specific requirements and are well suited to most industries due to the large range of different mountings and materials of construction.

Operation

A float equipped with a permanent magnet moves up and down with the fluid level between two stop rings and its magnetic field actuates a hermetically sealed reed switch embedded in the stem.

Installation and Maintenance

The level switches of the LS-300, LS-400E, LS-800E, LS-800E-PVC are mounted through the opening (flange or threaded) in the tank top or the bottom of the tank. Although the units are designed for vertical operation, they operate without problems even when mounted at an angle of up to 30° from the vertical axis. Maintenance work is reduced to a minimum and consists of cleaning off residues from the switch stem if necessary.

Max lengths

LS-300:	400mm
LS-400E:	800mm
LS-800E:	3000mm
LS-800E-PVC	2000mm



LS-300 with flange



LS-400E



LS-800E



LS-800E-PVC

LEVEL SWITCHES

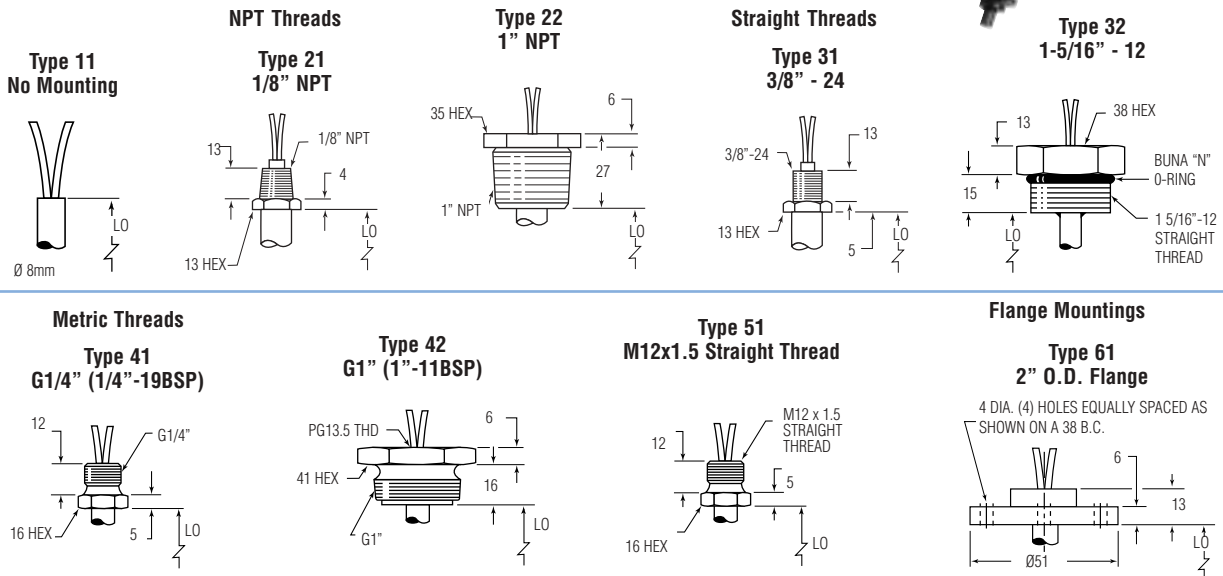


Multiple Level Switch LS-300 (1-5 switch points)

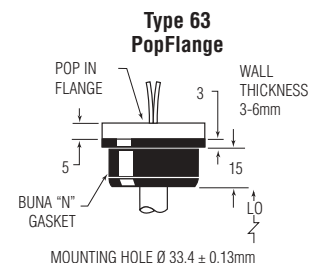
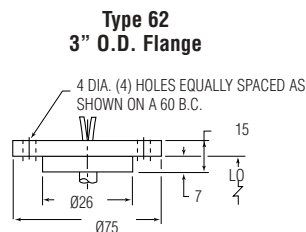
- ▶ All-Plastic Wetted Parts (Polysulfone)
- ▶ Lengths to 400mm

Designed for the high quantity needs of the OEM, LS-300 Series Switches are the ideal level sensor for shallow tanks and reservoirs. Compact and versatile, these low-cost, plastic level switches offer a broad choice of mountings and float materials. The following pages illustrate the various design parameters available to configure custom LS-300 Series Switches.

Mounting Types



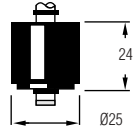
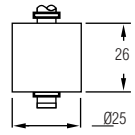
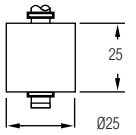
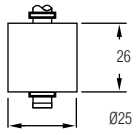
Stem, Mounting and Collar Material	Polysulfone
Max Length (Lo)	400mm
Mounting Position	Vertical ± 30° Inclination



Electrical Connections

	Type 1 Leadwire	Type 2 Cable	Type 3 Liquid-Tight Cable	Type 4 Junction Box Assembly	Type 5 DIN43650 Plug	Type 6 DIN43651 Plug
Compatible Mounting Type(s)	All			42	42, 62	42
Protection Rating	IP64		IP67		IP65	
Extended Leads	#22 AWG PVC 610mm Min.	#22 AWG PVC Jacketed Cable, 610mm Min.		Terminal Box (7 Terminals)	3 Poles	6 Poles
Max. No. of Levels Group I			5		2	5
Group II			3		1	3

Floats

Float Material	Buna N	Polysulfone	Polypropylene	
			Solid Foamed	Hollow
Float Dimensions				
Float Material Suitable for ...	Oil, Fuels	Waterbased Liquids	Broad Chemical Use	Low Specific Gravity Liquids
Operating Temperature *	Water to 80° Oil: -40°C to +105°C	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C
Pressure, (bar), Max. **	17	3.5	17	3.5
Min. Media Specific Gravity	.45	.75	.90	.65

* Operating temperature range based on float ratings

** When used with mounting Type 21, 32 or 22 only; Mounting Type 61, 62 and 63 are not recommended for pressure applications. Pressures are derated with increasing temperature.

Electrical Specifications

Typically, one float is required for each point at which you need a switch action to occur. The number of actuation levels available depends on the Group Type Wiring selected; see below.

- Group I Wiring: 1 to 5 Actuation Levels
- Group II Wiring: 1 to 3 Actuation Levels
- Switch (SPST, N.O. or N.C.): 10/20/50/100 VA.

Notes:

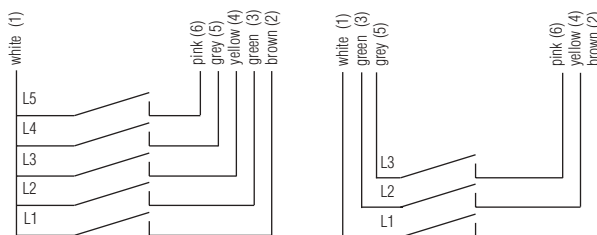
- Units with 50 and 100 VA switches are not UL recognised or CSA listed.
- Other wiring options available. Consult factory.
- Consult Factory for load information.

Float Type	Dimensions			
	A	B	C	D
Buna N	25mm	45mm	3mm Minimum	18mm
Polysulfone	22mm			24mm
Solid P.P.	16mm			29mm
Hollow P.P.	22mm			22mm

Notes:

- Actuation levels are calibrated on ascending fluid level with water, specific gravity 1.0, as the calibrating fluid, unless otherwise specified.
- Tolerance on actuation levels is ± 3mm.
- Tolerance on length is ±2mm.

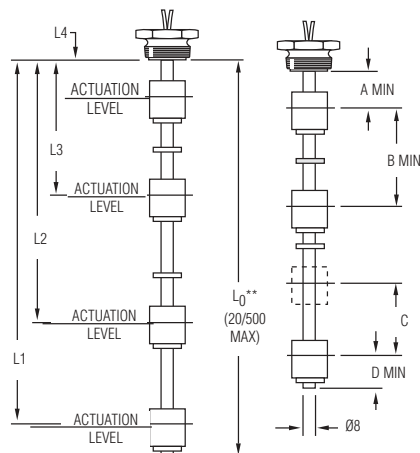
Switching Group



* Pin correlation of plug connectors shown in parenthesis.

- A = Minimum distance to highest actuation level.
 - B = Minimum distance between actuation levels.
 - C = Minimum distance between two actuation levels with one float (Note: One float for two levels can be used only when low level is N.C. dry and high level is N.O. Dry).
 - D = Minimum distance from end of unit to lowest level.
- Switch actuation levels are determined following the guidelines below.

Actuation Level Dimensions



* **Actuation level distances and L₀ (overall unit length) are measured from inner surfaces of mounting plug or flange.**

See mounting types on page 40 for L₀ reference point.

** Length Overall (L₀) = L₁ + Dimension D. See Mounting Types for Maximum Length values.

LS-300 Custom Length, float type level switch check list

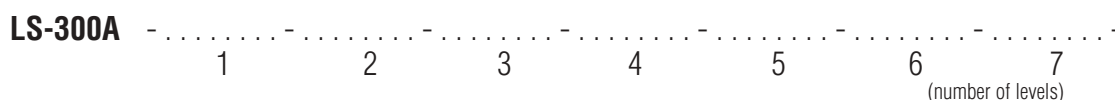
MULTI POINT
LEVEL SWITCHES
www.gems-sensors.co.uk
Application Specific Data

(Please copy and use as order form)

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

- | | | |
|---|--|-------------------------|
| 1. Liquid Media | | 5. Viscosity: SSU |
| 2. Pressure: Minimum _____ <input type="checkbox"/> bar | Maximum _____ <input type="checkbox"/> bar | 6. Tank Material: _____ |
| 3. Temperature: Minimum _____ <input type="checkbox"/> °C | Maximum _____ <input type="checkbox"/> °C | Tank Depth: _____ |
| 4. Specific Gravity: Minimum _____ <input type="checkbox"/> | Maximum _____ <input type="checkbox"/> | |

Enter selected code, from the chart below, at the relevant positions to create Pt. No.


Product Parameters
1. Mounting Type:

- | | |
|--|---|
| <input type="checkbox"/> 11 - No mounting | <input type="checkbox"/> 21 - 1/8" NPT |
| <input type="checkbox"/> 22 - 1" NPT | <input type="checkbox"/> 31 - 3/8" - 24 Straight Thread |
| <input type="checkbox"/> 32 - 1-5/16"-12 | <input type="checkbox"/> 41 - G1/4" - (1/4"-19BSP) |
| <input type="checkbox"/> 42 - G1" (1"-11BSP) | <input type="checkbox"/> 51 - M12 x 1.5 Straight Thread |
| <input type="checkbox"/> 61 - 2" O.D. Flange | <input type="checkbox"/> 62 - 3" - 24 O.D. Flange |
| <input type="checkbox"/> 63 - Pop Flange | |

4. Electrical Rating:

- | | |
|---|--|
| <input type="checkbox"/> 010 - SPST, 10VA | <input type="checkbox"/> 020 - SPST, 20VA |
| <input type="checkbox"/> 050 - SPST, 50VA | <input type="checkbox"/> 100 - SPST, 100VA |

5. Switching Group:

- | |
|---|
| <input type="checkbox"/> Group 1 - Common Return |
| <input type="checkbox"/> Group 2 - Independent Return |

2. Electrical Connections:

✓	Type	Description	Compatible Mountings
	1	Lead Wires, 610mm, Min	All
	2	Cable, 610mm, Min	All
	3	Liquid-Tight Cable Fitting	42
	4	Junction Box Assembly	42
	5	DIN43650 Plug Connector, 3 Poles	42, 62
	6	DIN43651 Plug Connector, 6 Poles	42

6. Switch Actuation Level*:

Actuation Level	*Distance to Actuation Level from inner face of mounting	SPST Switch Operation** (Check Type)	
		N.O.	N.C.
L5			
L4			
L3			
L2			
L1***			

Number of levels.....(entered at pos. 6 in pt. No above)

- * Measured from inner surface of mounting plug or flange. See mounting types on page 1.
- ** Switch position is "normal" with unit dry (tank empty).
- *** L1 is the distance to the lowest actuation level with mounting "up", and is the distance to the highest actuation level with mounting "down".
- B. Length Overall from inner face of mounting..... ±2 mm (max 400mm)
- 7. Unit is Mounted in: T - Top Mounted
 B - Bottom Mounted

Multiple Level Switch LS-400E (1-4 switch points)

MULTI POINT

Max. contact loads of the reed switch:
 SPST 50 VA; 0.5 A; 250 VAC (NC/NO).
 SPDT 10VA; 0.3A; 100 Vdc
 (Higher voltage on request).
 The data NC/NO are defined for an empty tank.

Specifications

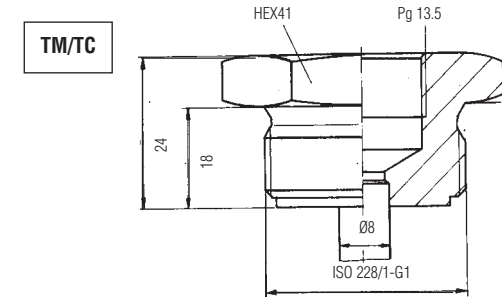
Materials		
Stem	Brass	Stainless Steel
Mounting type	Brass	Stainless Steel
Float	Buna N	Stainless Steel
Operating pressure	10 bar	20 bar
Float temperature*	-20°C ... +80°C Water -20°C ... +110°C Oil	-20°C ... +150°C
Min. specific gravity of the liquid	0.46 g/cm ³	0.85 g/cm ³
Depth of immersion at a density of 1	~9mm	~21mm
Protection rating	IP65 (IP64 for Potted Cable/Leads)	



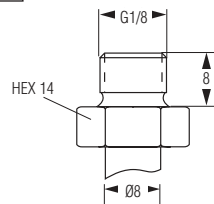
Mounting Direction

Tank top : 0	Bottom : U
--------------	------------

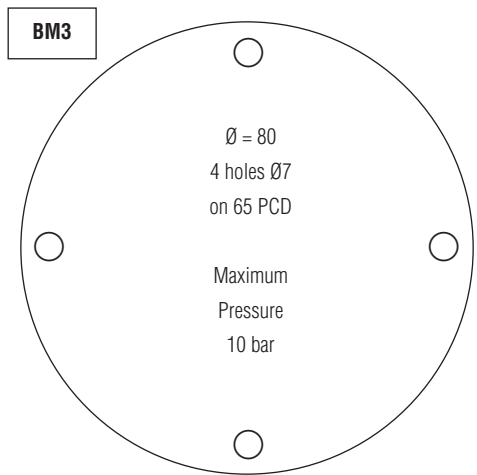
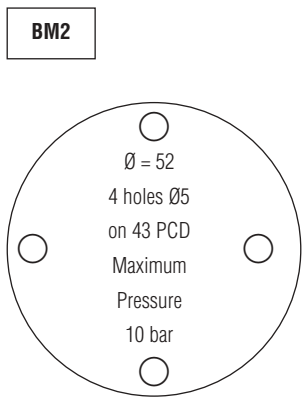
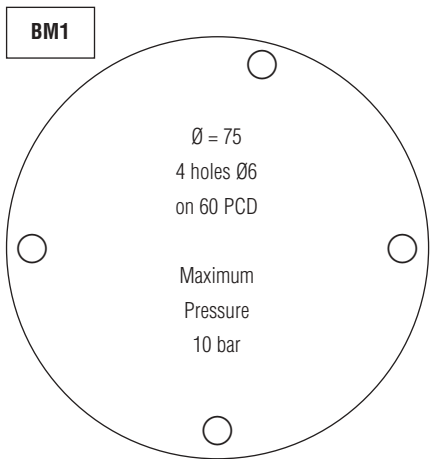
Mounting Type



CM/CC



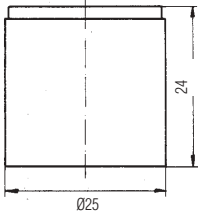
Available with potted cable/leads only.



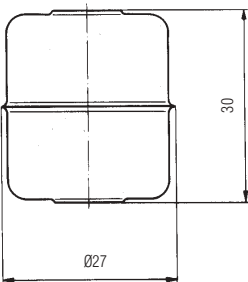
Flanges are only available with DIN 43650 Connector or Potted Cable/Leads.
 Flange thickness = 5mm
 Standard flanges shown
 Other flanges available for OEM applications.

LEVEL SWITCHES

Floats



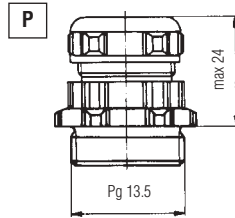
N = Buna N



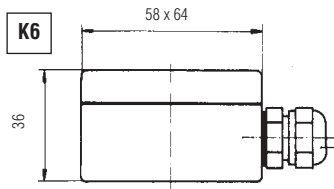
C = Stainless Steel

Electrical Connection

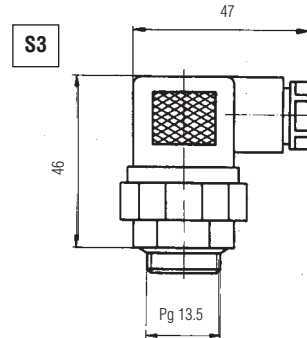
Pg 13.5 Cable gland
Cable (PVC=0.34mm² or 0.25mm²)
standard length appr. 1m;
Temperature: -20 ... +80°C



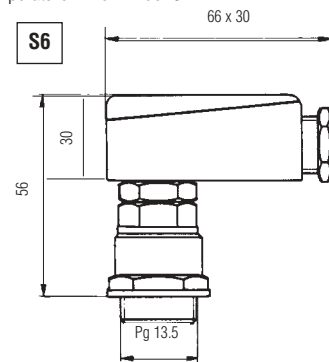
Terminal box 6-poles
Temperature: -20 ... +150°C



Plug connector acc. DIN 43650
3 poles + earth
Temperature: -20 ... +90°C



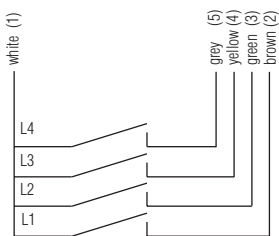
Plug connector acc. DIN 43651
6 poles + earth
Temperature: -20 ... +90°C



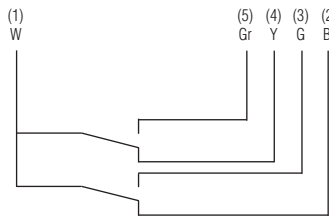
Switching Groups

(Pin correlation of the plug connectors)

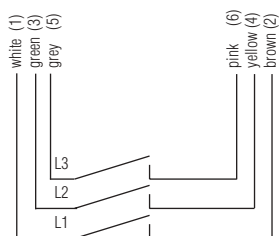
Group 1



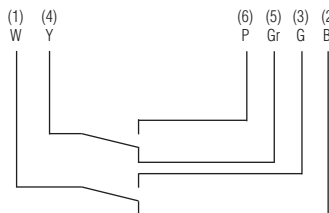
Group 3



Group 2



Group 4



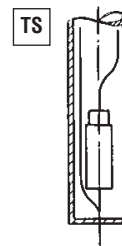
Temperature Switch

For large or OEM applications the LS-400E may be fitted with a temperature switch.

It is installed at the lower end of the stem and reduces the number of switch points by one.

Maximum Rating 2A, 120Vac, 2A, 24Vdc.

For full specification contact your sales office.



LS-400E Multiple Level Switch check list

MULTI POINT

LEVEL SWITCHES

(Please copy and use as order form)

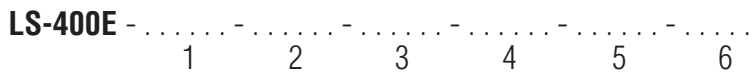
Customer: _____

Order no.: _____ Quantity: _____

Application specific data:

(Please complete fully and accurately)

1. Medium _____
2. Pressure (bar): Min _____ Max _____
3. Temperature (°C): Min _____ Max _____
4. Specific gravity (g/cm3): _____ Min _____ Max _____
5. Viscosity (SSU): _____
6. Tank: Material _____ Depth _____
7. Connection periphery (eg relay, PLC,.....): _____



- | | | | |
|----------------------------------|---|--------------------------|-------------|
| 1. Mounting direction: | Through tank top | <input type="checkbox"/> | O |
| | Through tank bottom | <input type="checkbox"/> | U |
| 2. Mounting Type | Brass | <input type="checkbox"/> | TM |
| Tank screw: | Stainless Steel | <input type="checkbox"/> | TC |
| Flange ø75: | Brass | <input type="checkbox"/> | BM1* |
| ø52: | Brass | <input type="checkbox"/> | BM2* |
| ø80: | Brass | <input type="checkbox"/> | BM3* |
| Put in Plug G1/8: | Brass | <input type="checkbox"/> | CM |
| | Stainless Steel | <input type="checkbox"/> | CC |
| No Mounting | Brass Stem | <input type="checkbox"/> | OM |
| | Stainless Steel | <input type="checkbox"/> | OC |
| 3. Floats: | Buna N | <input type="checkbox"/> | N |
| | Stainless Steel | <input type="checkbox"/> | C |
| 4. Electrical connection: | Plug connector DIN 43650 | <input type="checkbox"/> | S3 |
| | max. switch points Group 1=2, Group 2=1 | | |
| | Plug connector DIN 43651 | <input type="checkbox"/> | S6 |
| | Cable and gland | <input type="checkbox"/> | P |
| | Potted Cable | <input type="checkbox"/> | VC |
| | Potted Leads | <input type="checkbox"/> | VL |
| | Terminal box 6-poles | <input type="checkbox"/> | K6* |
| 5. Switching group: | Group 1 | <input type="checkbox"/> | 1 |
| | Group 2 | <input type="checkbox"/> | 2 |
| | Group 3 (10VA, 0.3A, 100Vdc) | <input type="checkbox"/> | 3 |
| | Group 4 (10VA, 0.3A, 100Vdc) | <input type="checkbox"/> | 4 |
| 6. Options: | Bent Stem | <input type="checkbox"/> | BS |
| | Temperature Switch | <input type="checkbox"/> | TS |

*K6 not available with flange options BM1, 2 and 3

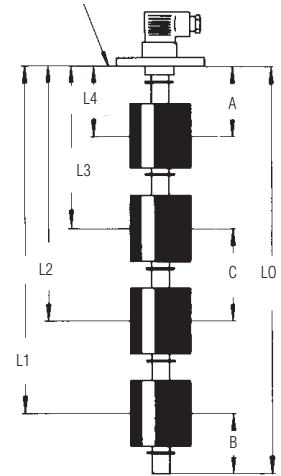
Please specify each non listed part:.....

Dimensions

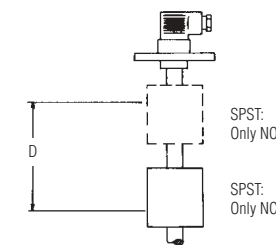
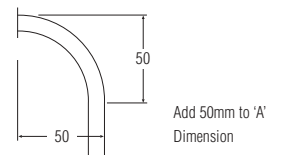
- L₀** = 800mm max.
- A** = min. from reference edge to highest switch point.
- B** = min. from stem end to lowest switch point.
- C** = min. between two switch points
- D** = min. dual action (One float actuates two switch points)

Stem	Brass	Stainless Steel
A	38mm	46mm
B	23mm	35mm
C	44mm	60mm
D	3mm	3mm

Reference edge (Sealing Face)



Bent Stem Option



Level dimensions (Tolerances ± 3mm related to the mid of float.)

Distance level	NO	NC	SPDT
L1 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L2 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L3 =	<input type="checkbox"/>	<input type="checkbox"/>	
L4 =	<input type="checkbox"/>	<input type="checkbox"/>	
L0 =	±2mm max.		800 mm

Multiple Level Switch LS-800E (1-7 switch points)

Max. contact loads of the reed switch: SPST 100 VA; 3.0 A; 250 VAC (NC/NO).
 SPDT 20 VA; 0.5 A; 250 VAC (Change-over contact).
 The data NC/NO are defined for: an empty tank / rising level.



Specifications

Materials	Brass	Stainless Steel	
Stem	Brass	Stainless Steel	
Mounting elements	Brass	Stainless Steel	
Flange		Stainless Steel only	
Float	Buna N	Stainless Steel	PTFE
Operating pressure	10 bar	30 bar	3 bar
Float temperature	-40°C to +80°C Water -40°C...+110°C Oil	-40°C to +150°C	-40°C to +150°C
Min. specific gravity of the liquid	0.58 g/cm ³	0.80 g/cm ³	0.71 g/cm ³
Depth of immersion at a density of 1	~20mm	~30mm	~34mm
Protection rating	IP65 (IP64 for Potted Cable/Leads)		

Mounting Direction

Tank top : O Bottom : U

Mounting Types

(Material: Stainless Steel or brass)

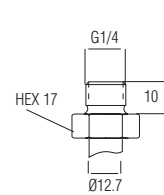
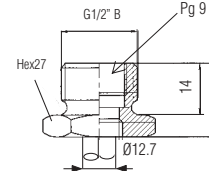
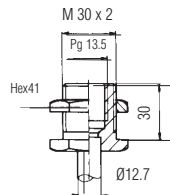
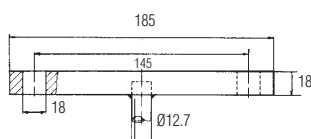
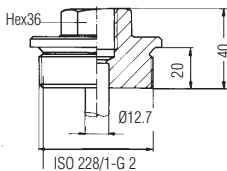
TM/TC = Tank screw DIN 910

BCC = Flange DN65-PN 16

AM/AC = Bulkhead fitting

EM/EC = Put in plug G1/2

DM/DC = Put in plug G1/4



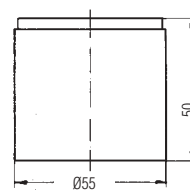
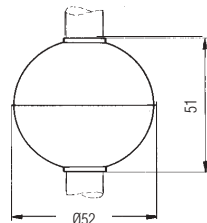
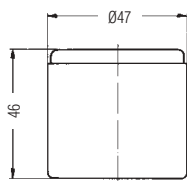
Available with Potted Cable/Leads Option only

Floats

N = Buna N

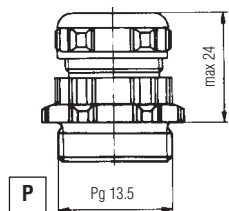
C = Stainless Steel

T = PTFE

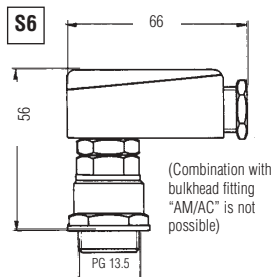


Electrical Connections

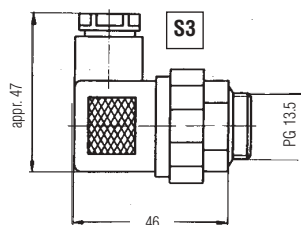
Pg 13.5 Cable and gland
 Cable standard length appr. 1m;
 Temperature: -20 ... +80°C



Plug connector acc. DIN43651*
 6 poles + earth
 Temperature: -20...+90°C
 max switch points: Group 1 : 5,
 Group 2 : 3, Group 3 : 2, Group 4 : 2

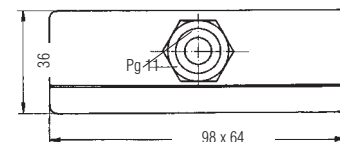


Plug connector acc. DIN43650*
 3 poles + earth
 Temperature: -20 ... +90°C
 max switch points: Group 1 : 2,
 Group 2 : 1

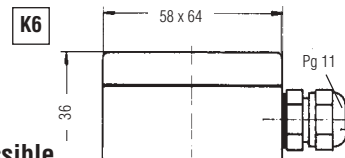


Terminal box 12 poles*
 Temperature: -20 ... +150°C

K12



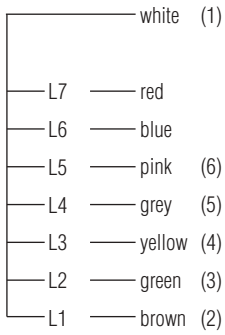
Terminal box 6 poles*
 Temperature: -20 ... +150°C



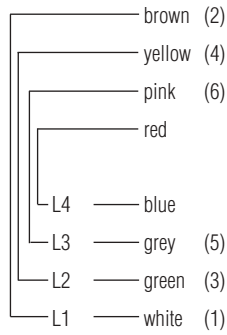
* Combination with put in plug "EM/EC" is not possible

Switching Groups

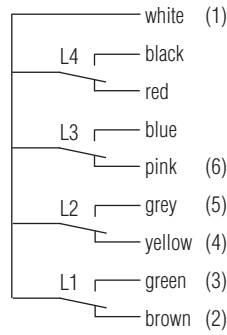
(Pin correlation of the plug connectors)



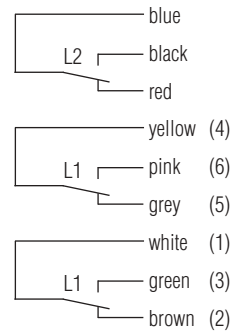
Group 1, max. 7 switch points, NC/NO



Group 2, max. 4 switch points, NC/NO



Group 3, max. 4 switch points (SPDT)



Group 4, max. 3 switch points (SPDT)

Options

Vertical adjustment

Vertical adjustment is only available with tank screw (T). It allows the stem to be adjusted vertically, limited only by the distance from the top stop ring to the electrical connector less the thickness of the mounting.

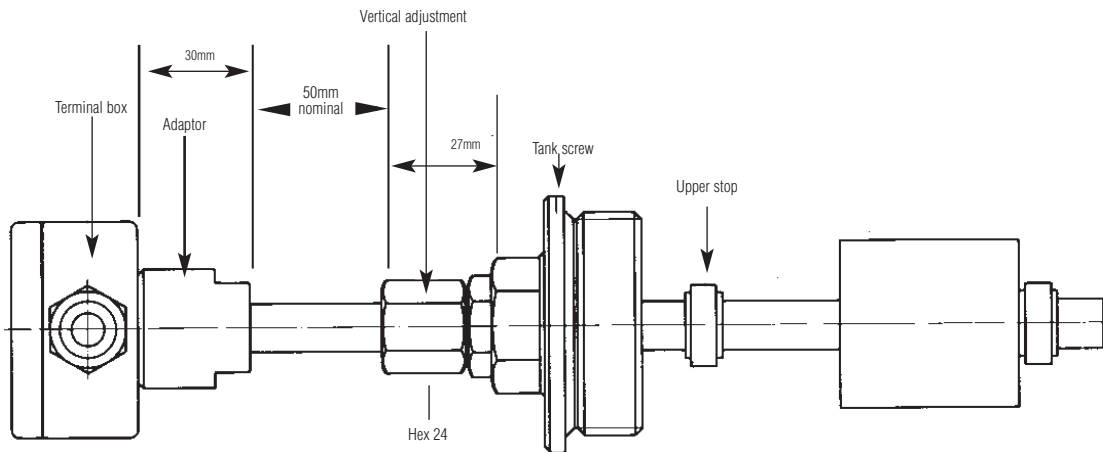
(Combination with bulkhead fitting "AM/AC" is not possible)

Vertical adjustment

VVM = Brass

VVC = Stainless Steel

max. pressure: 10 bar



Slosh shield

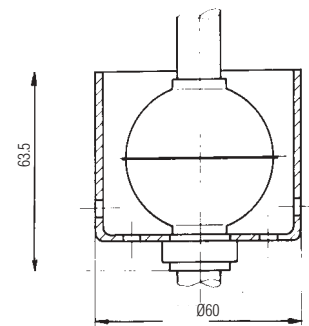
Each switch point can be equipped with a slosh shield, made from Stainless Steel, to avoid unintentional repetitive opening and closing of the switch due to turbulence or ripple.

(Combination with tank screw "TM/TC" is not possible)

Slosh shield

Material: Stainless Steel

DH



LS-800E Multiple Level Switch check list

(Please copy and use as order form)

Customer: _____
 Order no.: _____ Quantity: _____

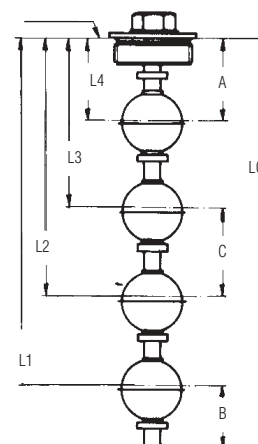
Application specific data: (Please complete fully and accurately)

1. Medium _____
 2. Pressure (bar): Min _____ Max _____
 3. Temperature (°C): Min _____ Max _____
 4. Specific gravity (g/cm3): _____ Min _____ Max _____
 5. Viscosity (SSU): _____
 6. Tank: Material _____ Depth _____
 7. Connection periphery (eg relay, PLC,.....): _____

Dimensions

- L₀** = 3000mm max.
- A** = 60mm min. distance to highest switch point.
- B** = 50mm min. distance between stem and lowest switch point.
- C** = 75mm min. between two switch points
- D** = 7mm min. dual action (One float actuates two switch points).

Reference edge (Sealing Face)



LS-800E - 1. 2. 3. 4. 5. 6.

1. Mounting direction: Through tank top **O**
 Through tank bottom **U**

2. Mounting:

Tank screw G2" Brass **TM**
 Stainless Steel **TC**

Bulkhead fitting Brass **AM**
 Stainless Steel **AC**

Put in plug G1/2" Brass **EM**
 Stainless Steel **EC**

Flange DN 65/PN16 Stainless Steel **BCC**

Put in plug G1/4" Brass **DM**
 Stainless Steel **DC**

No Mounting: Brass **OM**
 Stainless Steel **OC**

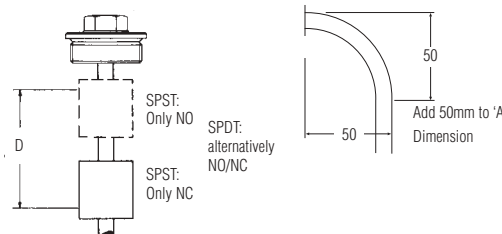
3. Floats: Buna N **N**
 Teflon **T**
 Stainless Steel **C**

4. Electrical connection: Plug connector DIN 43650 **S3**
 Plug connector DIN 43651 (Not with AM/AC) **S6**
 Cable gland **P**
 Potted Cable **VC**
 Potted Leads **VL**
 Terminal box 6-poles **K6**
 Terminal box 12-poles **K12**

5. Switching group: Group 1 **1**
 Group 2 **2**
 Group 3 **3**
 Group 4 **4**

6. Options: Vertical adjustment Brass **VVM**
 Vertical adjustment Stainless Steel **VVC**
 Slosh Shield **DH**
 Temperature Switch **TS**
 Bent Stem **BS**

Bent Stem Option



Level dimensions (Tolerances ± 3mm) related to the mid of float.

Distance level	NO group 1	NC group 1	NO group 2	NC group 2	SPDT group 3	SPDT group 4
L1 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L2 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L3 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L4 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L5 =	<input type="checkbox"/>	<input type="checkbox"/>				
L6 =	<input type="checkbox"/>	<input type="checkbox"/>				
L7 =	<input type="checkbox"/>	<input type="checkbox"/>				
L0 =	±2mm		max 3000 mm			

Please specify each non listed part:

Standard Products in **bold**

MULTI POINT

LEVEL SWITCHES

www.gems-sensors.co.uk

Multiple Level Switch LS-800E-PVC (1...4 switch points)

Max. contact loads of the reed switch: SPST 100 VA; 3 A; 250 VAC (NC/NO).
 SPDT 20 VA; 0.5 A; 250 VAC (Change-over contact).
 The data NC/NO are defined for: an empty tank / rising level.

Specifications

Materials	
Stem	PVC
Mounting elements	PVC
Float	PVC
Electrical connection	Terminal Box (ABS) 6 pole Pg 9 cable gland with 1m PVC-cable (0.34/0.25mm ²)
Operating pressure	1.0 bar
Temperature	-20°C ... +60°C
Min. specific gravity of the liquid	0.75 g/cm ³
Depth of immersion at a density of 1	~22mm
Protection rating	IP65

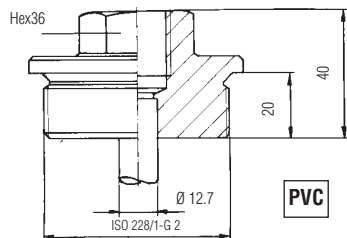


LEVEL SWITCHES

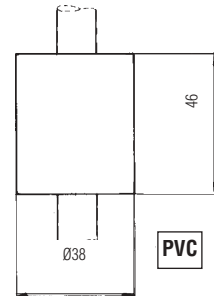
Mounting Direction

Tank top : O	Bottom : U
--------------	------------

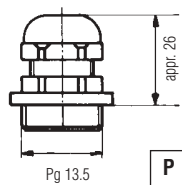
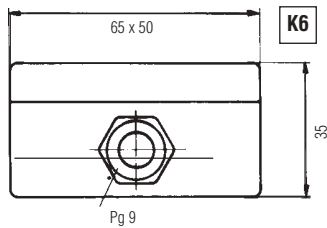
Mounting Elements



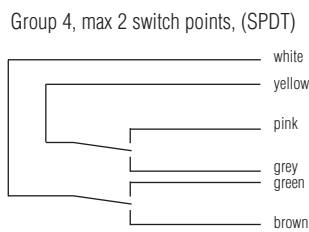
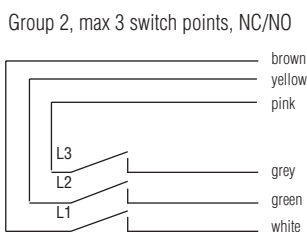
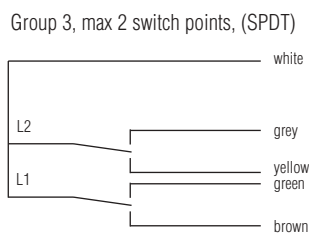
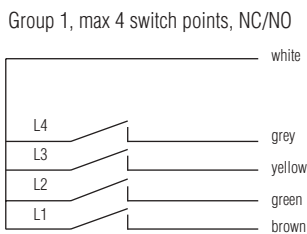
Floats



Electrical Connection



Switching groups PVC model



LS-800E-PVC Multiple Level Switch check list

(Please copy and use as order form)

Customer: _____

Order no.: _____ Quantity: _____

Application specific data:
(Please complete fully and accurately)

1. Medium _____
2. Pressure (bar): Min _____ Max _____
3. Temperature (°C): Min _____ Max _____
4. Specific gravity (g/cm3): _____ Min _____ Max _____
5. Viscosity (SSU): _____
6. Tank: Material _____ Depth _____
7. Connection periphery (eg relay, PLC,.....): _____

LS-800E - PVC 1. 2. 3.

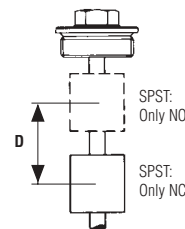
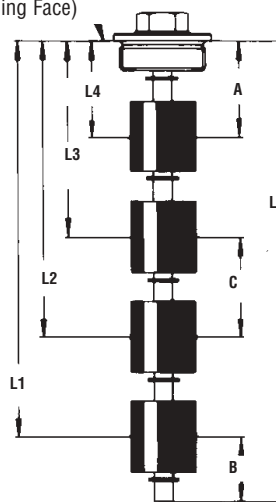
Order data

1. **Mounting direction:**
 - Through tank top 0
 - Through tank bottom U
2. **Electrical connection:**
 - Pg9 cable and gland (standard length: 1m) P
 - Terminal box 6-poles K6
3. **Switching:**
 - Group 1 1
 - Group 2 2
 - Group 3 3
 - Group 4 4

Dimensions PVC Model

- A = 58mm min. distance to upper switch point
- B = 50mm min. distance stem end to lowest switch point
- C = 75mm min. distance between two switch points
- D = 7mm min. distance between two switch points actuated by one float

Reference edge
(Sealing Face)



Dual-action:
One float actuates two switch points
(max distance=D).
SPST: Only NO
SPST: Only NC

MULTI POINT

LEVEL SWITCHES

Level Dimensions

(Tolerance ±3mm) related to the mid of float

Distance level	NO group 1	NC group 1	NO group 2	NC group 2	SPDT group 3	SPDT group 4
L1 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L2 =	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L3 =	<input type="checkbox"/>	<input type="checkbox"/>				
L4 =	<input type="checkbox"/>	<input type="checkbox"/>				
L0 =	±2mm		max 2000 mm			

Detector® Liquid Level Sensors featuring Micropower Impulse Radar

MIR

Whether or not you are familiar with Micropower Impulse Radar (MIR), also known as guided wave radar, there is one important fact you need to know: Gems Detector® Series are the most affordable radar liquid level sensors ever brought to market. Years in development, our key goal was to make radar affordable for original equipment manufacturers, while retaining robust performance so necessary in process use. Gems Detector price-performance statistics are going to change the way you think about using radar for liquid level sensing! Detector sensors are currently available in two dual-guide versions: solid rods and flexible rods. Each has particular advantages that suit a variety of special requirements, yet they share many common high-performance traits.

- ▶ Great Resolution - 0.25mm
- ▶ Great Repeatability - 0.25mm
- ▶ Great Response - < 2 seconds

Gems Detector sensors are effective for measuring any liquid with a dielectric ≥ 3.0 and are particularly effective in media that often frustrate other measuring technologies. Foaming liquids, viscous and coating fluids, slurries and other particulated liquid media - all are candidates for the micropower impulse radar technology employed in Detector sensors.

Smart and responsive, Detector sensors transmit microwave pulses every 2 μ sec and detect new readings every 310 milliseconds. Each reading compiles a running average of the previous 5 cycles to provide your system accurate level measurements to within 0.25mm. Putting it another way, Detector Sensors deliver 30 million pulses and 193 reading updates every minute! This is high performance measurement you can depend on and one more example of Gems commitment to Smarter Products, Better Solutions.



LEVEL SWITCHES

Radar - What's the Difference

Unlike conventional through-air radar (also known as FMCW - Frequency Modulated Continuous Wave), Micropower Impulse Radar (MIR) utilises a wave-guide to direct or guide very low power microwave pulses. FMCW radar sensors emit higher frequency microwave pulses through-air to reflect from the product surface.



Through-air radar is a non-contact method that utilises a reflected radio wave to determine level. The technology requires high power output and tends to require complex signal and data processing. This results in large antennas, expensive electronics and extensive installation.



MIR directs a pulse down a probe that is reflected at the material to be measured. Transit time is measured and level calculated. Use of a probe or wave-guide permits very efficient energy transmission, use of compact, low power electronics resulting in higher efficiency and lower costs.

Radar for OEMs

- ▶ Food & Beverage
- ▶ Fuel Cells
- ▶ Medical Equipment
- ▶ Printing
- ▶ HVAC/R
- ▶ Semicon
- ▶ Pharmaceuticals Manufacturing
- ▶ Speciality Chemicals
- ▶ Measure Contents of Any Vessel from 102mm to 3.65M

Gems has designed and priced Detector sensors for practical and affordable application by Original Equipment Manufacturers. Specify either MIR-800 or MIR-900 and we will deliver your sensors sized and calibrated - ready to drop in and connect with minimal labour.

We welcome your inquiries. Please contact a Gems specialist today to discover how radar can make your product smarter and better.

Principle of Operation

Detector sensor uses Micropower Impulse Radar (MIR) or time Domain Reflectometry (TDR) to measure the distance to the surface of the tank contents and output a 4-20 mA signal proportional to liquid level with high resolution and accuracy.

1 Radar Pulse Generated

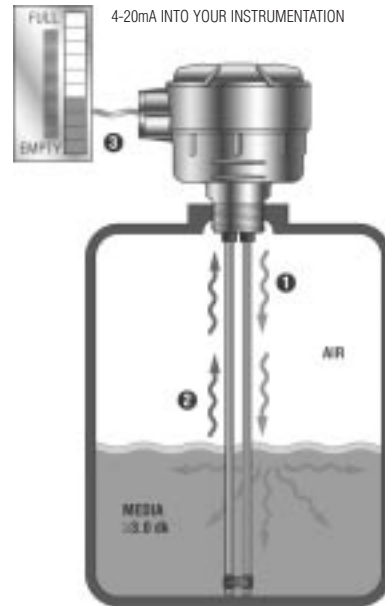
Very high frequency, low power microwave pulses are generated and sent down the probe.

2 Wave Reflection

When the pulses reach the liquid surface, they are reflected. The dielectric constant of the liquid determines how much of the pulse is reflected. These reflected pulses travel back up the probe where they are detected and timed.

3 Distance Calculation

The Detector interprets this time of flight information and converts it into liquid level or tank volume.



MIR Applications

MIR excels at Difficult Fluid Sensing

Detector® MIR Sensors are compatible with more types of difficult media than other technologies. If you don't see your fluid challenge here, call Gems Sensors and we will tell you why Detector® Sensors are right for your application.

	Detector® MIR	Radar (FMCW)	Ultrasonic	RF Capacitance	Magneto- restrictive	Float/ Magnetic
Changing Dielectric Constant	✓	✓	✓		✓	✓
Coatings	✓	✓	✓		✓	✓
Foam	✓					
Low Specific Gravity	✓	✓	✓			
Changing Specific Gravity	✓	✓	✓			
Dirty Liquids	✓	✓	✓			
Slurries	✓	✓	✓	✓		
Steam/Condensate	✓				✓	✓
Suspended Solids	✓					
Vapours	✓	✓			✓	✓
Interface Detection				✓	✓	✓
Non-Contact		✓	✓			

Definitions

Dielectric Constant (dk)

A characteristic quantity of a given dielectric substance, sometimes called the relative permittivity. In general, the dielectric constant is a complex constant, with the one segment being reflective surface properties, and another being the radio absorption coefficient.

Accuracy

How closely an instrument measures the true or actual value of the process variable being measured or sensed.

Repeatability

The maximum difference between output readings of a device or measurement to produce, repeatedly and without adjustments, the same value or result.

Resolution

The smallest increment of change that can be detected which produces a detectable change in the output.

MIR-800E Series - Solid Dual Rod

MIR

- ▶ Lengths to 2m
- ▶ Excellent Resolution
- ▶ 6mm Deadband
- ▶ Repeatable
- ▶ Economical
- ▶ Indicate to Very Bottom of Tank

Series 800E sensors feature solid wave guides to reach within <1mm of a tank bottom; especially beneficial when controlling expensive fluids, where undetected inventory beneath common sensors represents costly waste. A deadband of just 6mm is located at the top end just below the mounting.

These sensors are stocked and available with rods of 1000mm or 2000mm and may be trimmed to required length during installation. For OEM customers, Gems supplies finished units sized per specification and ready for installation. For deeper tanks, please see the MIR-900E Series.

Specifications

General	
Model	MIR-800E
Wave guide configuration	Solid, Dual Rod
Technology	Micropower Impulse Radar
Operating frequency	2.5 GHz
Mechanical	
Enclosure material	304SS
Enclosure height	110mm
Probe material	316SS
Probe dimensions	4.75mm diameter
Other wetted materials	Thermal plastic polyurethane, TPX (Polymethylpentene), Viton®
Mountings	1" & 2" BSPs (NPT also available)
Indication range	102mm to 2m
Electrical	
Supply voltage	6-36 VDC
Output	4-20mA (2-wire)
Approvals	UL & CSA Intrinsically Safe (Pending), CE
Termination	1/2" NPT conduit with cable gland
Environmental	
Temperature range	-18°C to +65°C
Maximum pressure	6.9 bar @ 65°C
Dielectric range	≥3.0
Enclosure rating	IP67
Electromagnetic compatibility	CE EN 50081-1 Emissions; CE EN 50082-1 Immunity
Performance	
Resolution	0.25mm
Repeatability	0.25mm
Accuracy	1-2% full scale
Linearity	1-2% full scale
Response time	2 seconds
Warm-up time	15 seconds



MIR-800E: Cut & Calibrate

Gems Sensors stocks standard sensors that you cut to length and calibrate. And to simplify the calibration, a display and two pushbuttons are included.

1. Order sensors from stock - ship same day.
2. Cut the rods to suit your tank.
3. Simple three step calibration; no need to fill and drain your tank.
4. Install the sensor.

How to Order

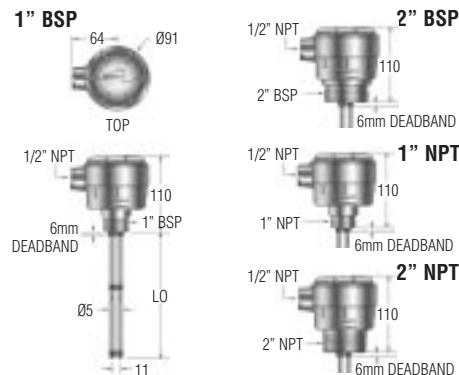
Select by mounting size and wave guide length suitable for tank depth

Mounting Size	Wave Guide Length (See Cut & Calibrate above)	Configurable Length of Indication	Part Number
1" BSP	1000mm	102mm to 1m	041-1015
	2000mm	102mm to 2m	041-1017
2" BSP	1000mm	102mm to 1m	041-1016
	2000mm	102mm to 2m	041-1018
NPT Sizes		Contact a Gems Specialist	

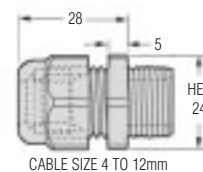


Dimensions (in mm)

Except for mounting sizes, all types share equivalent dimensions



Cable Gland



MIR-800E Series sensors detect fluid media to within a hair of the bottom of a tank or vessel - about the thickness of the paper this brochure is printed on is all the separation needed for the proper sensor function.

Standard Products in **bold**

LEVEL SWITCHES

www.gems-sensors.co.uk