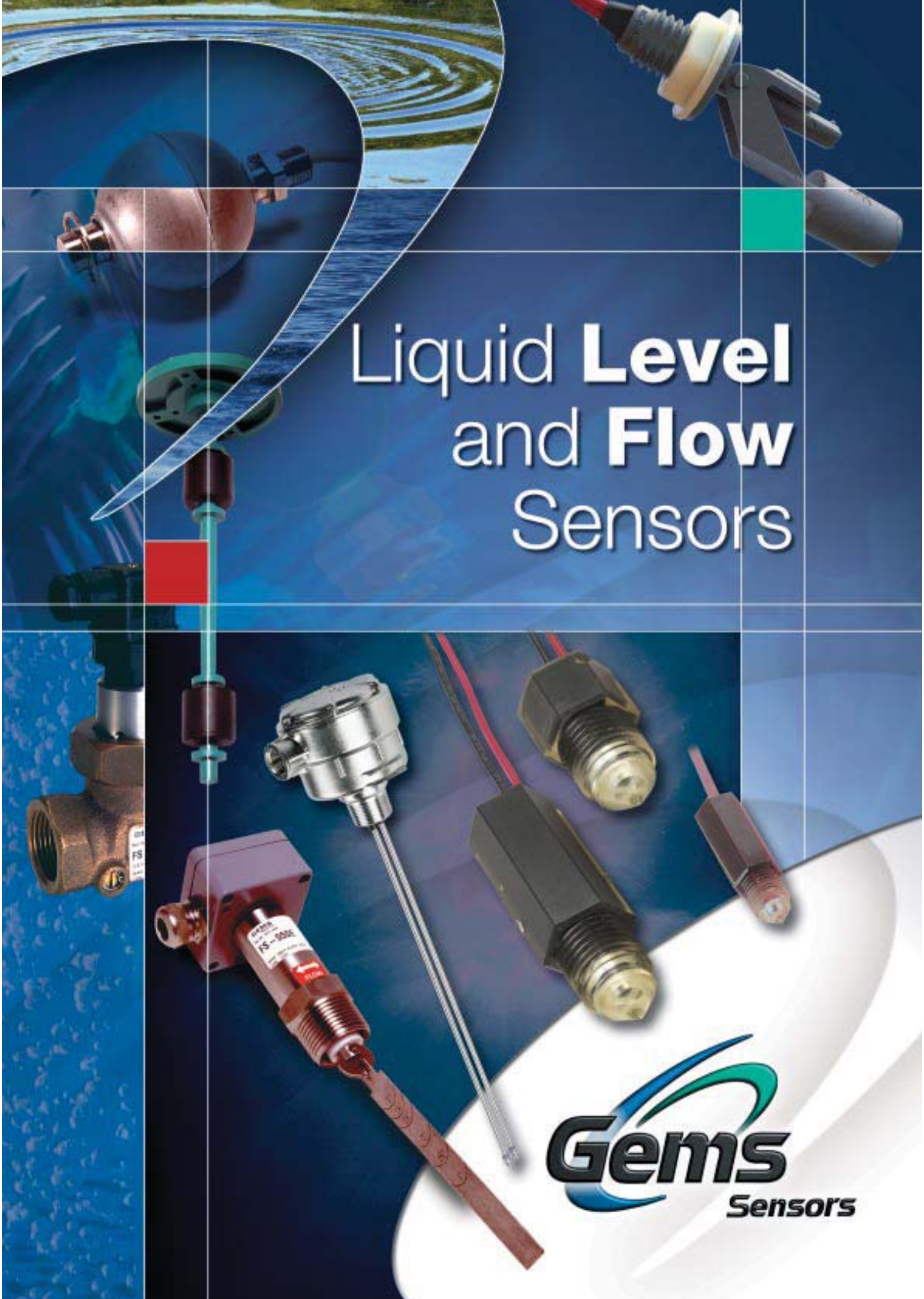
Liquid Level
and Flow
Sensors
Gems
Sensors

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 Prducts 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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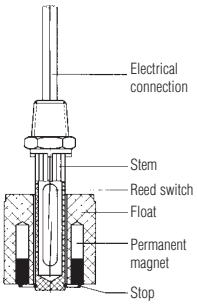
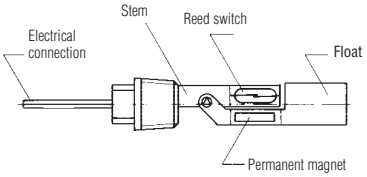
Operating Principle of Gems Level Switches

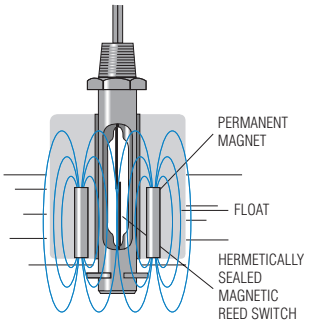




General Operating Principle

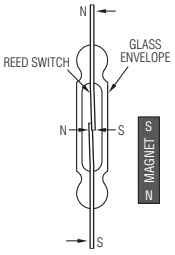
GEMS Level Switches operate on a direct, simple principle. In most models, a float encircling a stationary stem is equipped with powerful, permanent magnets. As the float rises or lowers with liquid level, the magnetic field generated from within the float actuates a hermetically sealed, magnetic reed 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 ± 2mm. 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:

American Bureau of Shipping

RINA - Registro Italiano Navale (Italy)

Underwriters laboratories UL (USA)

Canadian Standards Association - CSA (Canada)

Germanischer Lloyd GL (Germany)

Bureau Veritas BV (France)

American Bureau of Shipping

ATEX

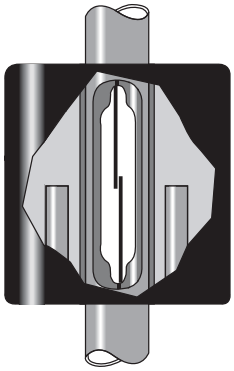
CE Products supplied as standard.
Consult Sales Office for further details.

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 mislead 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.

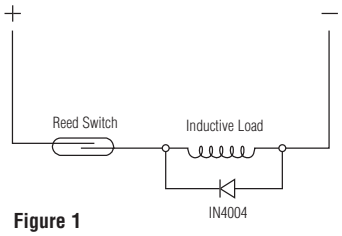


Figure 1

D.C. Contact Protection (Drain the Load)

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.

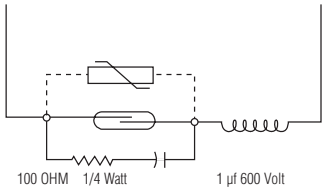


Figure 2

A.C. Contact Protection (Protect the Switch)

Notes:

1. Don't be misled by low voltage ≤10V, low current ≤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 capacitative 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

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
	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
Single Level Switches	"	-	Metal	LS-52100E	23	150	35
1 Switch point	"	-	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
Bilge Water Level Switches	Bracket	-	Plastic / Metal	LS-240E	29	80	10
1 Switch point	(±30°)	-	Metal	LS-270E	29	80	10
Pear Drop Float	Vertical	-	Plastic	M	31	60	1
	Vertical	-	Plastic	G & GM	32 & 33	55	2
		400mm	Plastic	LS-300	35	105	17
Multiple Level Switches	Vertical	800mm	Plastic / Metal	LS-400E	38	110	20
1 ... 7 Switch points	(±30°)	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

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

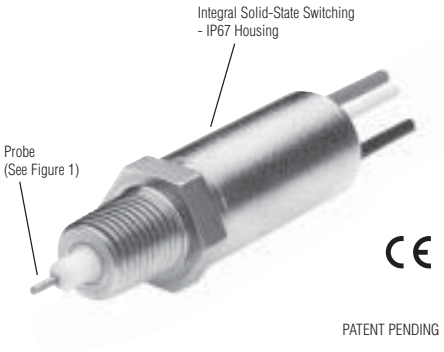
- No Moving Parts
- Integral Electronic Switching
- 172 bar Max. Pressure
- 125°C Max. Temperature
- Built-In Slosh Dampening

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

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)

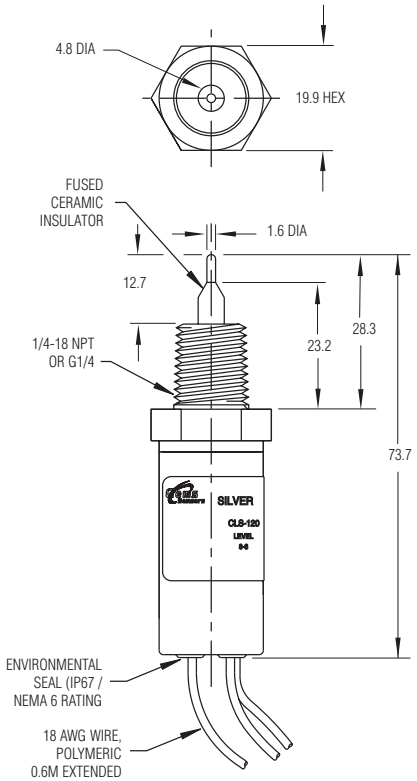
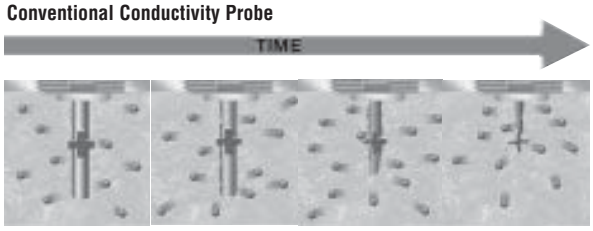


Figure 1

CLS-1200 - Not Your Typical Conductivity Sensor!

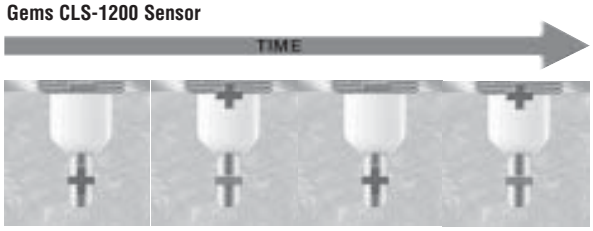
Users of conventional conductivity-based liquid level sensors know that erosion of the probe often renders them inoperable after a short time. CLS-1200 sensors are immune to this erosion due to their unique **alternating potential electronics**.

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)

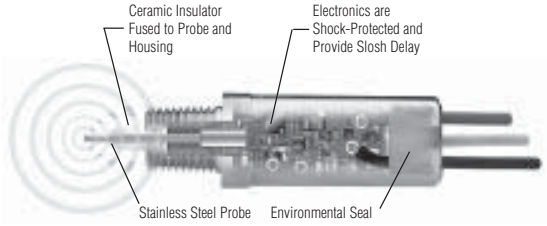
Notes:

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 compatability, contact Sales Office.

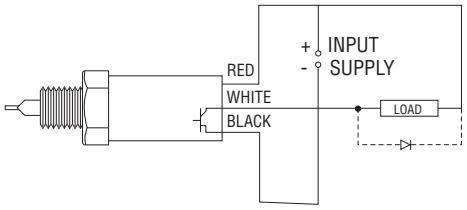
Operating Principle

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

Let GEMS keep and 'Eye" on your Liquid Level:

Compact, Electro-Optic Liquid Level Switches and Controllers

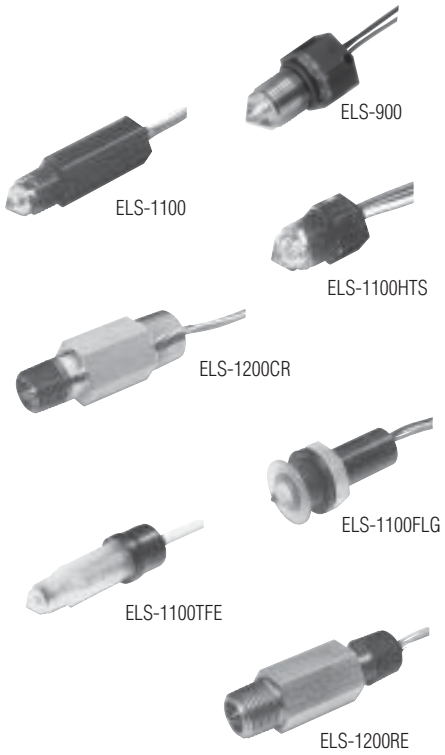
- Small size
- Economically priced
- Built in, solid-state electronics
- No moving parts
- Triangular prism, not susceptable to droplets
- Simple, one-unit installation

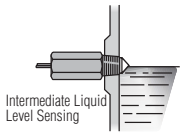
ELS Series Level Switches are low cost, compact, optical level sensors with built-in switching electronics. With no moving parts, these small units are ideal for a variety of point level sensing applications - especially where dependability and economy are a must.

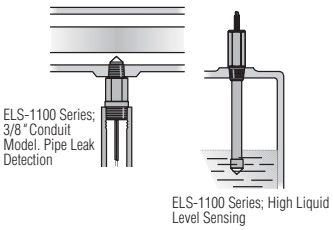
The sensor offers ±1mm repeatability and broad liquid compatibility. They are not recommended for use in any liquid that crystallises or leaves a solid residue. Level switches are suitable for high, low or intermediate level detection in practically any tank, large or small. Installation is simple and quick through the tank top, bottom or side Solid state switching ensures dependability over long service life.

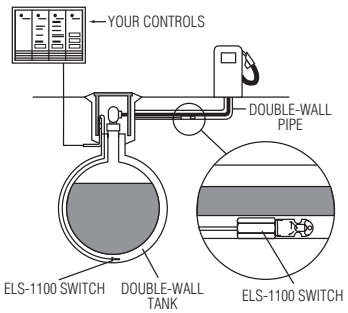
Typical Applications

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

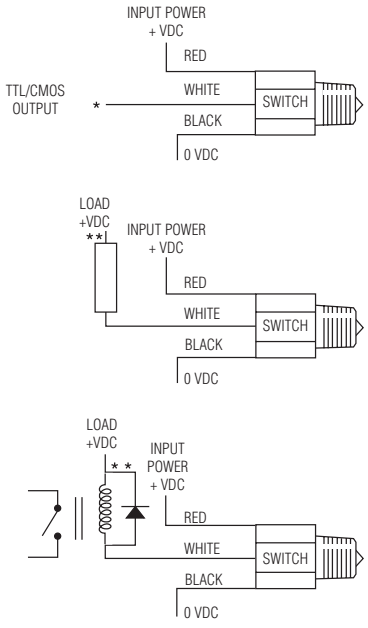








Typical Wiring Diagrams - ELS-1100 and ELS-300 Series



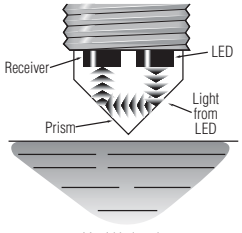
* TTL/CMOS Output - For levels greater than 5 volts, a 10K pull-up resistor is required at the output.

** Maximum Load = 40mA @ 30 VCD.

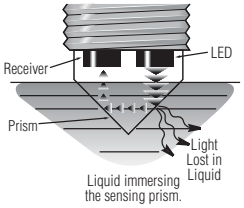
Simple Operating Principle

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.



Liquid below the sensing prism.



Liquid immersing the sensing prism.

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 dyalisis 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

1/2" - 20 SAE #5 Mounting

1/4" - NPT Mounting

U.L. pending

M12 x 1 Mounting

CE

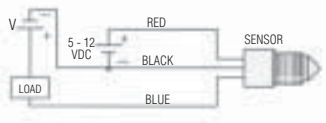
Specifications

Materials	
Housing	Polyethersulfone
O-Ring	Viton® (1/2" SAE #5 amd 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

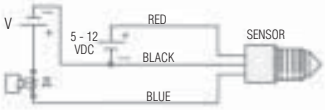
* These switches are not for use in freezing liquids, Leads +120°C

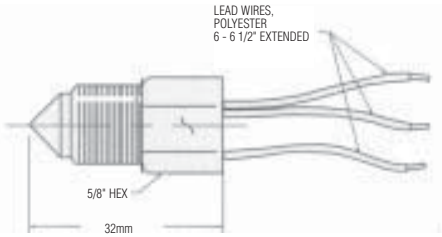
Typical Wiring Diagrams

External Load



Relay Output





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**

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.

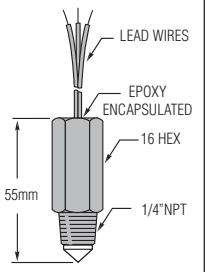
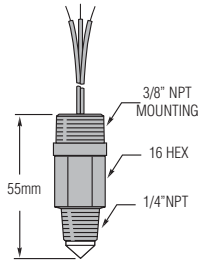
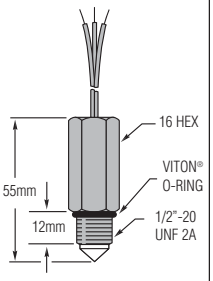
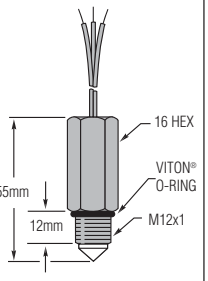
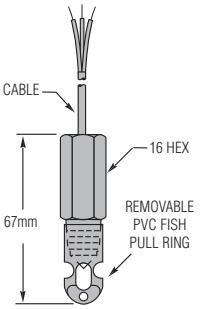
U.L. Recognised

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 susceptability	Meets (MIL-STD-461B Part 2 Modified) Specification of 10 V/M for Frequency Range 30 to 1000 MHz (Except 609 MHz = 9 V/M and 679 MHz = 7.5 V/M).

* These switches are not for use in freezing liquid
** 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

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

ELS-1100HT

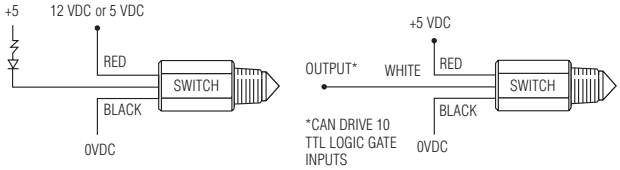
ELS-1100HTS

Specifications

Materials	
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 VCD input power units switch a maximum 5 VCD 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.

	Probe Condition at Current Sink	
Input Power	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

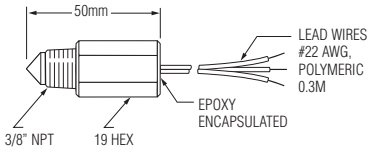
Probe Condition at Current Sink	Part Number	
	3/8" NPT	M16x2
Wet	181674	**191341**
Dry	181675	**191342**

(Wet = NO, Dry = NC)

Dimensions (in mm)

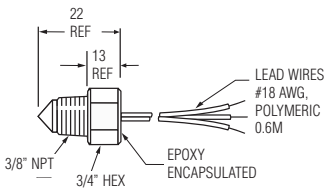
HT Series

3/8" NPT Mounting

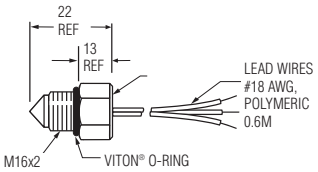


HTS Series

3/3" NPT Mounting



M16 X 2 Straight Thread Mounting with O-Ring



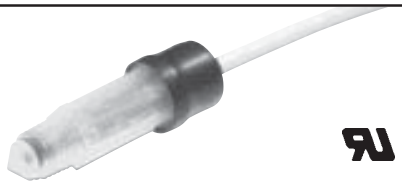
Extended Power and Switching Capabilities of 10-28 VDC Models with Gems.

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

Standard Products in **bold**

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

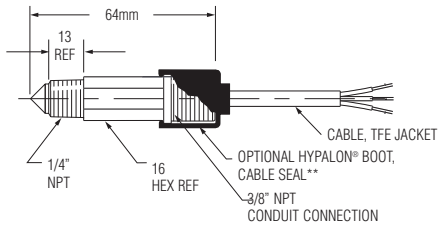
Materials	
Housing and prism	Teflon®
Operating pressure	10 bar Maximum
Operating temperature*	-18°C to 80°C
Input voltage	10 - 28 VDC
Current consumption	18 mA, Approximately
Output†	TTL/CMOS Compatible. Open Collector Output May Sink 40 mA Up to 30 VDC.
Repeatability	±1 mm
EMI susceptability	Meets (MIL-STD-461B Part 2 Modified) Specification of 10 V/M for Frequency Range 30 to 1000 MHz (Except 609 MHz = 9 V/M and 679 MHz = 7.5 V/M).

* These switches are not for use in freezing liquid

† See Page 10 for Wiring Diagrams

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

Dimensions (in mm)



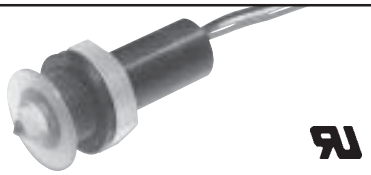
How To Order

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.



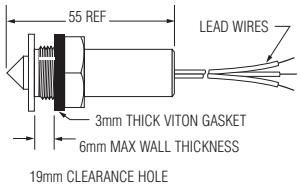
Specifications

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 Susceptability	Meets (MIL-STD-461B Part 2 Modified) Specification of 10 V/M for Frequency Range 30 to 1000 MHz (Except 609 MHz = 9 V/M and 679 MHz = 7.5 V/M).

* These switches are not for use in freezing liquid

† 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.

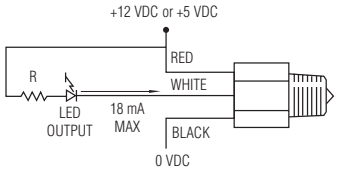
ELS-1150

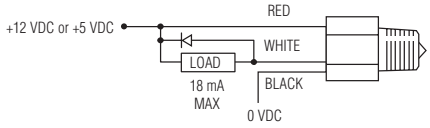
Specifications

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

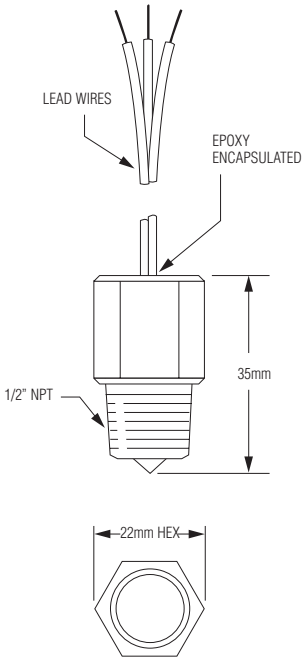
Specify Part Number based on Input Power and Output Condition Required

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)

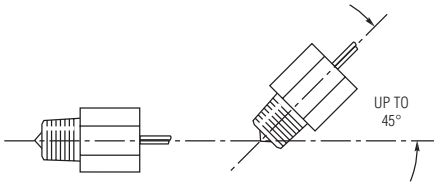
Dimensions

ELS-1150 Series



Mounting Attitude

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



Standard Products in **bold**

ELS-1200 Series

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 Steel①
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

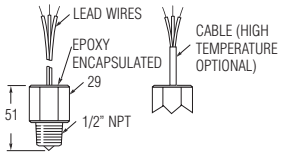
How To Order

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

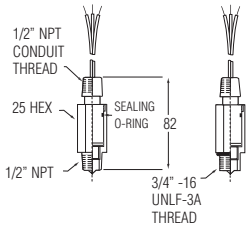
(Wet = NO, Dry = NC)

Dimensions

ELS-1200 Integral Electronics

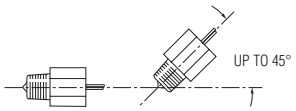


ELS-1200 Removable Electronics



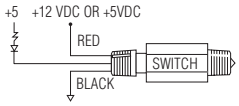
Mounting Attitude

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

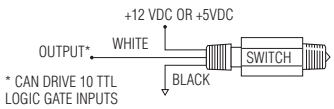


Wiring Diagrams

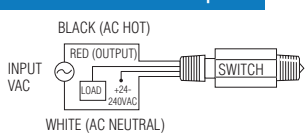
Transistor Output



TTL Compatible Output

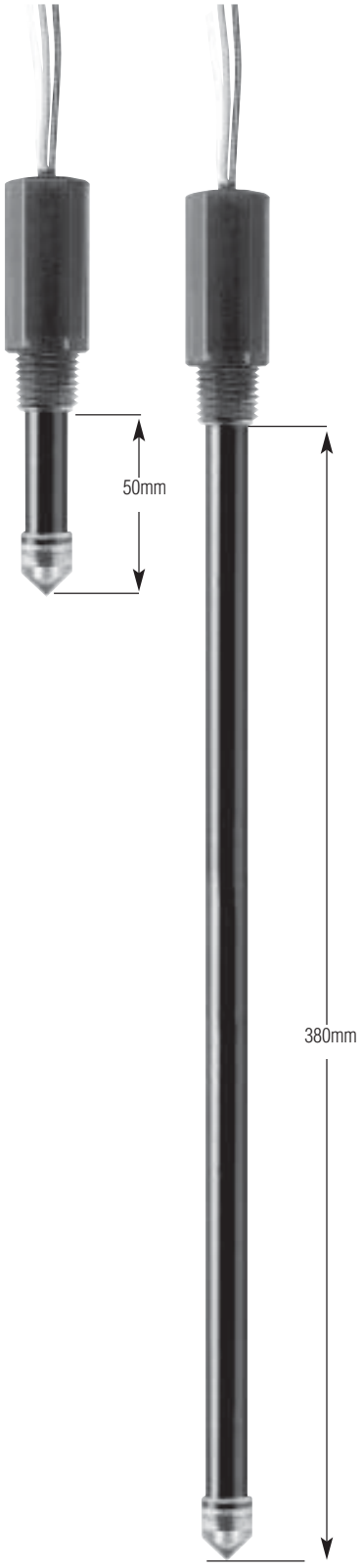


SPST, 24 or 120 VAC Output



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 perfomance 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.

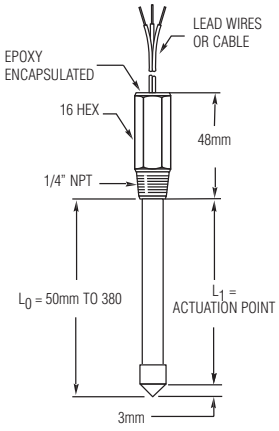


Specifications

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



How to Order

Ask Gems for order sheet

Opto-Pak® Controllers for GEMS Electro-Optic Switches

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

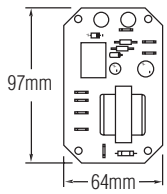
Specifications

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*

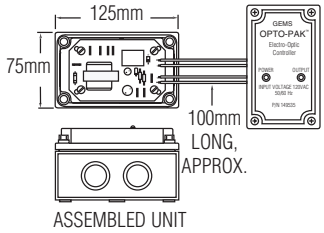
*Ten (10) 1/4" female spade connectors (not shown) shipped loose with each unit.

Dimensions (in mm)

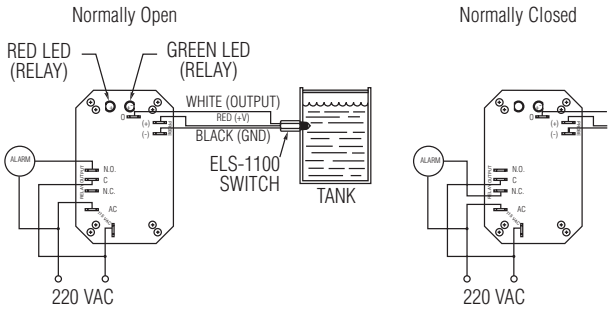
Open Circuit Board Type



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**

Float Type Level Switches

Standard or Custom Length Versions

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

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

Unique Variations and Options

Need a level switch with an integrated syphon tube? Or, maybe a level switch that also provides continuous temperature output? You'll find both of these and other interesting designs inside this 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.

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

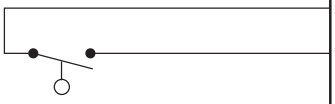
VA	Volts	Amps AC	Amps DC
10 General Use	0-50	.2	.13
	120	.08	N.A.
	100	N.A.	.1
20 Pilot Duty	0-30	.4	.3
	120	.17	.13
	240	.08	.06
50 General Use	0-50	0.5	0.5
	120	.4	.4
	240	.2	.2
100*	120	.8**	N.A.
	240	.4	N.A.

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

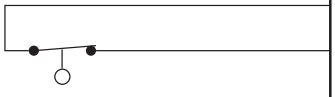
** Limited to 50,000 operations.

Typical Wiring Diagrams

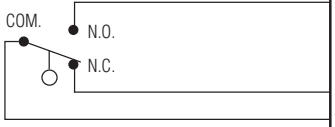
SPST, Normally Open - Dry



SPST, Normally Closed - Dry



SPST, Shown Dry (Change over)



Single level switches made of plastic or metal for horizontal installation

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)

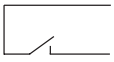
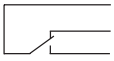
DC ratings on request.

Abbreviations

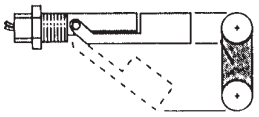
NO = Normally open

NC = Normally closed

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

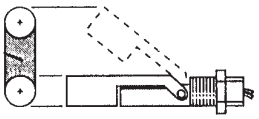
	fly lead	cable	
	red	white	SPST normally open/NO
	red	brown	normally closed/NC
	red	white	SPDT change-over contact
	brown	brown	
	red	green	

Normally Open

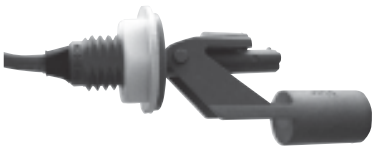


When the switch is mounted so that the float lowers with the liquid level, the switch is NO

Normally Closed



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



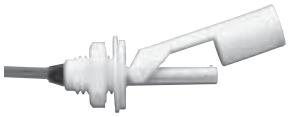
The Type 12 features a “dropped float” with elevated hinge points keeping the hinge and float pivot out of the media eliminating float hang-up problem due to liming and calcium build up. Media Level at switch point is approximately 8mm below pivot.

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.

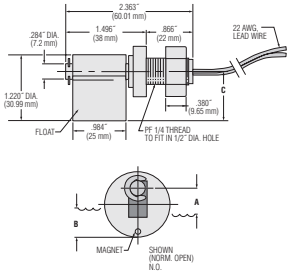
LS-6
Horizontal Mounting through a 1/2" diameter hole in the tank wall

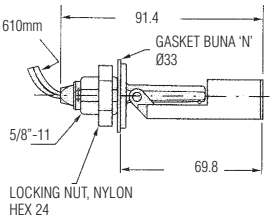


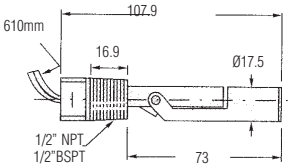
LS-7 Type 3
Internal Mounting

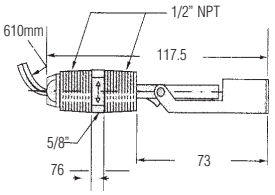
Type 5
External Mounting

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)

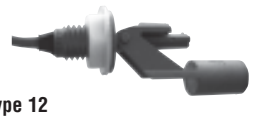
How To Order

	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	–

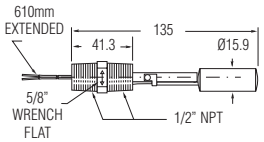
Standard Products in **bold**

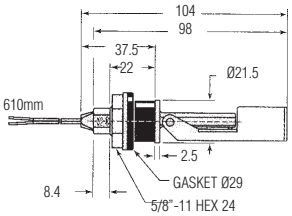
Type 9
External Mounting

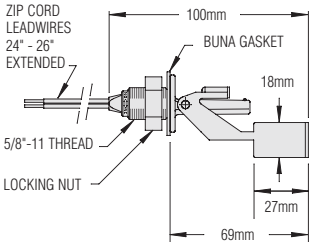
Type 10
External Mounting
Mounts and seals through non-threaded hole Ø22 using an HNBR compression gasket. Wall thickness 0.5 to 4mm



Type 12
External Mounting (NC only)







Specifications

	Type 9	Type 10	Type 12
Materials		Versaplast	Noryl**
Stem/mounting	316 Stainless Steel	Polypropylene**	27mm
		Nylon*	
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**

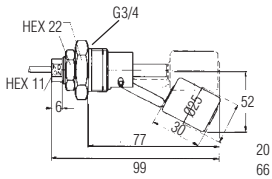
Single Level Switches, side mounted LS-1050E, LS-2050E, LS-52100E

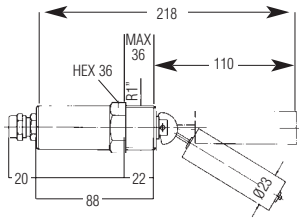
LS-1050E
External/Internal Mounting
For up to 20mm wall
(Hole Ø 17mm Internal Mount

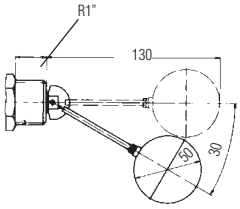
LS-2050E Brass/Buna N
General Purpose materials designed to provide reliable service in oils and water.

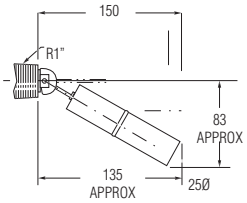
LS-2050E Stainless Steel
Ultimate strength; for pressure up to 60 bar and temperatures to 150°C

LS-52100E
Rugged, all stainless steel unit offers a broad chemical compatability 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 0.34mm²	Cable 0.34 mm² PVC Terminal box	Cable 0.5mm² silicone Terminal Box	Cable 0.5mm² silicone Terminal Box
Float arc	36mm			
Protection rating	IP64	IP65	IP65	IP65
Weight approx.	300g	300g	350g	300g

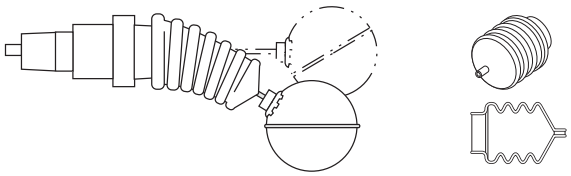
How To Order

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**

Single level switches made of plastic or metal for vertical installation

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:	0.5A;	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.

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.

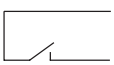
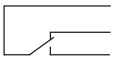
Abbreviations

NO = Normally Open

NC = Normally Closed

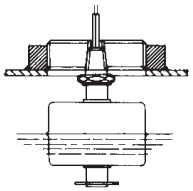
SPST = Single-pole-single-throw

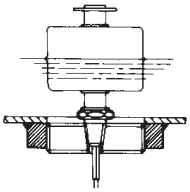
SPDT = Single-pole-double-throw (Change-over contracts)

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

Installation Examples

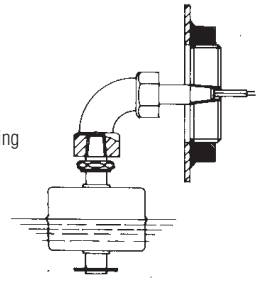
Top Mounting

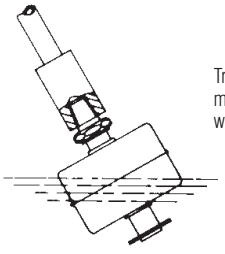




Bottom Mounting

Side Mounting



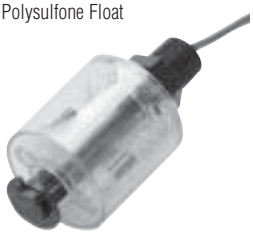


Transversal mounting (30°) with extension

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

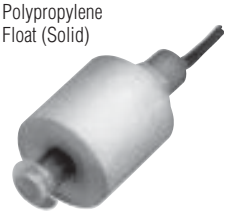


For water based liquids, with limited use in oils and chemicals

Buna N Float

Ideal for oils and fuels

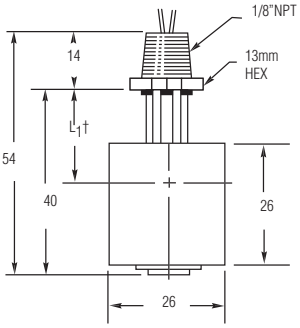
Polypropylene Float (Solid)



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).

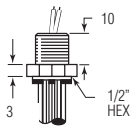
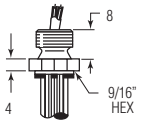
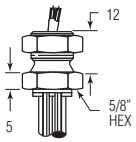
Polysulfone Float: 19.0mm

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		Polypropylene		Polypropylene
			25mm	19mm	25mm	19mm	
Cable	G1/8	010 - 2919(1/8 NPT)	171512	177820	171515	–	171518
	M12 + NUT	–	**189786**	–	**189787**	_	**189739**
Leads	1/8 NPT	42295	162745	177818	116826	201540	142505
	3/8 UNC	–	171511	177819	171514	–	171517

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

LS-3 Specials

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

LS-3 Slosh Shield

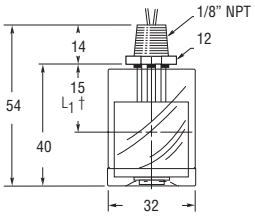
Compact, all-polypropylene switch with slosh shield is ideal for use with turbulent liquids in small tanks. FDA approved materials.

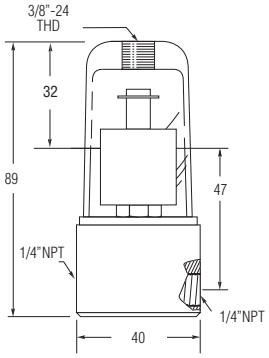
LS-3 Bottle Level

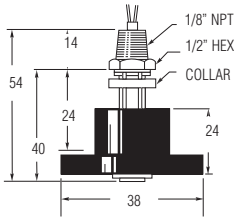
For external mounting on tanks too small to accommodate internally mounted switches. (See note below)

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).
† L_1= 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

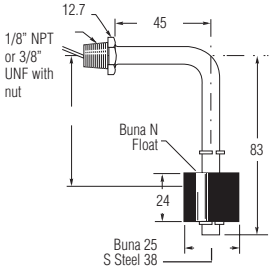
Offer broad chemical compatibility for general purpose use. Also ideal for oils and water.

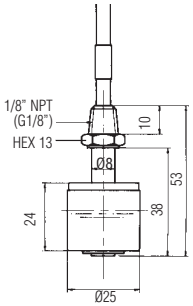
LS-1750E

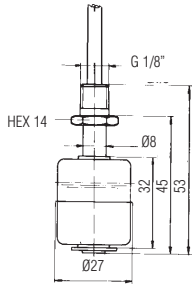
Rugged construction suitable for most corrosive liquids, and for high temperatures and pressures.

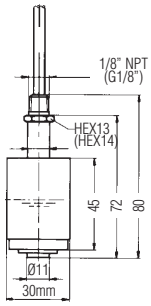
LS-1800

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	+80°C Water	+150°C	+80°C Water
(Note: PVC Cable	+110°C Oil	+110°C Oil		+110°C Oil
Limited to +80°C Ambient)	+150°C S Steel Float	+100°C PTFE		
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 mm2 PVC	Fly lead: AWG 20 FEP Cable: 0.34 mm2 PVC	Fly Lead: AWG 20 FEP Cable: 0.34 mm2 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

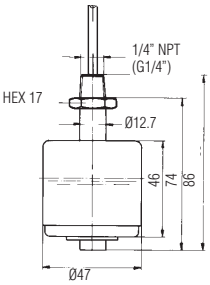
Stem, Float, Mounting Electrical Connection	LS-77700	LS-1700	LS1750E	LS-1800
Brass/Buna, NPT, cable		010-2921 NO/NC		010-2930 NO/NC 010-3011 SPDT
Brass/Buna, NPT, leads	118125	010-1701 NO/NC		013-5651 NO/NC 013-0272 SPDT
Brass/Buna, G, cable		**011-1700** NO/NC		**011-1800** NO/NC
SSteel/Buna, NPT, cable		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 level switches LS-1900, LS-1900T, LS-1950E, LS-74780

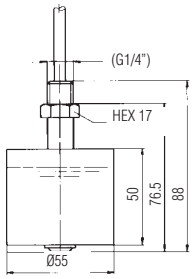
LS-1900

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



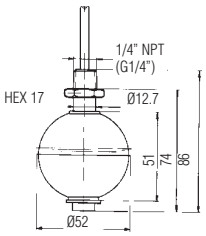
LS-1900T

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



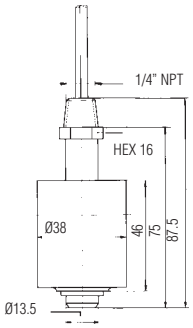
LS-1950E

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/cm3	0.80 g/cm3	0.75 g/cm3	0.85 g/cm3
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: 0.34mm2 PVC	Fly lead: AWG 20 FEP Cable: 0.5mm2 silicone Cable: 0.34mm2 PVC Hi-temp. version - AWG 18 PTFE	Fly lead: AWG 20 FEP Cable: 0.5mm2 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

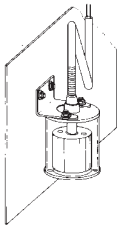
Standard Products in **bold**

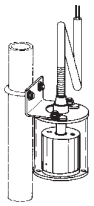
Bilge water level switches

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.





ABS American Bureau of Shipping

LS-240-3E

Germanischer Lloyd GL (Germany)

LS-270-E

Germanischer Lloyd GL (Germany)

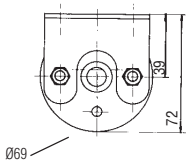
LS-750

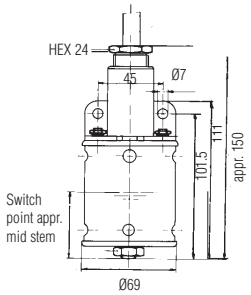
Applications

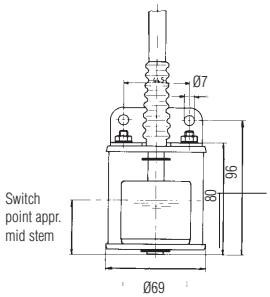
LS-240-3E: This switch has extremely robust construction. It is perfectly suitable for applications on ships and wherever heavy mechanical loads occur.
The LS-240-3E has been accepted by the Germanischer Lloyd, among others, and approved for application by the German Navy.

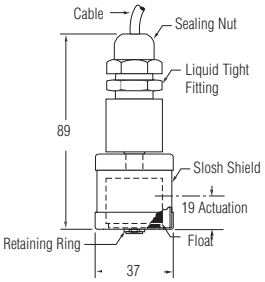
LS-270-E: This bilge water level switch has been developed especially for low level alarms and can monitor levels as low as 35 mm. As the cable is vulcanized the switch is submersible to "IP67". The float can also be constructed as an interface level indicator.
The LS-270-E has been accepted by the Germanischer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









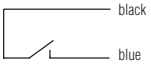
Specifications

	LS-240-3E	LS-270-E	LS-750
Material stem **Material float:**	S Steel Buna N	S Steel Buna N	Brass 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

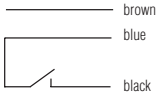
How to Order

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	

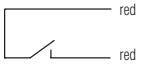
Connecting Diagram



LS-240-E



LS-270-E



LS-750

Standard Products in **bold**

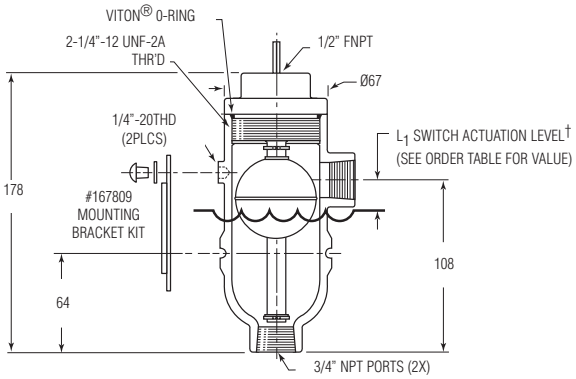
Large Size - Alloys

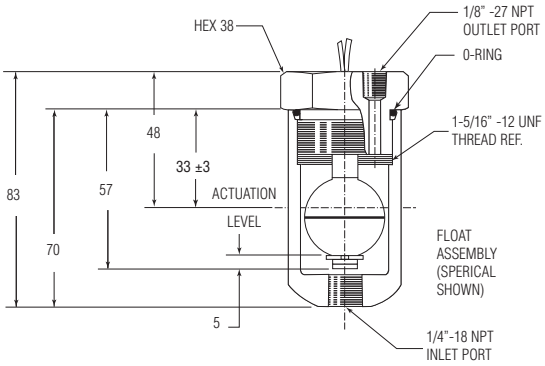
When a Switch won't fit in the tank, use a non-intrusive Bottle Type

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

LS-800-5

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 M - Mechanical Tilt Float Level Switch

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

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

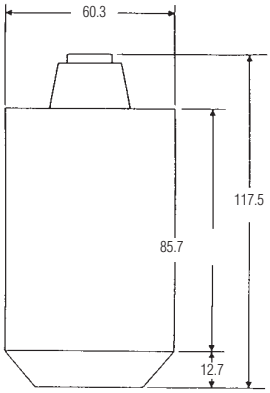
Specifications

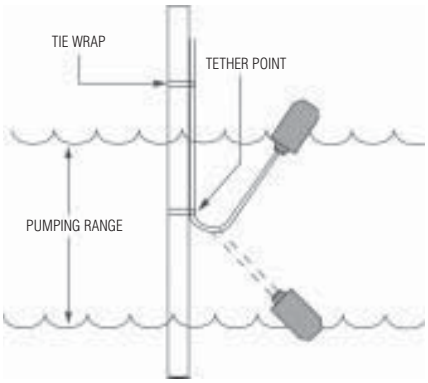
Cord	16 gauge 2 or 3 conductor SJOW Oil Resistant CPE
Contact rating	13 amp @ 120/240 VAC 1/2 hp
Contact design	SPST, Normally Open or Normally Closed Common with N.O. & N.C. (form C)
Temperature rating	Wet 60°C; Dry 90°C
Overall weight	0.5k (not including weight)
Tether method	Tie-wrap nylon, weight 1kg
Approvals	U.L. recognised, CSA Cert, CE
Maximum pressure	1 Bar G

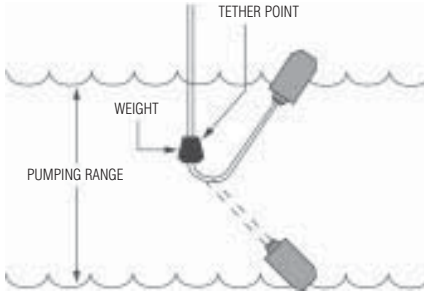
Applications

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

Dimensions (in mm)







How to Order

M XXX XX X

Series
M

Contact Configuration
BLU - SPST, Normally Open, narrow angle[1]
YEL - SPST, Normally Closed, narrow angle[1]
RED - SPST, Normally Open, wide angle[1]
WHI - SPST, Normally Closed, wide angle[1]
GRE - SPDT, Form C, wide angle[2]

Length
40 - 12.2m

Tender Method
T - Tie **W** - Weight

Tender Method	Part Number
Tie Wrap	7762360
Weight	7762381

Notes:

1. Narrow angle pumping range approximately 0.6 to 2.4m (30°)
2. Wide angle pumping range approximately 1.5 to 5.5m (90°)

Standard Products in **bold**

Series G-Pear Drop Float Switches

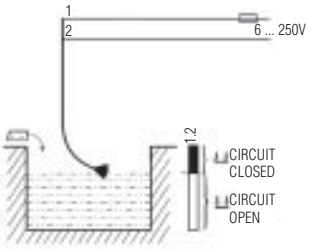
The Gems Sensors Pear Drop Float Switch is designed for use in various applications such as filling and discharging of pumps, and high and low level alarms. The large float casing option has buoyancy, which guarantees smooth, trouble free operation. The Mini unit has a diameter of 76mm and is suitable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

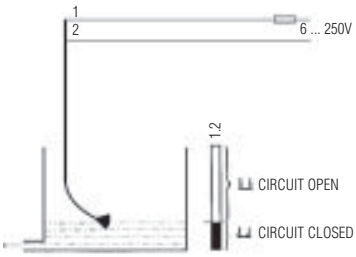
Specifications

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

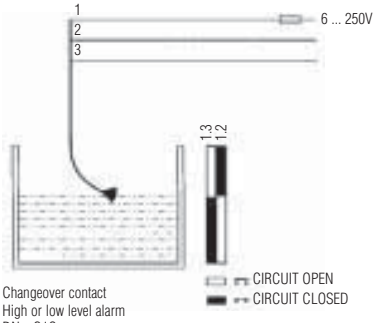
Alarms



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



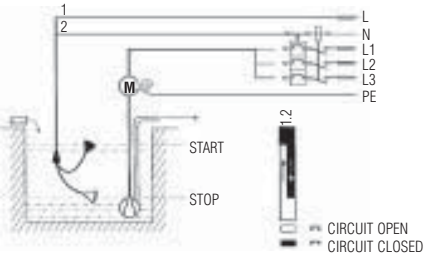
N/C opens on rising.
Low Le vel alarm
P.No. G1L



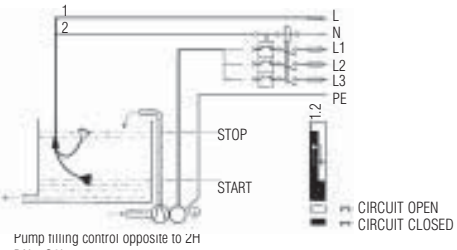
Changeover contact
High or low level alarm
P.No. G1C

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)

GXX-X XX X

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

Standard Products in **bold**

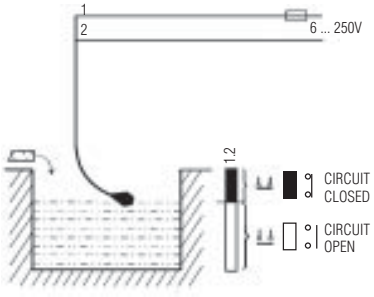
Series GM-Pear Drop Float Switches

Mini Float Pear Drop

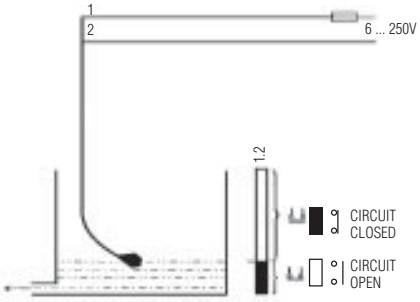
The Gems Sensors Pear Drop Float Switch is designed for use in various applications such as filling and discharging of pumps, and high and low level alarms. The large float casing option has buoyancy, which guarantees smooth, trouble free operation. The Mini unit has a diameter of 76mm and is suitable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

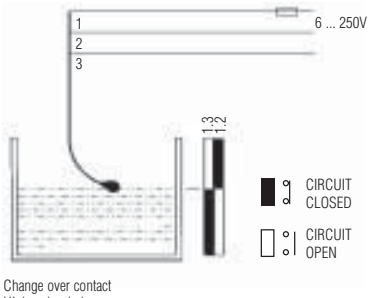
Alarms



HLA N/O closes on rise
P.No. GM1H

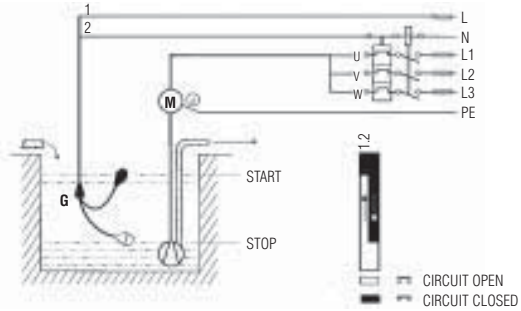


LLA N/C opens on rise
P.No. GM1L

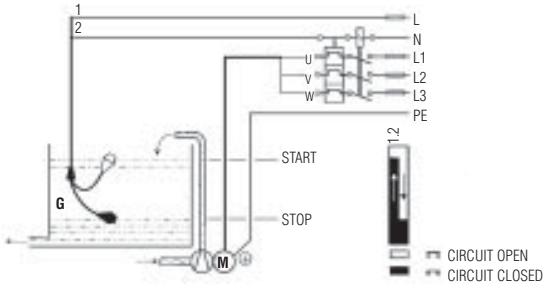


Change over contact
High or level alarm
P.No. GM1C

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)

GXXX-X XX X

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 filing 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

Standard Products in **bold**

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

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.

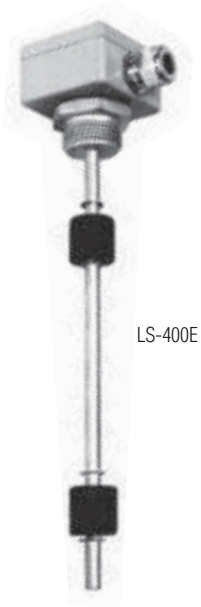
Installation and Maintenance

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

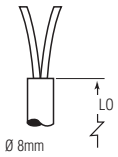
Multiple Level Switch LS-300 (1-5 switch points)

- 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.

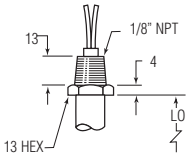
Mounting Types

Type 11
No Mounting

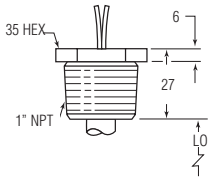


NPT Threads

Type 21
1/8" NPT

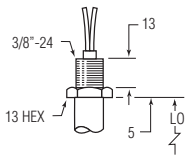


Type 22
1" NPT

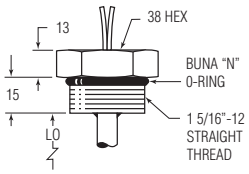


Straight Threads

Type 31
3/8" - 24

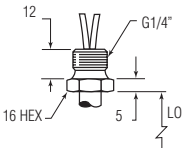


Type 32
1-5/16" - 12

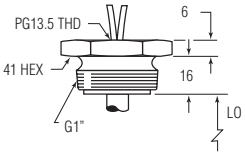


Metric Threads

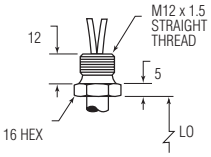
Type 41
G1/4" (1/4"-19BSP)



Type 42
G1" (1"-11BSP)

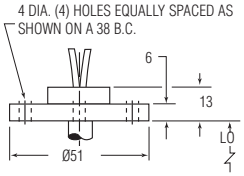


Type 51
M12x1.5 Straight Thread



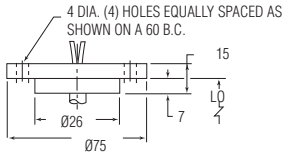
Flange Mountings

Type 61
2" O.D. Flange

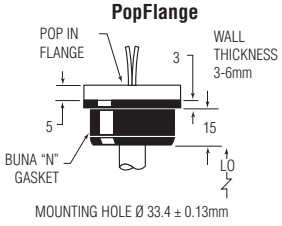


Stem, Mounting and Collar Material	Polysulfone
Max Length (Lo)	400mm
Mounting Position	Vertical ± 30° Inclination

Type 62
3" O.D. Flange

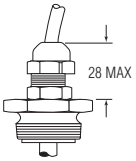
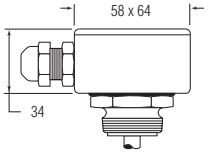
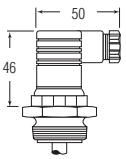
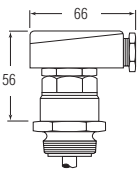


Type 63
PopFlange

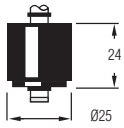
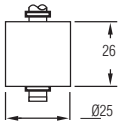
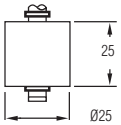
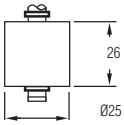


MOUNTING HOLE Ø 33.4 ± 0.13mm

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	Polypropylene 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.

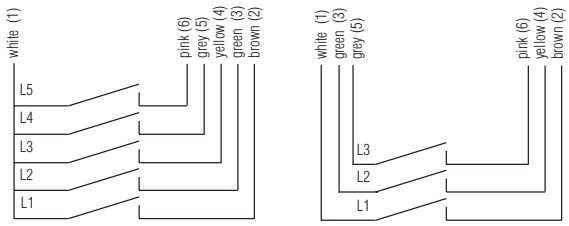
Group I Wiring:	1 to 5 Actuation Levels
Group II Wiring:	1 to 3 Actuation Levels
Switch (SPST, N.O. or N.C.):	10/20/50/100 VA.

Notes:
1. Units with 50 and 100 VA switches are not UL recognised or CSA listed.
2. Other wiring options available. Consult factory.
3. 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

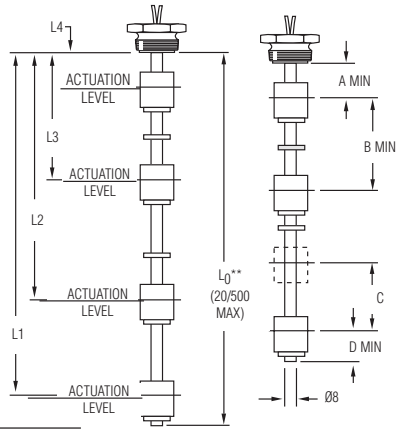
Notes:
1. Actuation levels are calibrated on ascending fluid level with water, specific gravity 1.0, as the calibrating fluid, unless otherwise specified.
2. Tolerance on actuation levels is ± 3mm.
3. Tolerance on length is ±2mm.

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 Lo (overall unit length) are measured from inner surfaces of mounting plug or flange.**

See mounting types on page 40 for L_0 reference point.

** Length Overall (L_0) = L1 + Dimension D. See Mounting Types for Maximum Length values.

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

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
2. Pressure: Minimum _____ ☐ bar Maximum _____ ☐ bar
3. Temperature: Minimum _____ ☐ °C Maximum _____ ☐ °C
4. Specific Gravity: Minimum _____ ☐ Maximum _____ ☐
5. Viscosity: SSU
6. Tank Material: _____

Tank Depth: _____

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

LS-300A - . . . . . - . . . . . - . . . . . - . . . . . - . . . . . - . . . . . - . . . . . -

1 2 3 4 5 6 7 (number of levels)

Product Parameters

1. Mounting Type:

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

4. Electrical Rating:

- ☐ 010 - SPST, 10VA
- ☐ 050 - SPST, 50VA
- ☐ 020 - SPST, 20VA
- ☐ 100 - SPST, 100VA

5. Switching Group:

- ☐ Group 1 - Common Return
- ☐ 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

3. Float Type:

- ☐ BN - Buna-N
- ☐ PS - Polysulfone
- ☐ SPP - Solid Foamed Polypropylene
- ☐ HPP - Hollow Polypropylene

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)

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

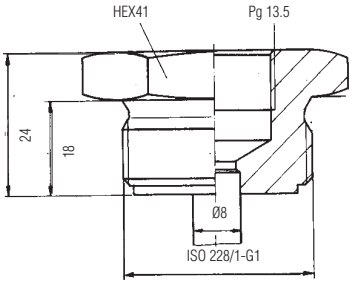
Materials		
Stem	Brass	Stainless Steel
Mounting type	Brass	Stainless Steel
Float	Buna N	Stainless Steel
Operating pressure	10 bar	20 bar
Float temperature*	-20°C ... +80°C Water -20°C ... +110°C Oil	-20°C ... +150°C
Min. specific gravity of the liquid	0.46 g/cm³	0.85 g/cm³
Depth of immersion at a density of 1	~9mm	~21mm
Protection rating	IP65 (IP64 for Potted Cable/Leads)	

Mounting Direction

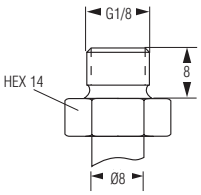
Tank top : O	Bottom : U

Mounting Type

TM/TC

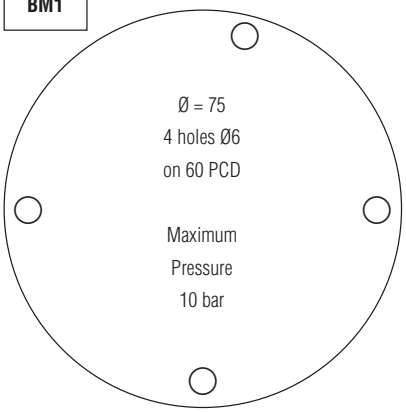


CM/CC

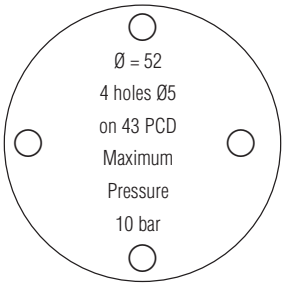


Available with potted cable/leads only.

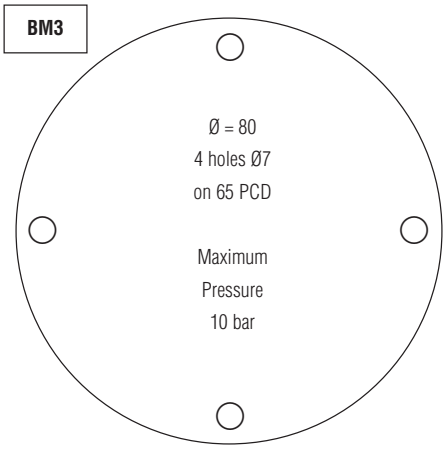
BM1



BM2

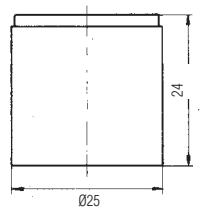


BM3

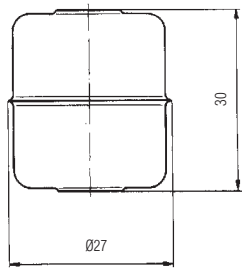


Flanges are only available with DIN 43650 Connector or Potted Cable/Leads.
Flange thickness = 5mm
Standard flanges shown
Other flanges available for OEM applications.

Floats



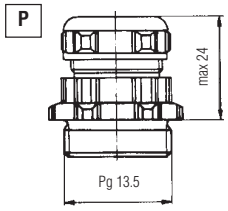
N = Buna N



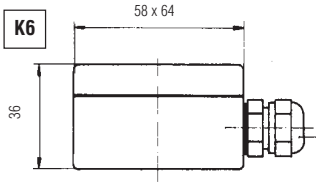
C = Stainless Steel

Electrical Connection

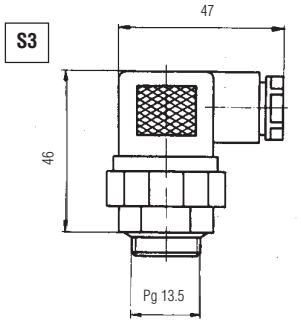
Pg 13.5 Cable gland
Cable (PVC=0.34mm² or 0.25mm²)
standard length appr. 1m;
Temperature: -20 ... +80°C



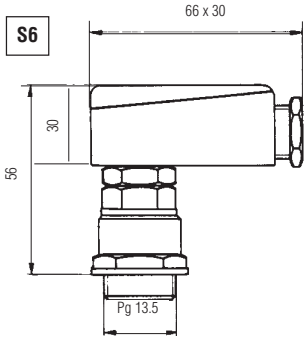
Terminal box 6-poles
Temperature: -20 ... +150°C



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



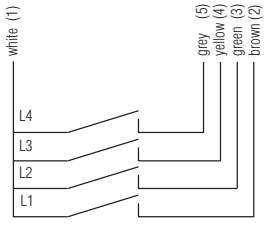
Plug connector acc. DIN 43651
6 poles + earth
Temperature: -20 ... +90°C



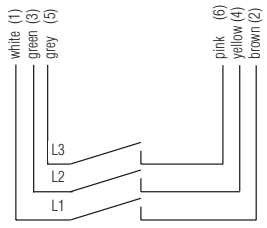
Switching Groups

(Pin correlation of the plug connectors)

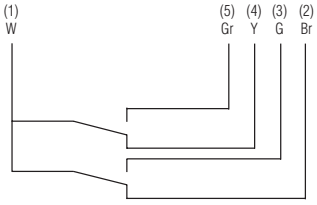
Group 1



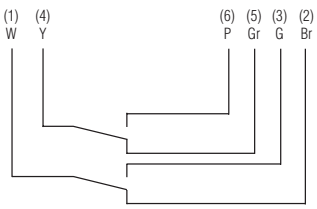
Group 2



Group 3



Group 4



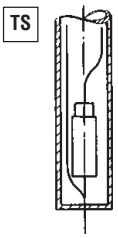
Temperature Switch

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

(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-400E - . . . . . - . . . . . - . . . . . - . . . . . - . . . . . - . . . . .
1 2 3 4 5 6

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

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

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

.....

.....

.....

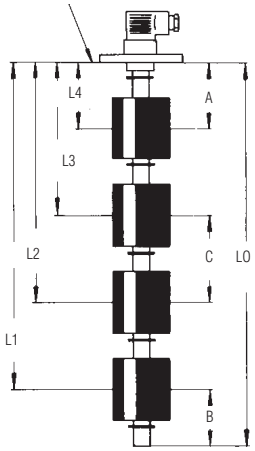
Standard Products in **bold**

Dimensions

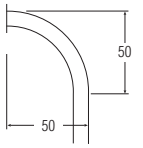
L_0 = 800mm max.
A = min. from reference edge to highest switch point.
B = min. from stem end to lowest switch point.
C = min. between two switch points
D = min. dual action (One float actuates two switch points)

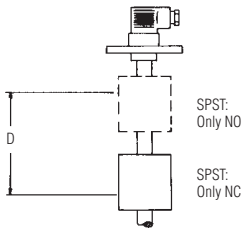
Stem	Brass	Stainless Steel
A	38mm	46mm
B	23mm	35mm
C	44mm	60mm
D	3mm	3mm

Reference edge (Sealing Face)



Bent Stem Option





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

Distance level	NO	NC	SPDT
L1 =	☐	☐	☐
L2 =	☐	☐	☐
L3 =	☐	☐	
L4 =	☐	☐	
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			
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/cm³	0.80 g/cm³	0.71 g/cm³
Depth of immersion at a density of 1	~20mm	~30mm	~34mm
Protection rating	IP65 (IP64 for Potted Cable/Leads)		

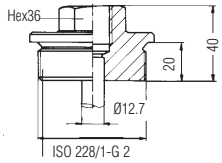
Mounting Direction

Tank top : O	Bottom : U

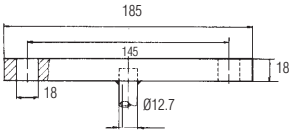
Mounting Types

(Material: Stainless Steel or brass)

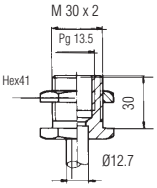
TM/TC = Tank screw DIN 910



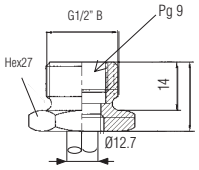
BCC = Flange DN65-PN 16



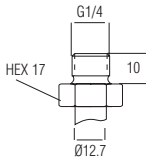
AM/AC = Bulkhead fitting



EM/EC = Put in plug G1/2



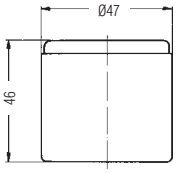
DM/DC = Put in plug G1/4



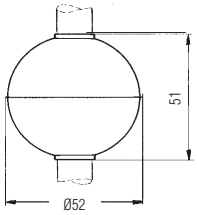
Available with Potted Cable/Leads Option only

Floats

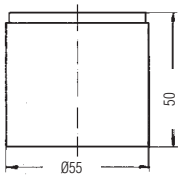
N = Buna N



C = Stainless Steel

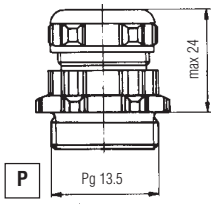


T = PTFE

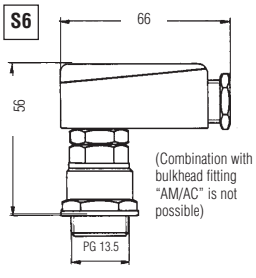


Electrical Connections

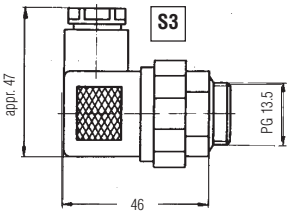
Pg 13.5 Cable and gland
Cable standard length appr. 1m;
Temperature: -20 ... +80°C



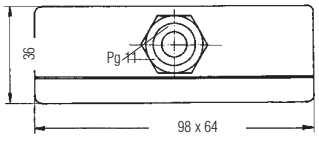
Plug connector acc. DIN43651*
6 poles + earth
Temperature: -20…+90°C
max switch points: Group 1 : 5, Group 2 : 3, Group 3 : 2, Group 4 : 2



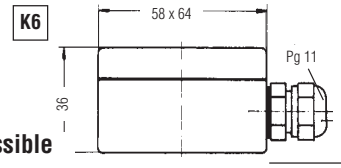
Plug connector acc. DIN43650*
3 poles + earth
Temperature: -20 ... +90°C
max switch points: Group 1 : 2, Group 2 : 1



Terminal box 12 poles* **K12**
Temperature: -20 ... +150°C



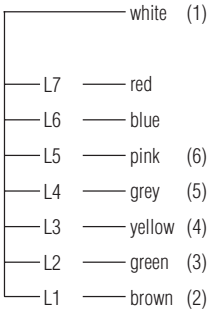
Terminal box 6 poles*
Temperature: -20 ... +150°C



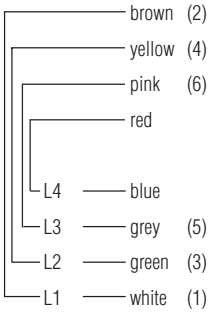
*** Combination with put in plug "EM/EC" is not possible**

Switching Groups

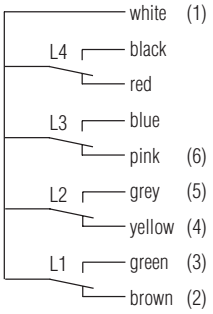
(Pin correlation of the plug connectors)



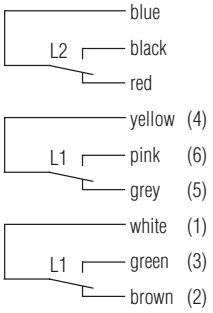
Group 1, max. 7 switch points, NC/NO



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.

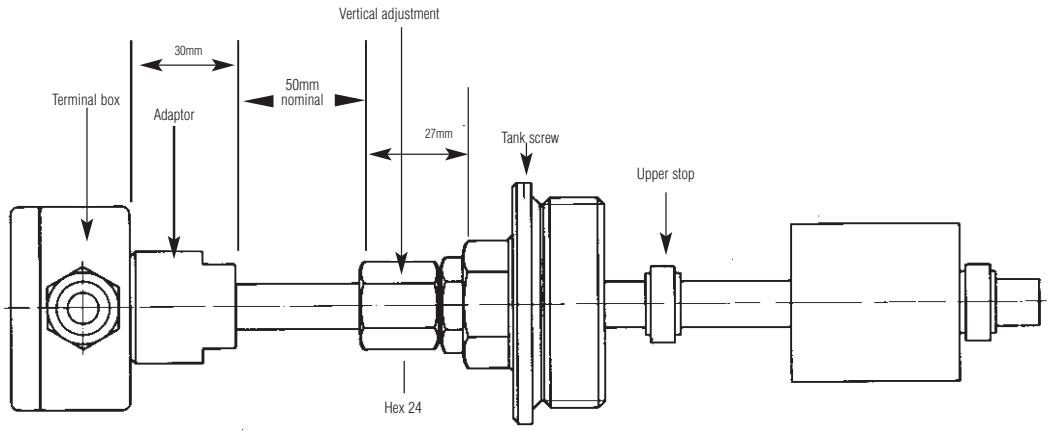
(Combination with bulkhead fitting "AM/AC" is not possible)

Vertical adjustment

VVM = Brass

VVC = Stainless Steel

max. pressure: 10 bar



Slosh shield

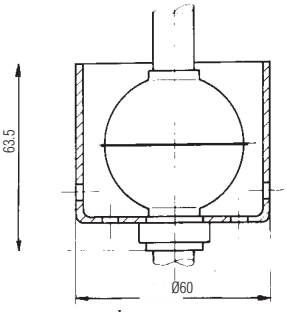
Each switch point can be equipped with a slosh shield, made from Stainless Steel, to avoid unintentional repetitive opening and closing of the switch due to turbulence or ripple.

(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

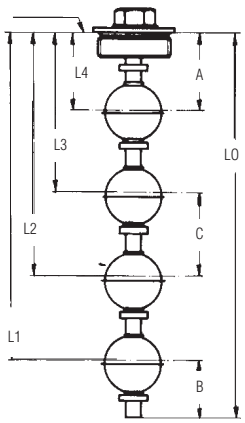
L_0 = 3000mm max.

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

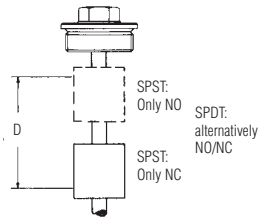
D = 7mm min. dual action (One float actuates two switch points).



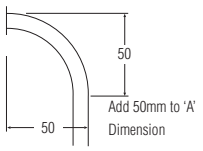
LS-800E - . . . . . - . . . . . - . . . . . - . . . . . - . . . . . - . . . . .
1. 2. 3. 4. 5. 6.

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

Standard Products in **bold**



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 =	☐	☐	☐	☐	☐	☐
L2 =	☐	☐	☐	☐	☐	☐
L3 =	☐	☐	☐	☐	☐	☐
L4 =	☐	☐	☐	☐	☐	
L5 =	☐	☐				
L6 =	☐	☐				
L7 =	☐	☐				
L0 =	±2mm			max 3000 mm		

Please specify each non listed part:

_____

_____

_____

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.

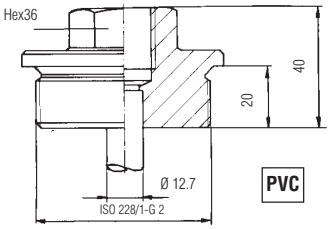
Specifications

Materials	
Stem	PVC
Mounting elements	PVC
Float	PVC
Electrical connection	Terminal Box (ABS) 6 pole Pg 9 cable gland with 1m PVC-cable (0.34/0.25mm2)
Operating pressure	1.0 bar
Temperature	-20°C ... +60°C
Min. specific gravity of the liquid	0.75 g/cm3
Depth of immersion at a density of 1	~22mm
Protection rating	IP65

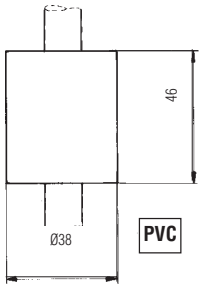
Mounting Direction

Tank top : O	Bottom : U

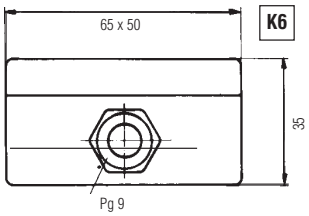
Mounting Elements

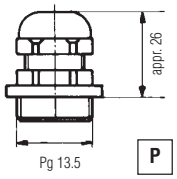


Floats



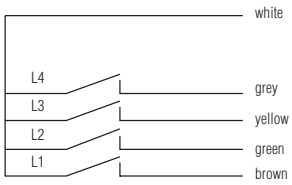
Electrical Connection



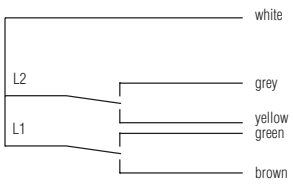


Switching groups PVC model

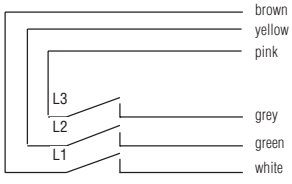
Group 1, max 4 switch points, NC/NO



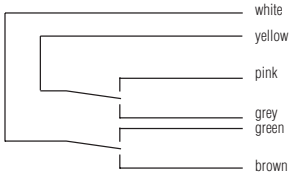
Group 3, max 2 switch points, (SPDT)



Group 2, max 3 switch points, NC/NO



Group 4, max 2 switch points, (SPDT)



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

Level Dimensions

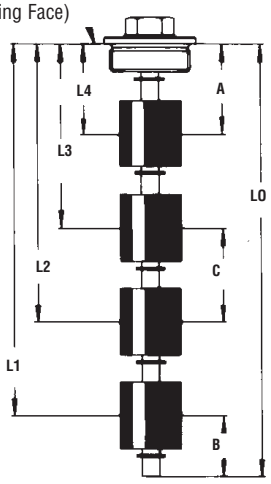
(Tolerance ±3mm) related to the mid of float

Distance level	NO group 1	NC group 1	NO group 2	NC group 2	SPDT group 3	SPDT group 4
L1 =	☐	☐	☐	☐	☐	☐
L2 =	☐	☐	☐	☐	☐	☐
L3 =	☐	☐				
L4 =	☐	☐				
L0 =	±2mm			max 2000 mm		

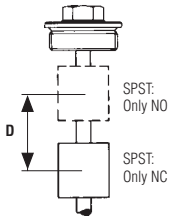
Dimensions PVC Model

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).



Detector® Liquid Level Sensors featuring Micropower Impulse Radar

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 µsec 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.

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.

FMCW Radar

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

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

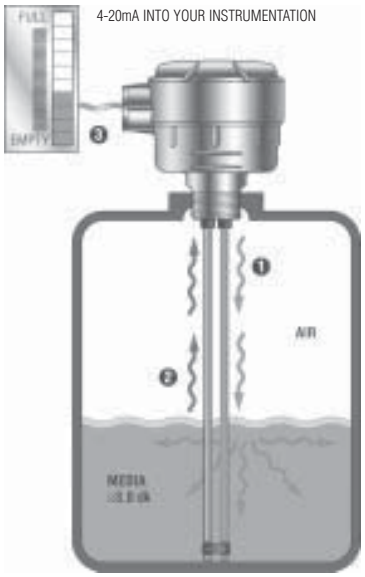
- Food & Beverage
- Fuel Cells
- Medical Equipment
- Printing
- HVAC/R
- Semicon
- Pharmaceuticals Manufacturing
- Speciality Chemicals
- Measure Contents of Any Vessel from 102mm to 3.65M

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

- 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

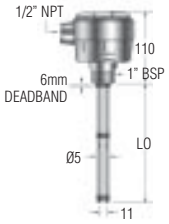
Select by mounting size and wave guide length suitable for tank depth

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		

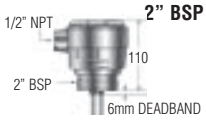
Dimensions (in mm)

Except for mounting sizes, all types share equivalent dimensions

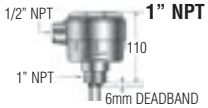
1" BSP



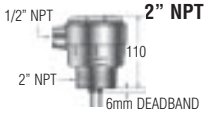
2" BSP



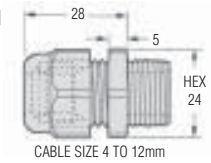
1" NPT



2" NPT



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**

MIR-900E Series - Flexible Dual Rod

- Highly Repeatable
- Lengths to 3.65m
- Tefzel® Wave Guide Encapsulation
- Ideal for Coating/Viscous Liquids

MIR-900E Series sensors handle tank depths to 3.65m, but more important for some will be the ability of this series to deliver dependable sensing in fluids that coat and build up on the sensor wave guide. The flexible dual rod is completely encapsulated with a low-dielectric bridge between the rods that facilitates accurate wave reflection, even when coated with media.
Two standard lengths are available, which may be trimmed to size to fit tanks 3.65m deep or less. A stainless steel weight, fitted at the guide's end, mantains guide rigidity. OEM versions are sized and calibrated at the factory and supplied with fitted Ryton® end weights. With zero deadband at the top, MIR-900E is capable of measuring tank contents right up to the bottom of its mounting.

Specifications

General	
Model	MIR-900E
Wave guide configuration	Flexible, Dual Rod
Technology	Micropower Impulse Radar
Operating frequency	2.5 GHz
Mechanical	
Enclosure material	304SS
Enclosure height	110mm
Probe material	Tefzel® over-moulded 304SS
Probe dimensions	13.6mm width x 2.13mm thickness
Other wetted materials	Thermal plastic polyurethane, Viton®, 304SS, Silicone, Ryton®
Mountings	1" & 2" BSPs (NPT also available)
Indication range	102mm to 3.65m
Electrical	
Supply voltage	8-36 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-900E: 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

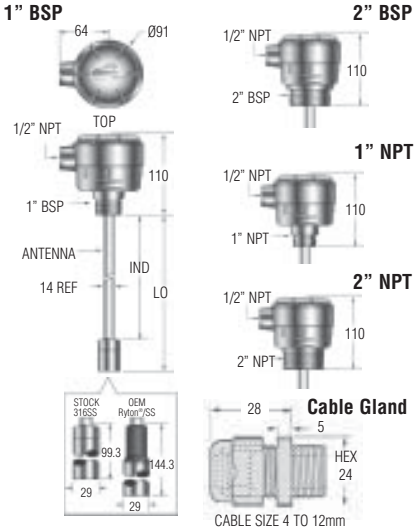
Select by mounting size and wave guide length suitable for tank depth

Mounting Size	Wave Guide Length (See Cut & Calibrate above)	Configurable Length of Indication	Part Number
1" BSP	3500mm	102mm to 3.65m	**041-1023**
2" BSP	3500mm	102mm to 3.65mm	**041-1024**
NPT Sizes	Contact a Gems Specialist		

Standard Products in **bold**

Dimensions (in mm)

Except for mounting sizes, all types share equivalent dimensions



Applications

1. **Use in deeper tanks**
   MIR-900E measures fluids to 3.65m. (Use MIR-800E up to 2m)
2. **Roll Out Installation for Tight Spaces**
   Tanks will often find their tops very close to ceilings. Flexible rods make installation a snap where tight headroom would render a long length sensor impractical. Use MIR-900E wherever space above the tank is at a premium.
3. **Zero Deadband**
   Sense liquids right up to the bottom of the sensor head. with MIR-900E sensors there is no dead band at the high level point.
4. **Over-moulded Rods for Coating, Crystallisation, and product build-up**
   Inks, paints, honey, syrups and other coating fluids will not stop the MIR-900E from maintaining accurate level sensing.
5. **Roll Up for Easy Transport and Handling**
   Moving a 3.65m long sensor has never been this easy. The MIR-900E saves storage space and reduces shipping costs.

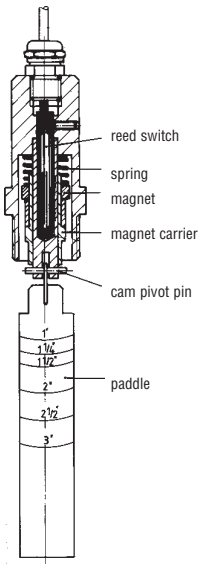
Operating Principle of Gems Flow Switches

GEMS flow switches work according to the principle which is shown in the simplified diagrams on this page.

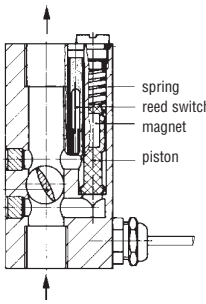
One can differentiate between two main operating principals:

1. A magnet-equipped piston or shuttle, displaced by the pressure differential (>350mb) from fluid flow, magnetically actuates a hermitically sealed reed switch within the unit.
2. Liquid flow deflects a paddle, which - with a pivoting cam - moves a magnet-equipped shuttle along the unit stem.

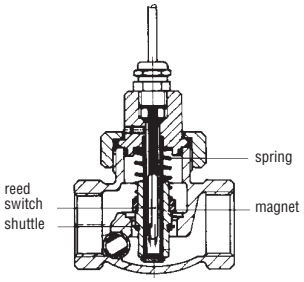
With both operating principles, if a pre-defined flow rate is achieved, a hermetically sealed reed switch is actuated by the magnetic field, resulting in the opening or closing of an electric circuit.



Operating principle



piston



shuttle

paddle

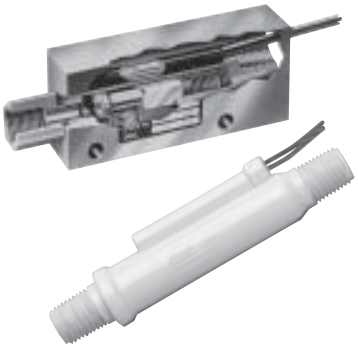
Flow Switches

Unique Designs ... For use in Liquids or Gases

GEMS line of flow switches features a broad range of configurations for use in liquids or gases. At preset ranges, ranging from 50 cc/min to 375 l/min, GEMS switches will initiate alarm actuation to automatic shut-down of a system.

These switches feature high quality, corrosion-resistant materials for use in the toughest environments. Material choices, ranging from stainless steel to Ryton®, offer vast chemical compatibility. Versions include switches with fixed or adjustable actuation settings, models for viscosity compensation or high pressures, in-line models and designs to satisfy any mounting or space requirement.

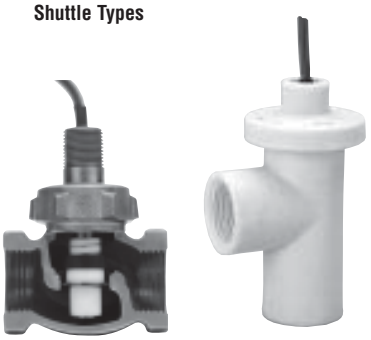
Piston Types



Selector Guide

The versatile GEMS Flow Switch line utilises four basic operating principles. This flow section is organised into four operational types: Piston, Shuttle, Paddle and Electronic. The Shuttle models are for use with high flow rates; the Piston types are designed for low flow rates; the Paddle for large line sizes and the Electronic switches encompass state-of-the-art electronics and positive visual indication.

Shuttle Types

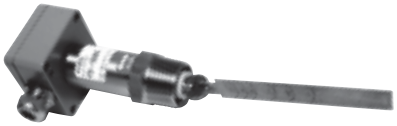


Variety of Operaating Principles

You can quickly pinpoint the GEMS Flow Switch that best meets your requirements using the Selection Chart on page 49. It directs you from the most general criteria of your application ... through key design choices ... to the specific switch series suitable for use. The Selector Guide also provides an excellent overall view of the full scope of the GEMS Flow Switch line and options detailed in this catalogue.

Notes:
For correct operation all piston and shuttle types require at least 350mb line pressure.

Paddle Types



Type	Standard-range (l/min)	Adjustment/output	Ports	Housing material	Page	*Max Temp °C	*Max Pressure (bar)
	0 0.4 4.0 100 200						
FS-3	0.2 — 3.8	pre-adjusted setpoints	R1/4", 1/4" NPT	Noryl®	52	100	10
FS-4	0.4 — 6.0	pre-adjusted setpoints	G1/4" with Adapter	Ryton	54	107	20
FS-6	0.4 — 6.0	pre-adjusted setpoints	G1/4"	Delrin	55	85	30
FS-100E	2.0 — 15.0	pre-adjusted setpoints	G3/8"	Brass	56	90	50
FS-100E-A	1.0 — 16.0	adjustable	G3/8"	Brass	56	90	50
FS-105E	0.005 — 150	adjustable	G1/4" ... G1"	Brass	59	120	250
FS-107E	0.10 — 90	adjustable	G1/2" ... G1"	Brass	59	120	250
FS-150	2.0 — 18.5	pre-adjusted setpoints	1/2" NPT	Polypropylene	53	100	14
FS-200	2.0 — 190.0	pre-adjusted setpoints	1" . . . 2" NPT	Bronze / SSteel	61	150	27
FS-200E	2.0 — 30.0	pre-adjusted setpoints	G1"	Bronze	60	150	27
FS-200E-A	3.0 — 57.0	adjustable	G1"	Bronze	60	150	27
FS-380	1 — 7.6	pre-adjusted set points	3/8" NPT or fitting	Brass / SSteel	57	135	70
FS-380P	1 — 7.6	pre-adjusted set points	3/8" NPT or fitting	Brass / Polypropylene	58	100	7.6
FS-400	3.0 — 37.5	pre-adjusted setpoints	3/4" NPT	Bronze	62	150	27
FS-400-A	3.0 — 53.0	adjustable	3/4" NPT	Bronze	62	150	27
FS-925E	0.4 — 6.0	pre-adjusted setpoints	G1/4"	Brass / SSteel	64	150	68
FS-926E	0.05 — 0.3	pre-adjusted setpoints	G1/4"	Brass / SSteel	64	150	68
FS-10798E	2.0 — 75.0	adjustable	G1/2"	Brass / SSteel	65	150	68
FS-500	1 — 18.5	pre-adjusted setpoints	R3/4" NPT	Polypropylene	63	100	7
FS-550E	15.0 — 125.0	pre-adjusted setpoints	R1"	Brass / SSteel	66	150	55
FT-110	0.5 — 30.0	pulsed output	G3/8", 3/8" NPT	Nylon 12	72	100	14
RFI	0.4 — 225	visual indication	1/4" ... 1" NPT/BSP	Polypropylene / Metal	68	100	14
RFO, RFA	0.4 — 225	pulsed/analogue output	1/4" ... 1" NPT/BSP	Polypropylene / Metal	69	100	14
RFS	0.4 — 225	adjustable	1/4" ... 1" NPT/BSP	Polypropylene / Metal	70	100	14

*Some material / media combinations will result in reduced specifiction.

Please refer to Full Product Specifications.

FS-3 0.2 - 3.8 (l/min) pre-adjusted set points

These ultra compact switches have been specially designed for reliable operation in clean-post-filtered water. They are made primarily of Noryl®, with all other wetted materials are FDA or NSF compliant. FS-3 switches are instrument quality, yet affordably priced for pure water equipment from UV lamp switching to filter life monitoring. Also well suited to some chemical applications and a variety of cooling applications: lasers, welders, etc.

Specifications

(all data related to water at +20°C)

Operating pressure	10 bar at 20°C; 3.4 bar at 100°C
Operating temperature	max. 100°C
Switch	SPST, NO, 20 VA, 120...240 V AC/DC
Inlet / outlet ports	1/4" NPT, R 1/4"
Electrical connection	AWG 22 PVC-lead wires, Length appr. 0.3m
Mounting orientation	Any position
Approvals	U.L. approved file No. E91926

*Materials of construction are either FDA or NSF compliant.

Notes:
1. NO switches in No Flow condition are standard; please contact us for NC models.
2. The device is designed to provide Flow/No Flow sensing. Tabulated set points specify maximum contact closure thresholds on increasing fluid flow. Re-establishment of a Normally Open contact occurs on decreasing fluid flow between set point and no flow.
3. Flow settings are based on a vertical position (inlet port down), using water at +20°C on increasing flow. Some variation in set point actuation will occur in other mounting orientations.
4. Use of 50 micron, or better, filtration is required.
5. Not recommended for use with oils.

How to Order

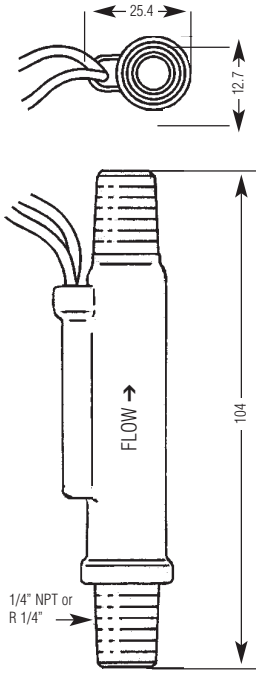
Set points (Fluid) (l/min)	Order numbers for Fluid 1/4" NPT	R 1/4"
0.2	165840	**166701**
1.0	165841	**166702**
2.0	165842	**166703**
3.8	165843	**166704**

GAS/AIR

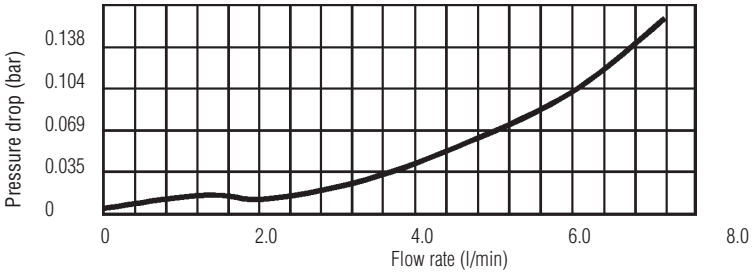
Set Points	(l/min)(air)	Order numbers for Gases	
0.35 bar	6.9bar	1/4" NPT	R1/4
12	28	165840-AIR	**166701-AIR**
28	74	165841-AIR	**166702-AIR**
70	158	165842-AIR	**166703-AIR**
140	340	165843-AIR	**166704-AIR**

Standard Models (Medium: water)
Specify the FS-3 flow switch using part numbers tabulated column above.
Special Requirements
GEMS caters to OEM needs with special configurations, including Gas (Air) flow and customer specified electrical terminations.

Dimensions (in mm)



Pressure Drop Diagram



Housing:	Noryl®
Piston:	Noryl®
Spring:	Stainless Steel

Standard Products in **bold**

FS-150 2.0 - 18.5 (l/min) with pre-adjusted set points

Straight flow path with low pressure drop

The FS-150 slim, inline switches reduce pressure drop to a minimum.

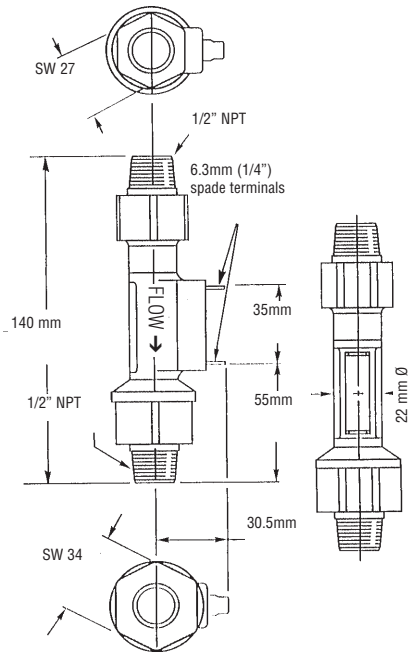
They incorporate a unique, dual-diameter, internal bore and piston configuration to minimise flow constriction. Liquids are able to smoothly pass around the piston and flow through the switch with little pressure loss to the down stream line.

Specifications

(all pressure data related to water at +20°C)

Operating pressure	14 bar
Operating temperature	-17 °C to +100 °C
Set point accuracy	±15%
Set point differential	20% max.
Switch	SPST, 20 VA
Inlet / outlet ports	1/2" NPT male
Electrical termination	6.3 mm (1/4") spade terminals (2)
Mounting orientation	Any position

Dimensions (in mm)



Housing: Polypropylene (hydrolytically stable)
Piston: Ryton®-R4 316 Stainless Steel
O-Ring Viton®
Spring 316 Stainless Steel

How to Order

Standard models (medium: water)

Specify part number based on flow setting and switch operation (see chart next column).

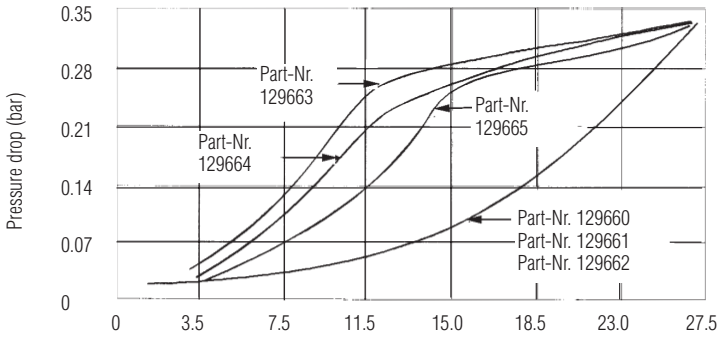
For liquids other than water

Special calibration is available from GEMS for media other than water. Please consult factory with your requirements, including flow media, operating pressure, flow set point and liquid viscosity (SSU).

Order Numbers

set points (l/min)	NO	NC
2.0	129660	129666
3.5	129661	129667
7.5	129662	129668
11.5	129663	129669
15.0	129664	129670
18.5	129665	129671

Pressure drop - typical



Test conducted with units in a horizontal position (terminals upwards), with water at 20°C

FS-4 0.4 - 6.0 (l/min)

Pre-adjusted set points

The FS-4 Series makes flow protection economical for a broad range of industrial applications such as business machines, heavy duty floor cleaners, commercial dishwashers and beverage dispensing equipment.

Specifications

(all data related to water at +20°C)

Max. flow	12 l/min
Max. operating pressure	20 bar
Proof pressure	30 bar
Max. temperature	+107 °C (Ambient +80°C for cable)
Set points	see order number
Switching function (related to increasing flow)	NC, NO, SPDT
Factory calibration position	vertical, inlet port down
Mounting orientation	Any position
Repeatability	± 1%
Adjustment accuracy	±15%
Hysteresis	max. 20%
Mounting	9/16"-18 UNF-2B, with adapter: G1/4"
Electrical connections	— lead wire: TPE, 18 AWG x 0.6m approx — cable: PVC, 0.34 mm² x 1m approx
Enclosure	IP 65
Electrical data contact rating	NC/NO: 100 VA; 3 A; 220 V~ SPDT: 20 VA; 0.5 A; 220 V~
Weight	0.1 kg

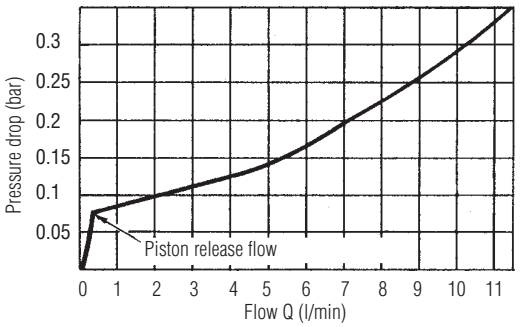
How to Order

set points (l/min)	order number lead wire		
	NO	NC	SPDT
0.4	122340	122346	122352
1.0	122341	122347	122353
2.0	122342	122348	122354
3.0	122343	122349	122355
4.0	122344	122350	122356
6.0	122345	122351	122357

set points (l/min)	order number cable		
	NO	NC	SPDT
0.4	020-0242	020-0248	**020-0254**
1.0	020-0243	020-0249	**020-0255**
2.0	020-0244	020-0250	**020-0256**
3.0	020-0245	020-0251	**020-0257**
4.0	020-0246	020-0252	**020-0258**
6.0	020-0247	020-0253	**020-0259**

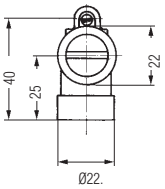
Pressure drop diagram

(at min. set point adjustment)

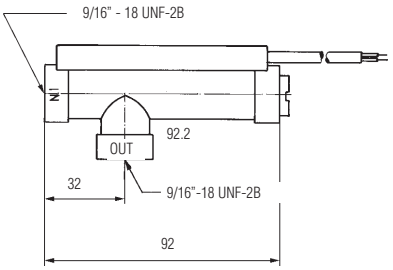


Standard Products in **bold**

Dimensions (in mm)



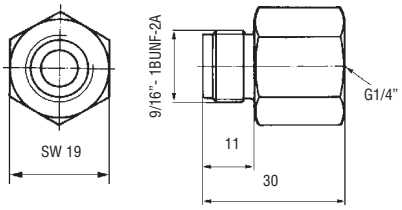
Housing: Ryton®
Piston: Ryton®
Spring: Stainless Steel
O-Ring Viton®

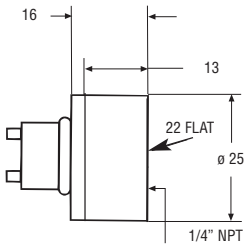


Adaptors

Please use adaptor only in connection with supplied Viton O-Ring.

Brass Adaptor 9/16"-18UNF-2B to G 1/4" with Viton O-Ring **912-0616**

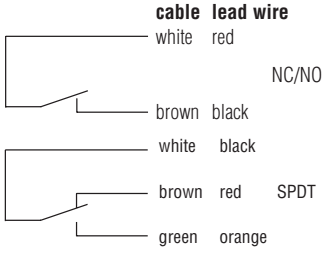




Ryton Adaptor 9/16"UNF-2B to 1/4" NPT with Viton 'O' ring

123029

Wiring Diagram



FS-6 0.4 - 6.0 (l/min)

Pre-adjusted set points

The FS-6 range of flow switches provides economical flow protection for a wide range of industrial applications such as photocopiers, heavy-duty floor cleaners and industrial dishwashers. The European integral G 1/4" connections obviate the need for additional adaptors and the design allows for easy mounting.

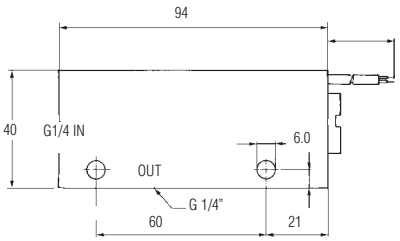
Specifications

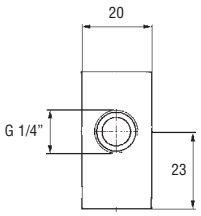
(all data related to water at +20°C)

Max. flow	12 l/min
Max. operating pressure	30 bar at +20 °C 16 bar at +50 °C 13 bar at +70 °C 5 bar at +85 °C
Proof pressure	45 bar
Max. temperature	+85 °C
Set points	see order number
Switching function (related to increasing flow)	NC, NO, SPDT
Factory calibration position	vertical, inlet port down
Mounting orientation	Any position
Repeatability	±1%
Adjustment accuracy	±15%
Hysteresis	max. 20%
Mounting	G1/4"
Electrical connections	cable: PVC, 0.34 mm2 (length: approx. 1 m)
Enclosure	IP 65
Electrical data contact rating	NC/NO: 100 VA, 3 A, 220 V~ SPDT: 20 VA, 0.5 A, 250 VA
Weight:	0.16 kg

Please note: For mineral oil applications please order brass piston instead of polysulphone piston.
Add GE169 to order number e.g. 020-0290 - GE169

Dimensions (in mm)





Housing:	Delrin®
Piston:	Polysulfone*
Spring:	Stainless Steel
O-Ring	Viton®

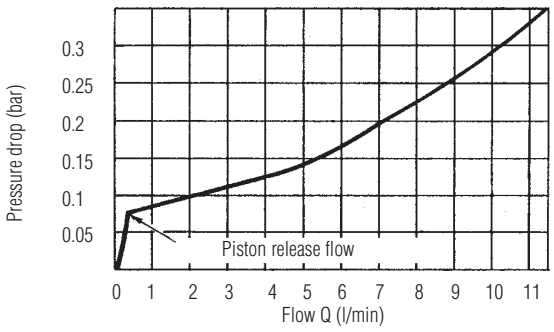
* Option Brass

How to Order

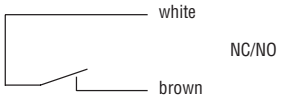
set points (l/min)	order number		
	NO	NC	SPDT
0.4	020-0290	020-0297	020-0304
1.0	020-0291	020-0298	020-0305
2.0	020-0292	020-0299	020-0306
3.0	020-0293	020-0300	020-0307
4.0	020-0294	020-0301	020-0308
6.0	020-0295	020-0302	020-0309

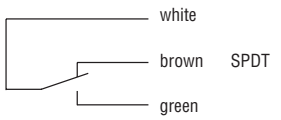
Pressure drop diagram

(at min. set point adjustment)



Wiring Diagram





FS-100E 2.0 - 15.0 l/min with pre-adjusted set points
FS-100E-A 1.0 - 16.0 l/min with adjustable set points

The FS-100E version (with pre-adjusted set points 2.0. . .6.0 l/min) operates in vertical mounting position only. It is equipped with a calibrated piston which is displaced by liquid flow to magnetically actuate a hermetically sealed reed switch isolated within the unit body. When flow decreases the piston returns to its prior position by its own, weight and deactuates the reed switch. The FS-100E version (with pre-adjusted set points 5.0. . .15.0 l/min) operates with the same principle but a positive spring-return deactuates the switch when flow decreases. Mounting is possible in any position.

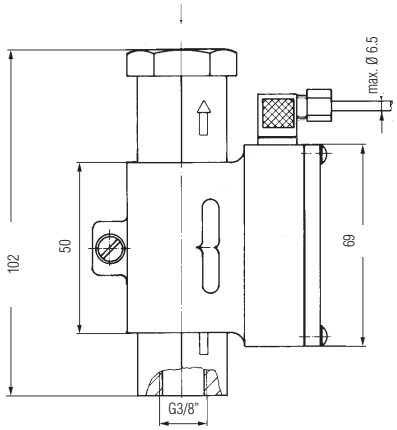
The FS-100E-A (adjustment range 1.0 . . . 16.0 l/min) operates according to the same principle as the FS-100E with spring. The FS-100E-A is provided with an additional scale on the brass body on which set points as well as setting functions can be adjusted in one operation. Only the mark of the junction box has to be moved over the respective scale value. Pressure drop is not influenced at all when changing set points.

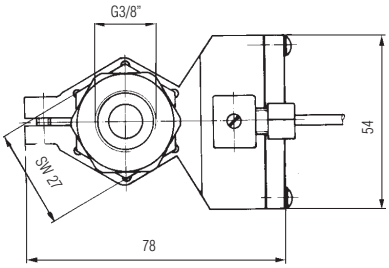
Specifications

(all data related to water at +20°C)

	FS-100E	FS-100E-A
Max. flow	24 . . . 40 l/min.	55 l/min
Max. operating pressure	50 bar	50 bar
Max. pressure drop	0.3 bar	0.3 bar
Max. operating temperature	+90 °C	+90 °C
Set points	see order number	adjustable 1 ... 16 l/min
Switching function (related to increasing flow)	NO/NC; the required function may be adjusted by moving the junction box	
Mounting position	see order number	any position
Factory calibration position	vertical, inlet port down	vertical, inlet port down
Repeatability	± 1%	± 1%
Adjustment accuracy	±10%	±10%
Hysteresis	max. 5%	max. 20%
Mountings	G 3/8"	G 3/8"
Electrical connections	miniature plug connector with cable gland (max. cable ø: 6.5 mm)	
Enclosure	IP 65	IP65
Electrical data contact rating	40 VA, 2 A, 220 V~	40 VA, 2 A, 220 V~
Weight	appr. 0.5 kg	appr. 0.5 kg

Dimensions (in mm)



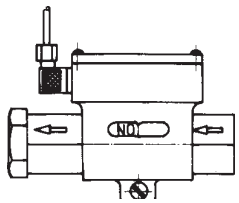


Housing:	Brass
Piston:	Brass
O-Ring:	Buna N
Spring:	Stainless Steel
Magnet	Ferrite

How to Order

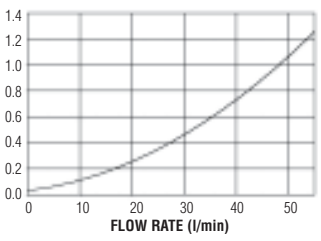
	set points (l/min)	Mounting position	order number
FS-100E	2.0	vertical	020-0402
	3.0	vertical	020-0403
	4.0	vertical	020-0404
	5.0	vertical	020-0405
	6.0	vertical	020-0406
	5.0	any position	020-0505
	6.0	any position	020-0506
	7.0	any position	020-0507
	8.0	any position	020-0508
	9.0	any position	020-0509
	10.0	any position	020-0510
	11.0	any position	020-0511
	12.0	any position	020-0512
	13.0	any position	020-0513
	14.0	any position	020-0514
	15.0	any position	020-0515
FS-100E-A		any position	**020-0315**

Set point adjustment/ Contact configuration

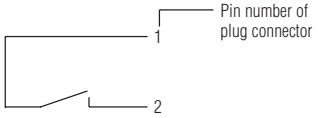


Adjust the housing to setting required

Pressure Drop Diagram



Wiring diagram



Standard Products in **bold**

FS-380 1 - 7.6 (l/min) pre adjusted set points

Compact Flow Switch for High Inline Pressures

These rugged inline flow switches use 150 micron filtration and are less susceptible to clogging than other high-pressure inline flow switches. The one-piece magnetic PPS composite piston makes the FS-380 ideal for high-pressure applications such as industrial cleaning equipment or high-pressure lubrication systems.

Specifications

(all data related to water at +20°C)

Operating pressure, max.	70 Bar
Operating temperature	-28.8°C to + 135°C
Set point accuracy	±20% Maximum
Set point differential	20% Maximum
Switch	SPST, 20VA N.O.at no flow
Inlet/outlet	3/8" NPT
Electrical termination	22 AWG, 0.6m Polymeric leads
Mounting orientation	Any position

How to Order

3/8" NPT

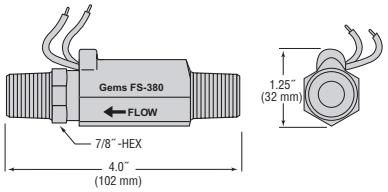
Flow settings l/min	Part numbers Brass	Stainless Steel
1.0	168432	179992
1.9	168433	179993
3.8	168434	179994
5.7	168435	179995
7.6	178353	179996

3/8" Tube Compression Fitting

Flow settings l/min	Part numbers Brass	Stainless Steel
1.0		177592
1.9		177593
3.8		177594
5.7		177595
7.6		–

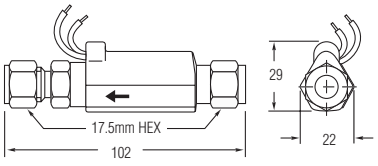
Models with compression fittings are available for OEM users.
Contact Sales Office for details.

Dimensions (in mm)

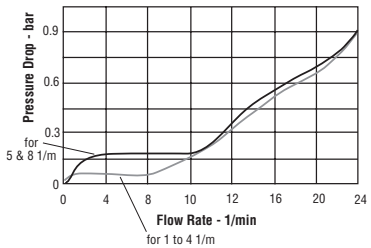


Housing: Brass or Stainless Steel
Piston: PPS Composite
Spring: 316 Stainless Steel
O-Ring: Fluorocarbon

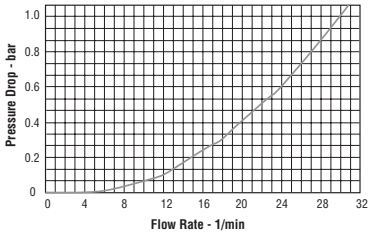
3/8" Tube End Compression Fitting



Pressure Drop - FS-380



Pressure Drop - FS-380P



FS-380P Series - Industrial Strength Inline Plastic Flow Switch

Flow Rate Settings: 1.0 l/min to 7.6 l/min
Port Size: 3/8˝ NPT Male and 1/4˝ Quick Disconnect (QDC) Male
Primary Construction Material: Polypropylene
Setting Type: Fixed

This rugged inline flow switch offers the same superior performance to non-clogging as its metal cousin (FS-380). The fixed set point and simple design make it a dependable switch. The FS-380P is an ideal choice for coolant applications requiring reliable flow detection in HVAC, semiconductor, welding, medical and other industries. 1/4˝ quick disconnect units have a host of snap-on mating adapters to fit most piping requirements.

Specifications

Wetted materials	
Housing	Glass Reinforced Polypropylene
Piston	PPS Composite
Spring	316 Stainless Steel
O-Ring	Fluorocarbon
Operating pressure	8.6 bar @ 21°C (70°F), 50 PSI @ 100°C (212°F)
Operating temperature	-18°C to +100°C (0°F to 212°F)
Set Point accuracy	20% of Set Point
Set Point differential	20% Maximum
Switch*	SPST, 20VA, N.O. at no Flow
Electrical termination	0.6 (approx) Polymeric Leads, 22 AWG
Filtration	100 Micron
Approvals	UL and CSA Pending

How to Order

Specify Part Number based on flow settings. Adapters for the 1/4˝ Quick Disconnect (QDC) Male unit are listed in the table at right.

Flow Settings L/min	Part Numbers 3/8" NPT Male	1/4" QDC Male*
1.0	197081	**197091**
1.9	197082	**197092**
3.8	197083	**197093**
5.7	197084	**197094**
7.6	197085	**197095**

*See selection of adapters below. QDC = Quick Disconnect

	Part Numbers	
Description	Straight Through	with Shut-Off Valve
1/4" NPT Male Pipe Thread	195787	198063
1/4" BSPT Male Pipe Thread	**198064**	**195788**
3/8" NPT Male Pipe Thread	198065	198066
3/8" BSPT Male Pipe Thread	**198067**	**198068**
1/4" O.D., .27" I.D. (6mm O.D., 4.3mm I.D.) Polytube	198096	198097
3/8" O.D., 1/4" I.D. (9.5mm O.D., 6mm I.D.) Polytube	198099	198098
1/4" (6.4mm) I.D. Barb	198401	198402
5/16" (7.9mm) I.D. Barb	198403	198404
3/8" (9.5mm) I.D. Barb	198408	198405
1/4" O.D. (6.4mm) O.D. JG®	198470	198406
3/8" O.D. (9.5mm) O.D. JG®	198459	198407

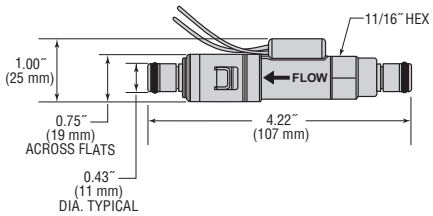
JG® is a registered trademark of John Guest USA, Inc.

Standard Products in **bold**

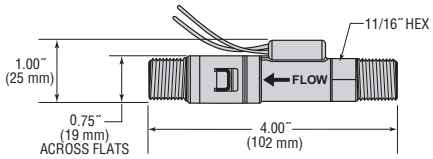
Dimensions (in mm)

1/4" Quick Disconnect Male Adapter

See table at bottom right for adapter Part Numbers.



3/8" NPT Port



Acetal Adapters for 1/4˝ Quick Disconnect Male Tube Fitting Units (82°C max.)

These adapters are available with or without an integral shut-off valve. The shut-off valve will stop line flow when the adapter is removed from the unit. Flow resumes when connected.

Typical shown: 1/4˝ NPT Male Pipe Thread with Shut-off Valve

FS-105E 0.005 - 150 l/min with adjustable set-points
FS-107E 0.1 - 90 l/min Viscosity Compensated with adjustable set-points

The FS-105E model operates in any mounting position. It is equipped with a calibrated piston which is displaced by flow to magnetically actuate a sealed hermetic reed switch. When flow decreases a positive spring returns the piston to its prior position and de-actuates the reed switch. The reed switch assembly is movable to allow for customer setting of flow rate within the limits of the switch selected. The adjustment does not effect the flow path, therefore pressure drop is not influenced when changing set-points. Versions available are for Liquid flow only. Robust components allow a pressure of 250 bar, ideally suited for high pressure cleaning and lubrication systems.

The FS-107E model operates in any mounting position. It is equipped with a calibrated piston in a calibrated orifice for viscosity compensation over 1 to 600 cSt. The piston is displaced by flow to magnetically actuate a sealed hermetic reed switch. When flow decreases a positive spring returns the piston to its prior position and de-actuates the reed switch. The reed switch assembly is movable to allow for customer setting of flow rate within the limits of the switch selected. The adjustment does not effect the flow path, therefore pressure drop is not influenced when changing set-points. Robust components allow a pressure of 250 bar, ideally suited for high pressure lubrication systems.

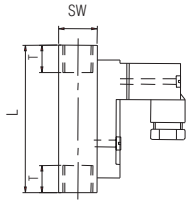
FS-105E

FS-107E

Specifications

	FS-105E	FS-107E
Max flow	100% above max. set-point range	100% above max. set-point range
Max operating pressure	250 bar	250 bar
Pressure drop	0.02 to 0.4 bar	0.02 to 0.4 bar
Operating temperature	-20° to 120°C	-20° to 120°C
Adjustable range	see order number	see order number
Switching function	NO with no flow, SPDT available	NO with no flow, SPDT available
Mounting orientation	Any position	Any position
Repeatability	1% of range	1% of range
Adjustment scale accurary	+/- 10%	+/- 5%
Hysteresis	max 20%	max 20%
Mountings	G1/4, G1/2, G1	G1/2, G1
Electrical connection	Din 43650, Mini for G1/4, G1/2, Std for G1	Din 43650
Enclosure	IP 65	IP 65
Electrical contact rating	NO - 250V, 1A, 100VA - G1 port NO - 220V, 1A, 100VA - G1/2 port NO - 200V, 1A, 20VA - G1/4 port SPDT - 250V, 1.5A, 50VA - G1, G1/2 SPDT - 200V, 1A 20VA - G1/4 port	NO - 250V, 3A, 100VA - G1 port NO - 220V, 1A, 100VA - G1/2 port
Weight (approx)	G1/4 - 140g, G1/2 - 350g, G1 - 1000g	

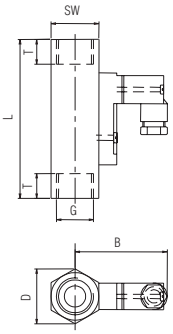
Dimensions (in mm)



Dimension

SW	D	B	G	T	L
17	17	47	1/4	10	65
27	31	52	1/2	14	90
41	47	72	1	17	130

Housing Nickel plated Brass
Piston Brass
Spring Stainless Steel

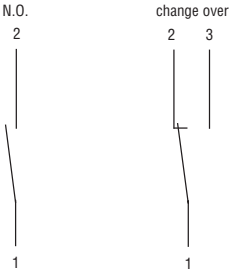


Dimension

SW	D	B	G	T	L
27	31	52	1/2	14	90
41	47	72	1	17	130

Meter 17mm wide

Wiring Diagram



How to Order

Order numbers for FS-105E

Adj Range L/min	Order 'NO'	Number "SPDT'	Port
5-60 ml	027-0100	027-0120	G1/4"
20-140ml	027-0101	027-0121	G1/4"
0.1-0.6	027-0102	027-0122	G1/4"
0.2-1.2	027-0103	027-0123	G1/4"
0.4-2.0	027-0104	027-0124	G1/4"
0.5-3.0	027-0105	027-0125	G1/4"
1.0-5.0	027-0106	027-0126	G1/4"
0.02-0.2	027-0107	027-0127	G1/2"
0.1-0.6	027-0108	027-0128	G1/2"
0.4-1.8	027-0109	027-0129	G1/2"
0.8-3.2	027-0110	027-0130	G1/2"
2-7	027-0111	027-0131	G1/2"
3-13	027-0112	027-0132	G1/2"
4-20	027-0113	027-0133	G1/2"
8-30	027-0114	027-0134	G1/2"
15-45	027-0115	027-0135	G1"
30-90	027-0116	027-0136	G1"
60-150	027-0117	027-0137	G1"

Order numbers for FS-107E

Adj Range L/min	Order 'NO'	Number "SPDT'	Port	Order No with visual indication 'NO'	'SPDT"
0.1-0.8	027-0300	027-0320	G1/2"		
0.4-1.6	027-0301	027-0321	G1/2"		
0.8-3	027-0302	027-0322	G1/2"		
2-7	027-0303	027-0323	G1/2"		
0.1-0.8	027-0304	027-0324	G1"	027-0340	027-0360
0.5-1.5	027-0305	027-0325	G1"	027-0341	027-0361
1-4	027-0306	027-0326	G1"	027-0342	027-0362
2-8	027-0307	027-0327	G1"	027-0343	027-0363
3-10	027-0308	027-0328	G1"	027-0344	027-0364
5-15	027-0309	027-0329	G1"	027-0345	027-0365
8-24	027-0310	027-0330	G1"	027-0346	027-0366
10-30	027-0311	027-0331	G1"	027-0347	027-0367
15-45	027-0312	027-0332	G1"	027-0348	027-0368
20-60	027-0313	027-0333	G1"	027-0349	027-0369
30-90	027-0314	027-0334	G1"	027-0350	027-0370

FS-200E 2.0 - 30 (l/min) with pre-adjusted set points
FS-200E-A 3.0 - 57 (l/min) adjustable set points

The FS-200E flow switch offers accurate flow detection with 1% repeatability and European G1" port size. The durable construction delivers long life repeatability in either water or oil. The design of large flow paths keep pressure drop low, thus are ideal for detection of flow in high volume lubrication, cooling or process applications.

The FS-200E Adjustable versions offer the same accuracy with the additional feature of external adjustment.

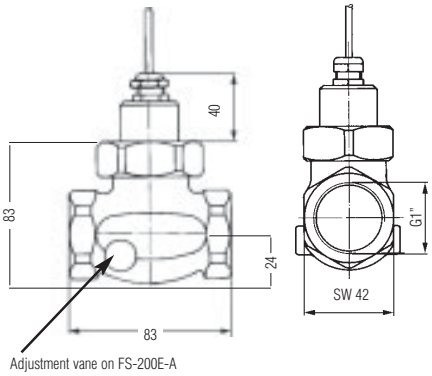
Adjustment vane on FS-200E-A

Specifications

(all data related to water at +20°C)

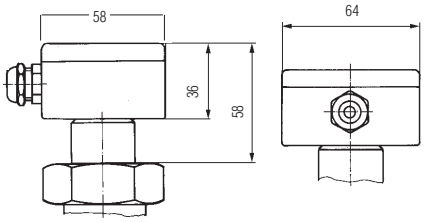
Max. flow	85 l/min
Max. operating pressure	27 bar
Proof pressure	45 bar
Temperature range	- 20 °C to +80 °C (cable, plug connector) - 20 °C to +150 °C (terminal box)
Set points	see order number
Switching function (related to increasing flow)	SPDT
Factory calibration position	horizontal, electrical connection up
Mounting orientation	any position
Repeatability	± 1%
Adjustment accuracy	±10%
Hysteresis	max. 15%
Mounting	G1"
Electrical connections	- cable: PVC, 3 x 0.34 mm2 (length: approx. 1 m) - plug connector per DIN 43650 - terminal box
Enclosure	- IP65
Electrical data contact rating	20 VA, 0.5 A, 250 V~
Weight	approx. 1.2 kg

Dimensions (in mm)

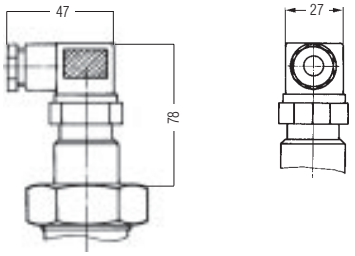


Housing:	Bronze
Disc	Stainless Steel
Spring:	Stainless Steel
O-Ring	Viton®
Magnet	PTFE/Ceramic

Terminal Box



Plug Connector



How to Order

Order numbers for FS-200E

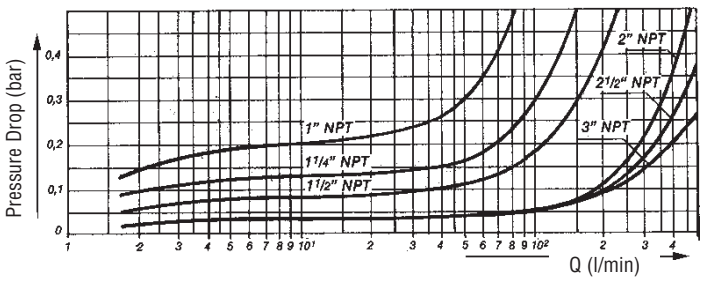
Set points (l/min)	Cable	Terminal box	Plug connector
2.0	020-2393	020-2401	020-3481
4.0	020-2394	020-2402	020-3482
7.5	020-2395	020-2403	020-3483
11.5	020-2396	020-2404	020-3484
15.0	020-2397	020-2405	020-3485
19.0	020-2398	020-2406	020-3486
22.5	020-2399	020-2407	020-3487
30.0	020-2400	020-2408	020-3488

Order numbers for FS-200E-A

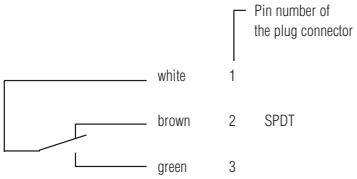
Set points (l/min)	Cable	Terminal box	Plug connector
3.0 ... 22.5	020-2413	**020-2416**	020-3489
7.5 ... 30.0	020-2415	020-2418	020-3491
19.0 ... 57.0	020-2414	**020-2417**	020-3490

Pressure Drop Diagram

(at min. set point adjustment)



Wiring Diagram



Standard Products in **bold**

FS-200 2.0 - 190 (l/min) with pre-adjusted set points

The FS-200 range of flow switches offer accurate flow detection, with 1% repeatability, with a wide range of flow and port sizes. The durable construction delivers long life repeatability in either water or oil. The design of large flow paths keep pressure drop low, thus are ideal for detection of flow in high volume lubrication, cooling or process applications.

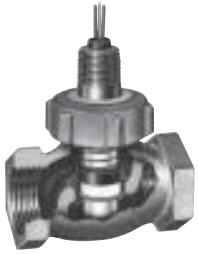
Specifications

(all data related to water at +20°C)

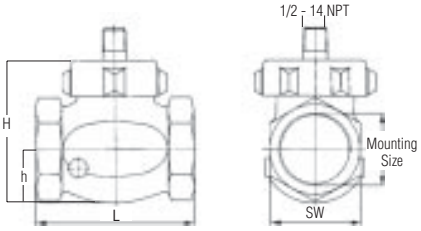
Max. flow	see order numbers
Max. operating pressure	27 bar at +20 °C
Proof pressure	45 bar
Temperature range	- 20 °C...+150 °C
Set points	see order numbers
Switching function (related to increasing flow)	SPDT
Factory calibration position	horizontal, electrical connection up
Mounting orientation	any position
Repeatability	±1%
Adjustment accuracy	±10%
Hysteresis	max. 15%
Mounting	1" NPT...2" NPT (see "dimensions" and "order number")
Electrical connections	- lead wire: Polymeric, 18 AWG (length: approx. 0.6m)
Enclosure	- IP 44 (with lead wire) - IP 54 (with conduit box IP65 [with K6])
Electrical data contact rating	20 VA; 0,5 A; 250 V~
Weight	see "dimensions"

How to Order

Set point (l/min)	Mounting	Max. flow (l/min)	Order number Housing Bronze	Order number Housing Stainless Steel
2.0 4.0	1" NPT	80	27051 27052	27059 27060
7.5 11.5			27053 27054	27061 27062
15.0 19.0			27055 27056	27063 27064
22.5 30.0			27057 27058	27065 27066
4.0 7.5	1 1/4" NPT	140	27067 27068	27076 27077
15.0 22.5			27069 27070	27078 27079
30.0 37.5			27071 27072	27080 27081
45.0 60.0 75.0			27073 27074 27075	27082 27083 27084
6.0 11.5	1 1/2" NPT	200	27085 27086	27093 27094
19.0 28.5			27087 27088	27095 27096
37.5 57.0			27089 27090	27097 27098
75.0 115.0			27091 27092	27099 27100
7.0 15.0	2" NPT	350	27101 27102	27109 27110
19.0 37.5			27103 27104	27111 27112
57.0 95.0			27105 27106	27113 27114
132.5 190.0			27107 27108	27115 27116



Dimensions (in mm)



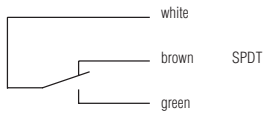
Housing:	Bronze or Stainless Steel
Disc	Stainless Steel
Spring:	Stainless Steel
O-Ring	Viton®
Magnet	PTFE/Ceramic

Mounting D	1" NPT	1 1/4" NPT	1 1/2" NPT	2" NPT
L	83	115	115	150
h	26	30	35	44
SW	42	53	62	72
H	71	83	98	118
Approx. weight	1.2 kg	1.8 kg	2.5 kg	4.0 kg

Pressure Drop Diagram

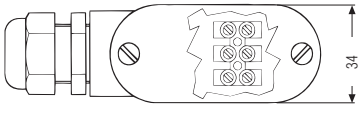
see previous page

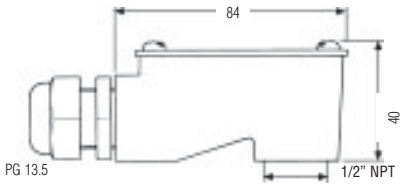
Wiring Diagram

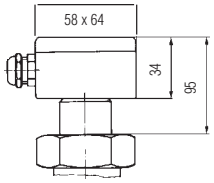


Terminal boxes

Conduit style Order Number: 912-0615





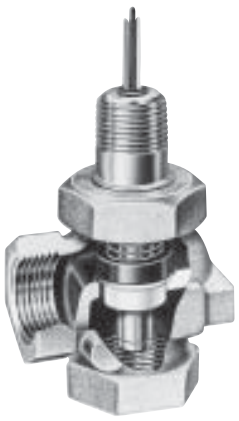


K6 style
Order Number: 912-0625

*Order numbers are valid for units with the electrical connection "lead wire". If you need a unit with the electrical connection "terminal box", please select the respective "lead wire" order number and add: "...with mounted terminal box 912-0615 or 912-0625. See drawing (previous page)

FS-400 3.0 - 37.5 (l/min) with pre-adjusted set points
FS-400A 3.0 - 53.0 (l/min) variable adjustment of set points

The FS-400 and FS-400-Adjustable switches provide 1% repeatability. The unit may be fitted instead of a pipe elbow where space is at a premium.

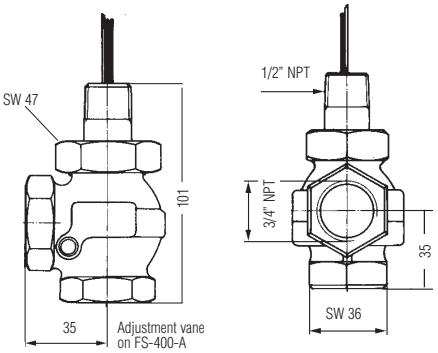


Specifications

(all data related to water at +20°C)

Max. flow	55 l/min
Max. operating pressure	27 bar
Proof pressure	45 bar
Temperature range	- 20 °C...+150 °C
Set points	see order numbers
Switching function (related to increasing flow)	SPDT
Mounting orientation	any position
Factory calibration position	vertical, inlet port down, electrical connection up
Repeatability	± 1%
Adjustment accuracy	± 5%
Hysteresis	max. 15%
Mounting	3/4" NPT
Electrical connection	- lead wire: Polymeric, 18 AWG (length: approx. 0.6 m) - terminal box option see page FS-200
Enclosure	- IP 44 (with lead wire) - IP 54 (with terminal box) IP65 (with K6 box)
Electrical data contact rating	SPDT max. 20 VA, 0.5 A, 250 V~
Weight	0.8 kg

Dimensions (in mm)



Housing:	Bronze
Disc	Stainless Steel
O-Ring	Viton®
Spring:	Stainless Steel
Magnet	PTFE/Ceramic

How to Order

Order numbers for FS-400

Set points (l/mm)	Order number
3.0	022-6440
6.0	022-6441
7.0	022-6442
9.5	022-6443
19.5	022-6444
28.5	022-6445
37.5	022-6446

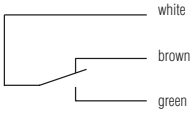
Order numbers for FS-400A

Set points (l/mm)	Order number
3.0 ... 15.0	022-6600
7.5 ... 30.0	022-6601
26.5 ... 53.0	022-6602

*Order numbers are valid for units with the electrical connection "lead wire". If you need a unit with the electrical connection "terminal box", please select the respective "lead wire" order number and add: "...with mounted terminal box 912-0615 or 912-0625".

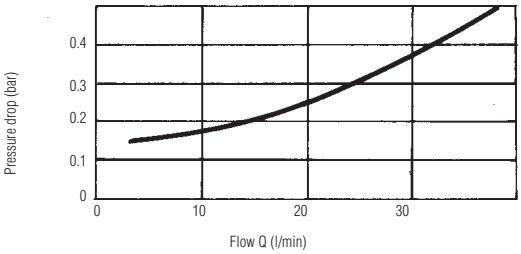
See drawing (page 60, FS-200)

Wiring Diagram



Pressure Drop Diagram

(at min. set point adjustment)



FS-500 1 - 18.5 (l/min) with pre-adjusted set points

The FS-500 offers economical flow monitoring, with a variety of switch actuation points and low pressure drop. The FS-500 is designed for ease of maintenance, as the bonnet and shuttle can be removed, leaving the housing and pipework connections intact. All wetted parts are manufactured from polypropylene or stainless steel, making the FS-500 ideal for a wide range of chemical and temperature applications.

Specifications

Operating pressure	7 bar at 20°C, 3.5 bar at 80°C
Temperature	+100°C
Set point differential	± 20% maximum
Set point accuracy	± 20%
Switch	SPST 20VA, N.O., 120-240VAC or VDC
Inlet/outlet ports	3/4" NPT, R3/4"
Electrical termination	0.6m lead wire
Mounting orientation	any position

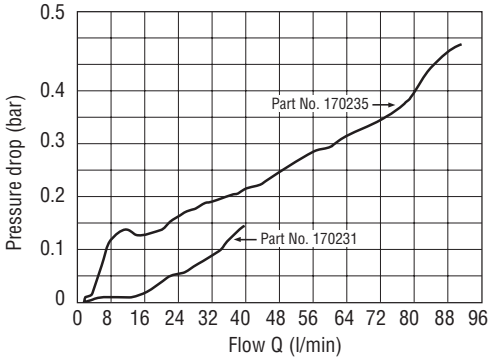
Housing:	Polypropylene
O-Ring	Viton®
Spring:	Stainless Steel

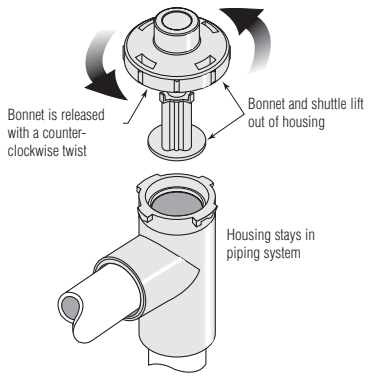
How to Order

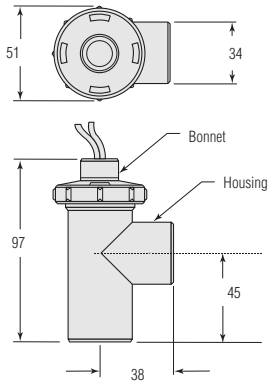
Order numbers for FS-500

Flow rate	R3/4" parallel	3/4"NPT
1 l/min	**175171**	170231
2 l/min	**175172**	170232
3.5 l/min	**175173**	170233
10 l/min	**175174**	170234
18.5 l/min	**175175**	170235

Pressure Drop Diagram





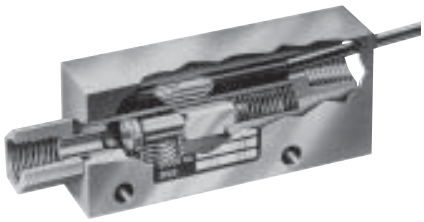


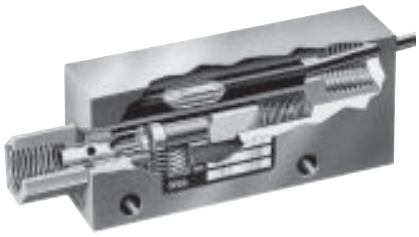
Standard Products in **bold**

FS-925E 0.4 - 6.0 (l/min) with pre-adjusted set points
FS-926E 0.05 - 0.3 (l/min) with pre-adjusted set points

These two series of precision-calibrated switches provides reliable and consistent performance; repeatability is within 1%. FS-925E and FS-926E units are factory preset for actuation at specified flow rates.

These switches provide accurate detection of excessive or insufficient flow rates in such applications as: protecting against loss of fluid flow in hydraulic systems, assuring proper coolant flow in semiconductor processing equipment, monitoring high pressure lubrication systems, and ensuring proper air flow in water/waste systems.



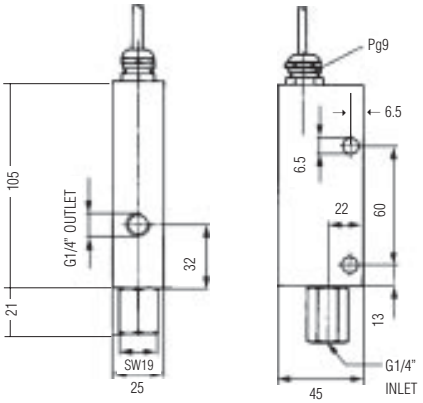


Specifications

(all data related to water at +20°C)

	FS-925E	FS-926E
Max. flow	12 l/min	3 l/min
Max. operating pressure	68 bar	68 bar
Proof pressure	100 bar	100 bar
Temperature range	- with Polysulfone piston (standard), with cable, with plug connector: -20 °C...+80 °C - with metal piston and terminal box: -20 °C...+150 °C	
Set points (l/min)	0.4; 1.0; 2.0; 3.0; 4.0; 6.0	0.05, 0.1, 0.15; 0.1; 0.25; 0.3
Switching function (related to increasing flow)	NC, NO, SPDT	NC, NO, SPDT
Mounting orientation	any position	any position
Factory calibration position with set point adjustment	vertical, inlet port down, electrical connection up	
Repeatability	± 1%	± 1%
Adjustment accuracy	±10%	±10%
Hysteresis	max. 15%	max. 20%
Mounting	G 1/4"	G 1/4"
Electrical connections	- cable: PVC, 2 or 3 x 0.34 mm2 (length: approx. 1 m) - plug connector per DIN 43650 - terminal box	
Enclosure	- IP 65	IP 65
Electrical data contact rating	- SPST (NC/NO): max. 100 VA, 3 A, 220 V~ - SPDT: max. 20 VA, 0.5 A, 250 V~	
Weight	0.5 kg	0.5 kg

Dimensions (in mm)



Housing:	Brass or Stainless Steel	
Piston:	Polysulfone* or Stainless Steel	(* option Brass)
Spring:	Stainless Steel	
O-Ring	Vitton®	

How to Order for FS-925E / FS-926E

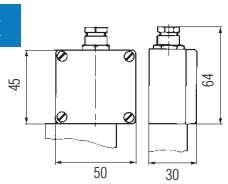
Type code: **FS-925E-**.....-
Set points:
(l/min) (0.4), (1.0), (2.0), (3.0), (4.0), (6.0)

Type code: **FS-926E-**.....-
Set points:
(l/min) (0.05), (0.1), (0.15), (0.2), (0.25), (0.3)

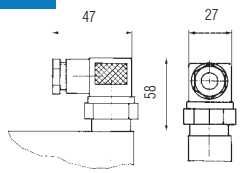
Housing material:	Brass	M
	Stainless Steel	C
Electr. connection:	Cable	P
	Terminal box	K
	Plug connector	S
Type of contact:	NO	S
	NC	O
	SPDT	W

Note: For mineral oil applications please order brass piston instead of polysulfone piston, -GE169 to the number e.g. FS-925E-0.4-M-P-W-GE169

Terminal Box



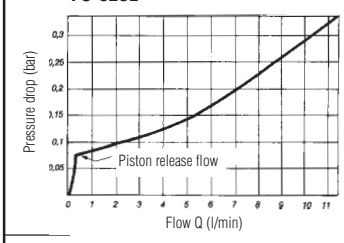
Plug Connector



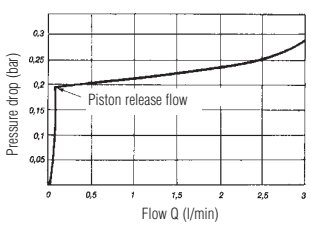
Pressure Drop Diagram

(at min. set point adjustment)

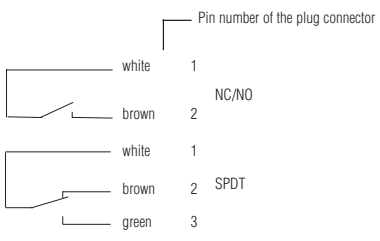
FS-925E



FS-926E



Wiring Diagram



FS-10798E 2.0 - 75 (l/min) variable adjustment of set points

These externally adjustable switches are ideal for protecting machine tools from coolant flow failure, for protecting bearings from loss of lubricant or to assure proper air flow. They offer an infinite number of flow settings at pressures up to 68 bar, with low pressure drop and precise repeatability.

The adjusting vane is easily field adjustable using an ordinary flat-bladed screwdriver. The adjustment is set-screw-locked for tamper-free operation after field calibration.

Specifications

(all data related to water at +20°C)

Max. flow	85 l/min
Max. operating pressure	68 bar
Proof pressure	100 bar
Temperature range	- with Polysulfone piston (standard), with cable, with plug connector: -20 °C...+80 °C - with metal piston and terminal box: -20 °C...+150 °C
Adjustment range	2...75 (l/min)
Switching function (related to increasing flow)	-NC, NO, SPDT
Mounting orientation	any position
Factory calibration position	horizontal, electrical connection up
Repeatability	± 1%
Adjustment accuracy	±10%
Hysteresis	max. 15%
Mounting	G 1/2"
Electrical connections	- cable: PVC, 2 or 3 x 0.34 mm2 (length: approx. 1 m) - plug connector per DIN 43650 - terminal box
Enclosure	- IP 65
Electrical data contact rating	- SPST (NC/NO): 100 VA, 3 A, 220 V~ - SPDT 20 VA, 0.5 A, 250 V~
Weight	1.2 kg

How to Order

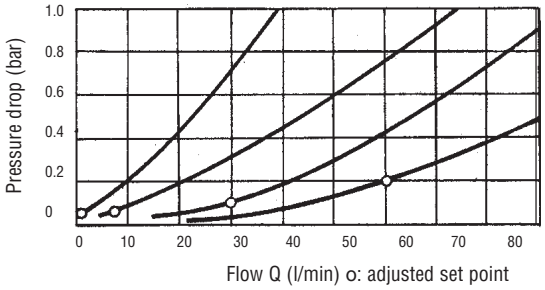
Type code: **FS-10798E- ..... - ..... - .....**

Housing material:	Brass	**M**
	Stainless Steel	**C**
Electr. connection:	Cable	P
	Terminal box	**K**
	Plug connector	S
Type of contact:	NO	S
	NC	O
	SPDT	**W**

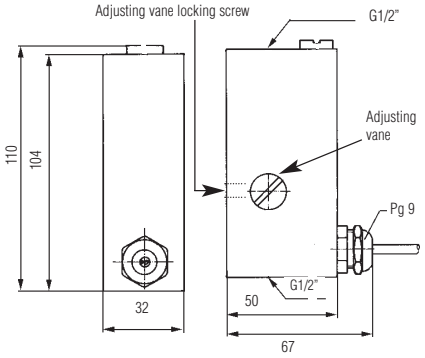
Note: For mineral oil applications please order brass piston instead of polysulfone piston, add -GE169 to type number e.g. FS-10798E-M-P-W-GE169

Pressure Drop Diagram

(at min. set point adjustment)



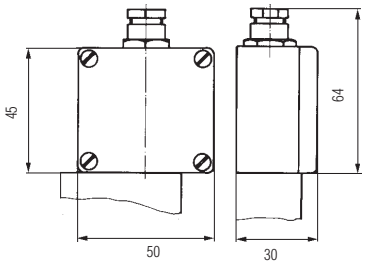
Dimensions (in mm)



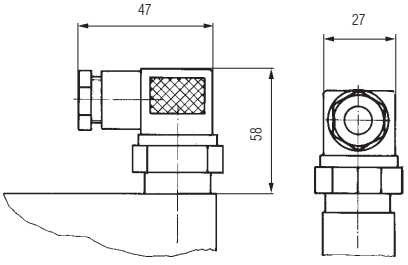
Housing:	Brass or Stainless Steel
Piston:	Polysulfone* or Stainless Steel
Spring:	Stainless Steel
O-Ring	Viton®

* option Brass

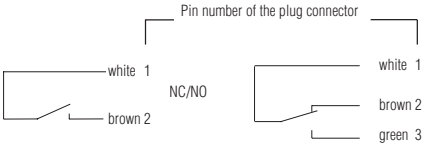
Terminal Box



Plug Connector



Wiring Diagram



Standard Products in **bold**

FS-550E 15.0 - 125.0 (l/min) with pre-adjusted set points

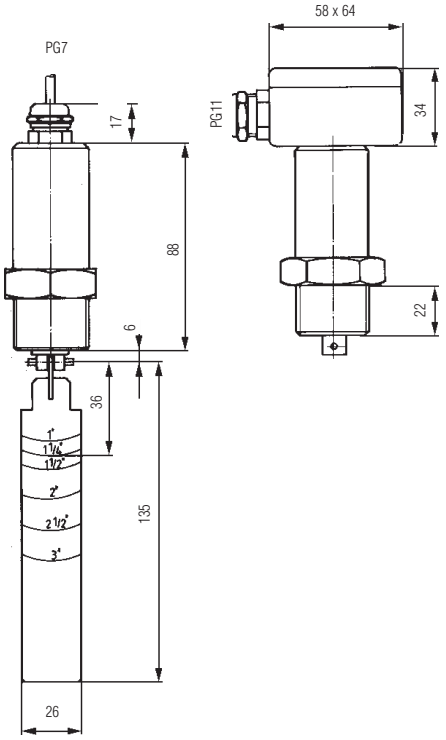
Standard FS-550E switches sense liquid flow in either direction to monitor flow/no-flow conditions. The paddle is trimmed during installation to permit switch actuation at the desired flow rate. As flow increases in a pipe, the paddle of the switch pivots to move out of the liquid path, producing less than 200mb of pressure drop regardless of pipe size.

Specifications

(all data related to water at +20°C)

Max. flow	determined by the pipe's inside diameter
Max. operating pressure	55 bar
Proof pressure	82 bar
Max. pressure drop	0.2 bar
Temperature range	cable: -20 °C...+80 °C terminal box: -20 °C...+150 °C
Set points	see set point adjustment guideline
Switching function (related to increasing flow)	-SPDT
Mounting orientation	vertical, electrical connection up
Repeatability	±5%
Adjustment accuracy	±25%
Hysteresis	max. 50%
Mounting	R1"
Electrical connections	- cable: PVC,3 x 0.34 mm2 (length: approx. 1 m) - terminal box
Enclosure	- IP 65
Electrical data contact rating	- SPDT max. 20 VA, 0.5 A, 250 V~
Weight	0.6 kg

Dimensions (in mm)



Housing: Brass or Stainless Steel
Paddle: Stainless
Spring: Stainless
Magnet: PTFE

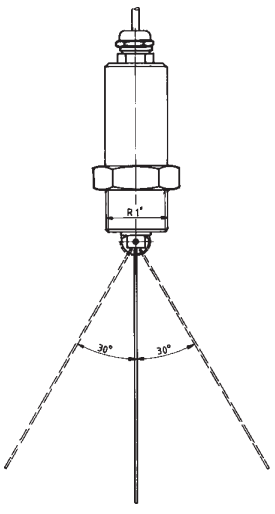
How to Order

Electrical Connection	Brass	Stainless Steel
Cable	020-3493	020-3495
Terminal box	**020-3497**	**020-3499**

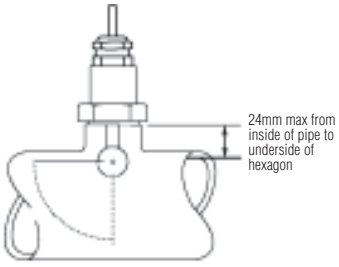
Set Point Adjustment

(approximate)

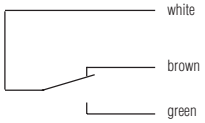
Cut-off size	Pipeline sizes							
	1 1/2"		2"		2 1/2"		3"	
	Set points (l/min) with increasing and decreasing flow							
	incr.	decr.	incr.	decr.	incr.	decr.	incr.	decr.
1 1/2"	57	42	106	80	144	114		
2"			84	57	103	76	182	144
2 1/2"					80	53	152	99
3"							118	76



Mounting Method



Wiring Diagram



Standard Products in **bold**

RotorFlow® Visual Indicators with Switch or Continuous Output Options

The Gems Sensors generation of rotorflow indicators offer high performance and durability, all at an affordable cost.

Three distinct options are available, all boasting broad chemical, pressure and temperature capabilities.

RFI RotorFlow Indicators

Simple visual confirmation of flow, the RFI indicator provides the low cost answer.

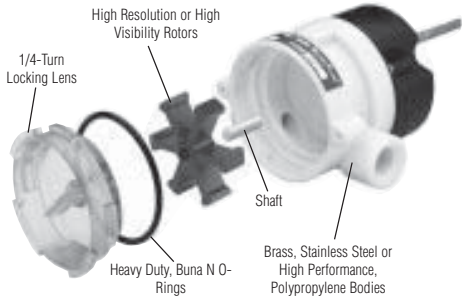
RFS RotorFlow Indicator and Switch

Visual indication plus switch, adjustable over the required flow rate. High reliable system guarding against jamming or false actuation.

RFO RotorFlow Indicator and Output

Visual indicator plus continuous output. Pulse or analogue DC voltage output proportional to the flow rate. Easy integration into all digital logic families.

Construction



- Flow range from 0.4 to 225 l/min
- Bright, visual indication
- Choice of pulsed analogue DC output or adjustable 1 amp switched output
- Available in high performance plastic, brass or Stainless Steel housing

Operating Principle

VISUAL ONLY

As liquid passes through the RotorFlow body, the rotor spins at a rate proportional to the flow.

OUTPUT VERSIONS

1. As liquid passes through the RotorFlow body the magnetic rotor spins at a rate proportional to flow. This causes a series of magnetic fields (the rotor vanes) to excite the Hall Effect sensor, producing a series of voltage pulses.
2. The output pulses are at the same voltage level as the input (4.5 – 24 Vd.c.) with a frequency proportional to the flow rate. The output signal can be utilised by digital rate meters, totalisers or other electronic controllers.

SWITCH

1. RFS Type switches incorporate state-of-the-art circuitry to compare the frequency of incoming pulses to an adjustable, preset frequency. When the pulse rate meets or exceeds the preset value, the SPDT relay closes. When the pulse rate falls below the preset value, the output relay opens. This unique design eliminates the possibility of a RotorFlow switch from remaining in a 'switch actuated' mode, if the rotor jams accidentally.
2. RotorFlow Indicators may be mounted with flow entering either port. Performance is optimised by positioning ports at the top of the unit, in a horizontal plane.

How to Order

Description	Part No.
DM21 Rate Meter/Totaliser	DM2150000
DM21 Rate Meter/Totaliser + 2nd Relay	DM2151000
DM21 Rate Meter/Totaliser + 2nd Relay + Analog Output	DM2153000

DM21 Series - 1/8 DIN Rate Meter/Totalizer

- Large 18mm high digits (LED)
- Programmable colour change display based on an event (red/green)
- Display configurable for update time, minimum number of pulses, and forced zero time
- Optional linear analog output relative to rate
- Standard outputs: two NPN transistors and one relay (2nd relay optional)
- CE Approved
- Standard 1.8 DIN size (92mmx45mm cutout)
- Easy programming
- Include output 1 and 2 status annunciators

Specifications

Supply voltage	90-264 VAC, 50/60 Hz, 4 watts
Sensor Power Supply	9-15 Vdc, Unregulated
Output	NPN Open Collector, 30 VDC Max, 100 mA Max
Relay	SPDT, 5A Resistive @ 110 VAC
Analog Output	0-20 mA, 4-20 mA, 0-10 V, 2-10 V, 0-5V, 1-5V

RotorFlow - RFI-Types, Visual Indicators

Applications - Visual only - RFI

There are varied applications, but some of the more common are:

- Plastic injection moulding equipment
- Visual flow on heat exchangers

Applications - Switch/Analogue Output - RFO & RFA

- Lasers
- Medical Equipment
- X-Ray Tubes
- Computers
- Robotic Welding Equipment
- Water Purification/ Dispensing Systems
- Chemical Metering Equipment
- Water Sampling
- Ice Making Machinery
- Water Injection Systems
- Proof of Delivery Systems

OEMS

Specialist designs are available based on your requirements. Please contact Sales Office for further details on options such as potable water, enhanced chemical capabilities or 4-20mA loop powered units.

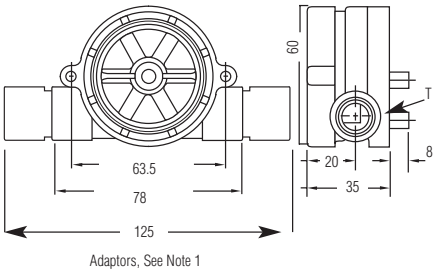
This is RotorFlow in its most basic form – a bright orange rotor turning with fluid flow. Simple, direct and reliable.

Flow rate is estimated, or simply confirmed, by viewing the speed of the turning rotor. Either port may be used for incoming flow, and new bayonet mounting lens is easily removed for quick cleanout. RFI Type RotorFlow sensors are easy to see, easy to install and easy to afford.

Specifications

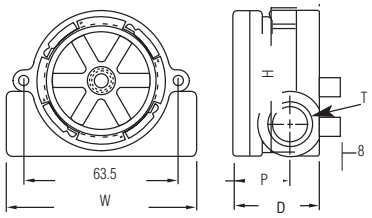
Wetted Materials		
Body	Polypropylene (Hydrolytically Stable, Glass Reinforced), SS or Brass	
Rotor pin	Ceramic	
Rotor	Moulded Nylon, Colour: High Visibility Orange	
Lens	Polysulfone	
O-Ring	Buna N (Metal body = Viton)	
Adaptor	Acetal (Polypropylene body only)	
Max. operating pressure	Polypropylene Body:	7 bar
	Metal Body:	14 bar
Max. operating temperature	Polypropylene Body:	80°C
	Metal Body:	100°C
Typical pressure drop	See Graph (Page 70 RFS)	

Polypropylene Bodies



Adaptors, See Note 1

Metal Bodies



T	W	H	D	P
1/4	77	60	35	20
1/2	77	60	35	22
3/4	100	66	51	27
1	100	66	51	27

Notes:

1. Adaptors are supplied fitted to plastic units, sealed using Teflon (PTFE) tape.
2. If NPT thread is required for plastic units discard adaptor.
3. For pressure drop curves see RFS page.

How to Order

Body Material	Port Size	Flow Ranges (l/min)		Order Number	
		Low Range*	Standard Range	BSP	NPT
Polypropylene	1/4"	0.4 to 4.0	2.0 to 20.0	**155420BSPP**	155420
	1/2"	6.0 to 45.0	15.0 to 75.0	**155480BSPP**	155480
Brass	1/4"	0.4 to 4.0	2.0 to 20.0	**142541BSPP**	142541
	1/2"	6.0 to 45.0	15.0 to 75.0	**142542BSPP**	142542
	3/4"	- - -	20 to 112.5	180392BSPP	180392
	1"	- - -	30 to 225	181681BSPP	181681
Stainless Steel	9/16 x 18 UNF	0.4 to 4.0	2.0 to 20.0	N/A	174596
	1/2"	6 to 45	15.0 to 75.0	173138BSPP	173138
	3/4"	- - -	20 to 112.5	181682BSPP	181682
	1"	- - -	30 to 225	181683BSPP	181683

* With use of low flow adaptor supplied, see page 70

Standard Products in **bold**

RotorFlow - RFO and RFA Types

4.5 - 24 VDC Pulsed Output - RFO
0 - 10 V, RFA

Gems Sensors popularised the Rotor-Flow's paddlewheel design by combining high visibility rotors with solid-state electronics that are packaged into compact, panel mounting housings. They provide accurate flow rate output with integral visual confirmation ... all with an unprecedented price/performance ratio.

Hall-Effect-Sensor sends a voltage pulse with each pass of magnetic field

Specifications

Wetted materials		
Body	Polypropylene (Hydrolytically Stable, Glass Reinforced), Stainless Steel or Brass	
Rotor pin	Ceramic	
Rotor	Ryton Composite, Colour: Black	
Lens	Polysulfone	
O-Ring	Buna N (Metal body = Viton)	
Max. operating pressure	Polypropylene Body: Metal Body:	7 bar 14 bar
Max. operating temperature	Polypropylene Body: Metal:	80 °C 100 °C
Electronics (both bodies)	65 °C Ambient	
Max. viscosity	45 cSt	
Input power	4.5 to 24 Vdc, (24Vdc Regulated Supply for RFA models)	
Output signal	4.5 to 24 Vdc Pulse, Pulse Rate dependent on Flow Rate, Port Size and Range 0 to 10 V, available (RFA model), consult Sales Office	
Max. current source output	70 mA	
Frequency output range	25 Hz (Low Flow) to 225 Hz (High Flow)	
Electrical termination	AWG 22 PVC-Jacketed Cable, Length 60 cm Colour Code: Red = + Vdc, Black = Ground, White = Signal output	
Typical pressure drop	See Graphs	

High Resolution Black Rotor
Ryton composite. Each of the six rotor arms are magnetized.

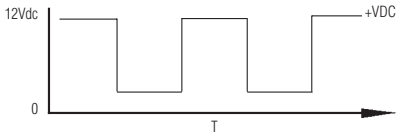
Signal Output

Output signal for RFO Types is an on/off pulse of the DC voltage supplied to the unit, it is compatible with all digital logic families. Input voltage range is 4.5 to 24 Vd.c.

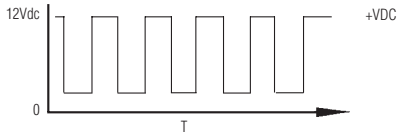
Frequency of the output pulse is proportional to the flow rate and ranges from approximately 25 Hz at low flow to 225 Hz at high flow. See order number for more information.

Following examples are at 12Vdc supply

Low Flow



HighFlow



* With use of Low-Flow-Adapter supplied.

See page 70 for more information.

For dimensions see page RFS

Please consult factory for detailed flow rate / frequency curves.

How to Order

Body	Port	Flow Ranges (l/min)		Output (Hz)	RFO		RFA
Material	Size	Low Range*	Standard Range	Approximate	BSP	NPT	
Polypropylene	1/4"	0.4 to 4.0 (±7%)	2.0 to 20.0 (±7%)	15-180	**155421BSPP**	155421	Consult Factory
	1/2"	6.0 to 45.0 (±7%)	15.0 to 75.0 (±15%)	20-190	**155481BSPP**	155481	
Brass	1/4"	0.4 to 4.0 (±7%)	2.0 to 20.0 (±7%)	15-180	**156261BSPP**	156261	Consult Factory
	1/2"	6.0 to 45.0 (±7%)	15.0 to 75.0 (±15%)	20-190	**156262BSPP**	156262	
	3/4"	- - -	20 to 112.5 (±15%)	25-210	194761BSPP	194761	
	1"	- - -	30 to 225 (±15%)	15-180	194762BSPP	194762	
Stainless Steel	9/16 - 18 UNF	0.4 to 4 (±7%)	2 to 20.0 (±7%)	15-180	N/A	165071	Consult Factory
	1/2"	6 to 45 (±7%)	15.0 to 75.0 (±15%)	20-190	165075BSPP	165075	
	3/4"	- - -	20 to 112.5 (±15%)	25-210	194763BSPP	194763	
	1"	- - -	30 to 225 (±15%)	15-180	194764BSPP	194764	

* With use of Low-Flow-Adaptor supplied

Standard Products in **bold**

RotorFlow - RFS Types Flow Setpoint Switching

RotorFlow Switches build an extra level of reliability and protection into your equipment. By principle of operation, the rotor cannot be deceived into indicating a positive flow situation when no flow actually exists. Once set to a desired actuation point, RotorFlow will switch to a 'no-flow' condition should the rotor stop for any reason.

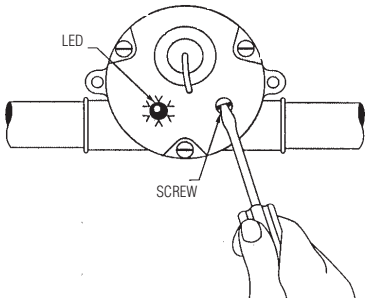
Specifications

Wetted Materials		
Body	Polypropylene, Brass, S Steel (Hydrolytically Stable, Glass Reinforced)	
Rotor Pin	Ceramic	
Rotor	Ryton Composite, Colour: Black	
Lens	Polysulfone	
O-Ring	Buna N (Metal Body = Viton)	
Max. Operating Pressure	Polypropylene Body: Metal Body:	7 bar 14 bar
Max. Operating Temperature	Polypropylene Body: Metal Body:	80 °C 100 °C
Electronics	65°C Ambient	
Max. Viscosity	45 cst	
Input Power	24 Vd.c. or 110 Va.c.	
Relay Contact Ratings (SPDT)	1A, 24 Vd.c. Resistive 0,5 A, 110 Va.c. (230 V a.c. on request)	
Repeatability	2% max. Deviation	
Set Point Accuracy (Factory Set)	± 5%	
Hysteresis	max. 15%	
Electrical Termination	22 AWG PVC-Jacketed Cable, Length 60 cm, Colour Code: Red = +Va.c./Vd.c., Black = Ground, White = N.O., Brown = N.C., Green = Common	
Typical Pressure Drop:	See Graphs	

Switch Set Point Calibration With LED Signal (RFS Type)

With the unit installed in the line and power supplied, complete the following steps to calibrate switch actuation point with proper flow rate. A small flat-blade screwdriver is the only tool required.

1. Adjust liquid flow in the line to the rate at which switch actuation is desired.
2. Insert screwdriver into opening on backside of housing and fit blade into the potentiometer adjustment screw inside.
3. If LED is not illuminated, slowly turn screwdriver counterclockwise and stop as soon as LED illuminates.
4. If LED is illuminated, turn screwdriver clockwise until LED light goes out. Then, slowly turn screwdriver counterclockwise and stop as soon as LED illuminates.



How to Order

Body Material	Port Size	Flow Ranges (l/min) Low Range*	Flow Ranges (l/min) Standard Range	Input Power	Order Number BSP	Order Number NPT
Polypropylene	1/4"	0.4 to 4.0	2.0 to 20.0	24 VDC	**155425BSPP**	155425
				110 VAC	155876BSPP	155876
	1/2"	6.0 to 45.0	15.0 to 75.0	24 VDC	**155485BSPP**	155485
				110 VAC	155886BSPP	155886
Brass	1/4"	0.4 to 4.0	2.0 to 20.0	24 VDC	**156265BSPP**	156265
				110 VAC	156266BSPP	156266
	1/2"	6.0 to 45.0	15.0 to 75.0	24 VDC	**156268BSPP**	156268
				110 VAC	156269BSPP	156269
	3/4"	- - -	20 to 112.5	24 VDC	180395BSPP	180395
				110 VAC	180396BSPP	180396
	1"	- - -	30 to 225	24 VDC	181688BSPP	181688
				110 VAC	181689BSPP	181689
Stainless Steel	9/16" - 18UNF	0.4 to 4	2.0 to 20.0	24 VDC	N/A	165073
				110 VAC	N/A	165074
	1/2"	6 to 45	15.0 to 75.0	24 VDC	165077BSPP	165077
				110VAC	165078BSPP	165078
	3/4"	- - -	20 to 112.5	24 VDC	181691BSPP	181691
				110 VAC	181692BSPP	181692
	1"	- - -	30 to 225	24 VDC	181693BSPP	181693
				110 VAC	181694BSPP	181694

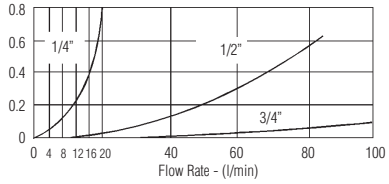
* With use of Low-Flow-Adapter supplied,

Standard Products in **bold**

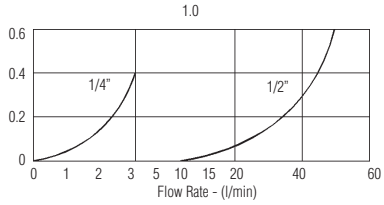
Pressure Drop Typical

throughout all options

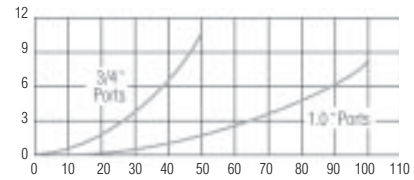
Standard Flow Range Units



Low Flow Range Units

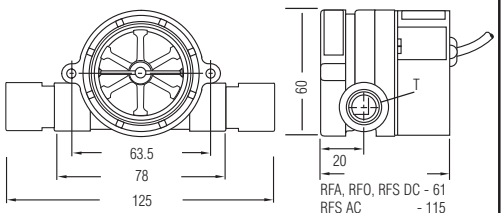


High Flow Units



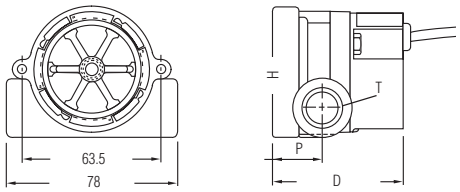
Dimensions (in mm)

RFA, RFO, RFS
Polypropylene Bodies



Adaptors, See Note 2, page 67

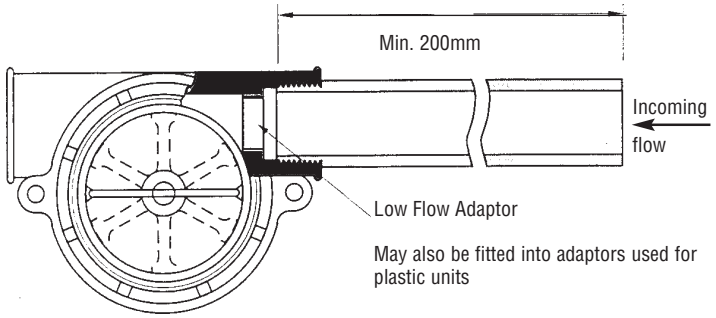
Metal Bodies



T	W	H	D DC models	D AC models	P
1/4	77	60	61	114	20
1/2	77	60	61	114	22
3/4	100	66	75	121	27
1	100	66	75	121	27

Installation and Maintenance

A proper installation will enhance RotorFlow sensor performance. Install using standard pipe fitting tools; horizontal fluid lines are recommended. For further installation and maintenance recommendations, refer to one of the following instruction bulletins: RFO Types - Part Number 157258; RFI Types - Part Number 157259; RFS Types - Part Number 157261. Since their function is to monitor dynamic fluid flow, naturally the rotor will react to turbulence, pulsation, entrained air, and other flow anomalies induced in the flow stream by other process hardware. For optimum performance, install RotorFlow units where nominal flow conditions exist with ports located at the top. Incoming flow may be placed to either port; a minimum of 20 cm of straight pipe on the inlet side is required. When operating in the low flow range, the supplied Low Flow Adapter must be installed in the incoming port.



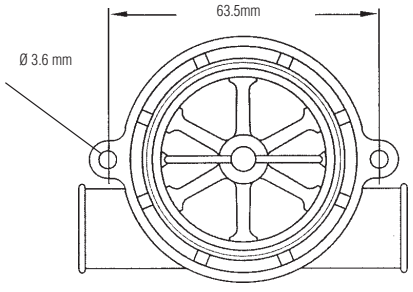
RotorFlow sensors connect to piping via NPT mating thread forms. The use of an appropriate thread sealant is necessary to assure a leak-tight connection. Permatex "No More Leaks" or 2 wraps of Teflon tape are the only sealants recommended for GEMS flow sensors. 150 micron filtration is recommended. However, should foreign particles enter RotorFlow sensor, accumulation is easily cleared by removing the lens from the body. The lens is removed by turning its centre rib 45° counter-clockwise, and then pulling it out. To reinstall the lens, simply reverse the process.

Panel Mounting

Any RotorFlow sensors may be panel mounted using holes integrated into the bodies.

Two (2) mountings ears are provided at the body centre line to receive 3.5mm ø self tapping screws (e.g. DIN 7971-B 3, 5 x 19) to accommodate panel mounting of the plastic RotorFlow units.

Note: ANSI T type 23 self-tapping screw are recommended. They may be replaced with standard machine screws if reinstallation should be required.



Important: In either case, pressure must be relieved from the system prior to sensor clean-out.

Low Flow Applications

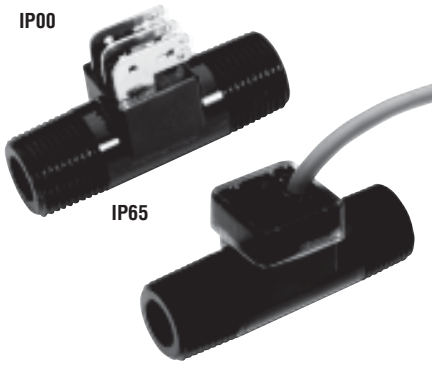
A low flow adaptor is supplied with all Rotorflow units. It is used to produce accurate response at low flow rates. Install the adapter, as shown above, in the port selected for incoming flow.

FT-110 Series - TurboFlow™

Economical Flow-Rate Sensors

- Low Cost Plus High Accuracy ±3% of Reading
- Measures Low Liquid Flow Rates of 0.4 to 30 l/min
- FDA Approved Materials
- Lightweight Plastic design enables mounting in any position

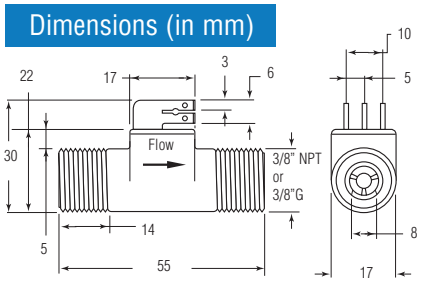
GEMS hall effect turbine flow rate sensor is ideal for OEM applications involving low flow liquid monitoring. The low cost coupled with 0.5% repeatability makes it an ideal candidate for replacing dispensing timer systems. Unlike existing timing systems, turbine technology is not influenced by changes in system pressure caused by ageing filters. The sensor's standard power and output specifications make it easy to retrofit to existing controllers.



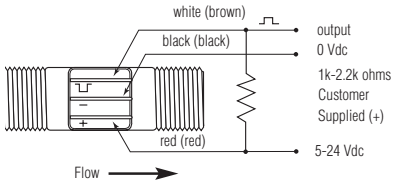
Specifications

Wetted materials	
Body	Nylon 12
Turbine	Nylon 12 Composite
Bearings	PTFE/15% Graphite
Operating pressure	14bar max
Burst pressure	170bar
Operating temperature	-20°C to 100°C (Ambient +80°C for cable)
Viscosity	32 to 81 SSU (.8 to 16 Centistokes)
Filter	<50 Microns
Input power	5 to 24 VDC @ 8mA
Output	NPN Sinking Open Collector @ 50mA Maximum (1 to 2.2K Ohm Pull-Up Resistor Required) (Hz Output)
Accuracy	±3% of Reading
Repeatability	0.5% of Full Scale
Electrical connection	Spade Terminals 2.8/6.3 x .8mm : 1m cable
Inlet/outlet ports	3/8" NPT Male : G 3/8" Male

Dimensions (in mm)



Wiring (Integral Cable in brackets)



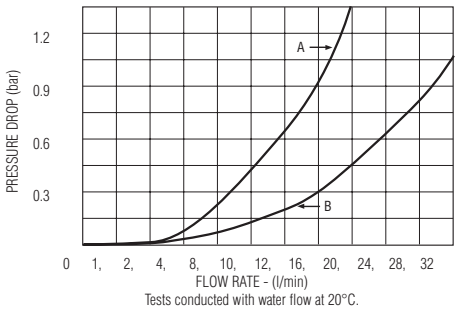
How to Order

Specify Part Number based on desired flow range and thread type

Flow Range Litres/m	Pulses per Litre	Frequency Output	Part Number Terminals 3/8" NPT	Terminals G 3/8"	Cable 3/8" NPT	Cable G 3/8"	Pressure Drop Code
.5-5	6900	58-575 Hz	173931	173936	173931-C	**173936-C**	A
1-10	3300	55-550 Hz	173932	173937	173932-C	**173937-C**	
1-15	4600	76-1150 Hz	173933	173938	173933-C	**173938-C**	
1-15	2200	37-550 Hz	173934	173939	173934-C	**173939-C**	B
2-30	1000	33-500 Hz	173935	173940	173935-C	**173940-C**	

● Consult Sales Office if there is a possibility of particles in the flow stream.

Pressure Drop - Typical



Tests conducted with water flow at 20°C.

FT-110 Accessories

Description	Part Number
Mating connector w/1m, 3 conductor, PVC pigtail leads	173941
Mating connector w/3m, 3 conductor, PVC pigtail leads	173942

Standard Products in **bold**

Conversions

Temperature Conversion

°F to °C	=	(°F -32) x 0.556
°C to °F	=	(1.8 x °C) + 32
KELVIN	=	°C + 273.15
RANKLINE	=	°F + 459.67

Bars - (bar)

x 100	=	Kilopascals (kPa)
x 14.504	=	Pounds-force per square inch (psi)
x 33.52	=	Feet of water (ftH_20) at 20°C (68°F)
x 29.53	=	Inches of mercury (in Hg) at 0°C
x 1.0197	=	Kilograms-force per square centimeter (kg/cm^2)
x 0.98692	=	Atmospheres (atm) sea-level standard
x 1.0443	=	Tons-force per square foot ($tonf/ft^2$)
x 750.06	=	Torr (torr) (=mmHg at 0°C)

Litres - (1)

x 1000	=	Cubic centimetres (cm^3)
x 0.035315	=	Cubic feet (ft^3)
x 61.204	=	Cubic inches (in^3)
x 1.308 x 10^3	=	Cubic yards (yd^3)
x 0.2642	=	U.S gallons (U.S. gal)
x 0.220	=	Imperial gallons (imp gal)

Inches of water - in H_2 at 20°C (68°F)

x 0.2487	=	Kilopascals (kPa)
x 2.487 x 10^{-3}	=	Bars (bar)
x 0.07342	=	Inches of mercury (in Hg) at 0°C
x 2.535 x 10^{-3}	=	Kilograms-force per square centimeter (kg/cm^2)
x 0.5770	=	Ounces-force per square foot (ozf/ft^2)
x 5.193	=	Pounds - force per square foot ($1bf/ft^2$)
x 0.03606	=	Pounds - force per square inch (psi)
x 2.454 x 10^{-3}	=	Standard atmospheres

Cubic feet (ft^3)

x 0.02832	=	Cubic metres (m^3)
x 2.832 x 10^{-2}	=	Cubic centimetres (cm^3)
x 1728	=	Cubic inches (in^3)
x 0.03704	=	Cubic yards (yd^3)
x 7.481	=	U.S gallons (U.S. gal)
x 6.229	=	Imperial gallons (imp gal)
x 28.32	=	Litres (1)

International

1 inch	=	25.4mm
Standard gravity	=	9.80665 m/sec^2
1 atmosphere	=	1013.25 mbar
1 pound mass	=	453.59237 gm

Dielectric Constants

Common Name	State	Degrees C / F	Dielectric Constant
Acetic Acid	Liquid	20 / 68	6.15
Acetone	Liquid	27 / 80	20.7
Ammonia	Liquid	-1 / 30	22.4
Aniline	Liquid	20 / 68	7.3
Aviation Spirit (100 Octane)	Liquid	25 / 77	3
Benzene	Liquid	20 / 68	2.284
Bitumen	Liquid		3.5
Bromine	Liquid	20 / 68	3.09
Butanol-1	Liquid	25 / 77	17.1
Butyl Acetate	Liquid	20 / 68	5.01
Carbon Tetrachloride	Liquid	25 / 77	2.23
Castor Oil, Hydrogenated	Liquid	27 / 80	10.3
Chlorine	Liquid	0 / 32	2
Chlorobenzene	Liquid	25 / 77	5.621
Chloroform	Liquid	0 / 32	5.5
Cyclohexane	Liquid	25 / 77	2.02
Dichloromethane	Liquid	20 / 68	9.08
Diethyl Ketone	Liquid	14 / 58	17.3
Dimethyl Sulphate	Liquid	20 / 68	55
Ethanol	Liquid	25 / 77	24.3
Ethyl Acetate	Liquid	20 / 68	6.4
Ethyl Benzene	Liquid	20 / 68	2.412
Ethyl Bromide	Liquid	18 / 64	4.9
Ethyl Ether	Liquid	20 / 68	4.34
Ethylene Chloride	Liquid	20 / 68	10.5
Ethylene Glycol	Liquid	25 / 77	37.7
Formic Acid	Liquid	21 / 69.8	57
Gasoline	Liquid		2 - 2 .2
Glycerine	Liquid		47.0 - 68.0
Glycerol	Liquid	77	42.5
Glycol	Liquid	68	42.2
Hexane	Liquid	68	1.89
Hexanol	Liquid	76	13.3
Hydrazine	Liquid	68	52.9
Hydrogen Bromide	Liquid	76	3.8
Hydrogen Sulphide	Liquid	48	5.8
Isobutyl Alcohol	Liquid	68	18.7
Isobutyl Chloride	Liquid	68	7.1
Isopropyl Alcohol	Liquid	68	15.7
Jet Fuel (Military-JP4)	Liquid	70	1.7
Lactic Acid	Liquid	66	19.4
Maleic Anhydride	Liquid	140	51
Methanol	Liquid	77	32.63
Methyl Acetate	Liquid	68	7.3
Methyl Alcohol	Liquid	68	33.1
Methyl Butyl Ketone	Liquid	62	12.4
Methyl Ether	Liquid	77	5.02
Methyl Salicylate	Liquid	68	9
Methyl Thiocyanate	Liquid	68	35.9
Mineral Oil	Liquid	80	2.1
Nitrobenzene	Liquid	77	34.82
Octane	Liquid	76	2.061
Oil, Linseed	Liquid	55	3.4
Oil, Vegetable	Liquid		2.5 - 3.5
Pentanol	Liquid	77	13.9
Petroleum	Liquid		1.8 - 2.2
Phenol	Liquid	118	9.9
Phosgene	Liquid	71.6	4.3
Phosphorus	Liquid	93.2	4.1
Phosphorus Trichloride	Liquid	77	3.4
Propanol-1	Liquid	77	20.1
Propanol-2	Liquid	77	18.3
Pyridine	Liquid	68	12.5
Sulphur	Liquid	448	3.48
Sulphur Dioxide	Liquid	32	15.6
Sulphur Trioxide	Liquid	70	3.6
Sulphuric Acid	Liquid	68	84
Tetrachloroethylene	Liquid	77	2.3
Tetrahydrofuran	Liquid	86	7.25
Toluene	Liquid	68	2.4
Trichloroacetic Acid	Liquid	140	4.6
Trichloroethylene	Liquid	61	3.4
Water	Liquid	68	80.4
Xylene	Liquid	68	2.4

- Contact Sales Office for additional dielectric constants

Also available from Gems

Pressure Transducers

Gems Sensors is the leading European manufacturer of high performance sputtered thin film and cost effective CVD pressure transducers and transmitters. With sales of over a million pressure sensors, Gems' products are renowned throughout the world for their exceptional levels of quality, reliability and long term stability, in applications in the water, power machinery and aircraft industries. Gems' pressure sensors are manufactured in our purpose built class 100 clean room using CAD/CAM technology, laser welding, mass spectrometry and special brazing equipment.

CVD

- Cost effective
- Large volumes available
- Accuracy +/-0.15%
- Large choice of electrical and pressure connections
- Short lead time

Thin Film

Thin film transducers and transmitters offer the ultimate combination of accuracy, stability and repeatability. The 4000 series are accurate to 0.08% and are rated for 25 years MTBF.

- High performance
- Class leading accuracy +/-0.08%
- High stability
- Large number of options
- Choice of material

Level Measurement - Pressure Based

Continuous level measurement for waste and water treatment and tank levels.

- Five year anti-water ingress warranty
- Lightning protection
- Zero maintenance
- No calibration needed

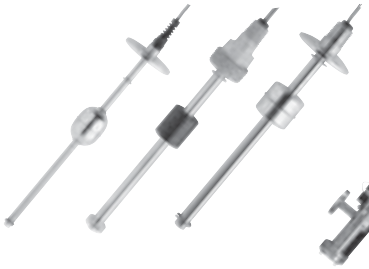
Pressure Switches

Various selections for OEM variants to process applications.

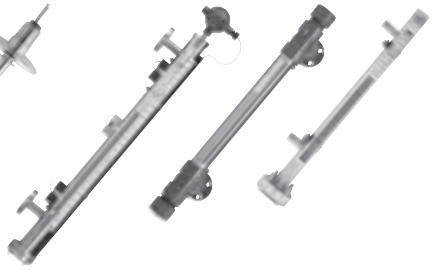
- Wide variety
- OEM design service

Specialist Products

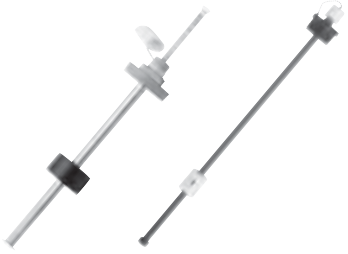
Tank Level Transmitters



Magnetic Level Indicators



Dip Tape Visual Level Indicators



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