

КАТАЛОГ

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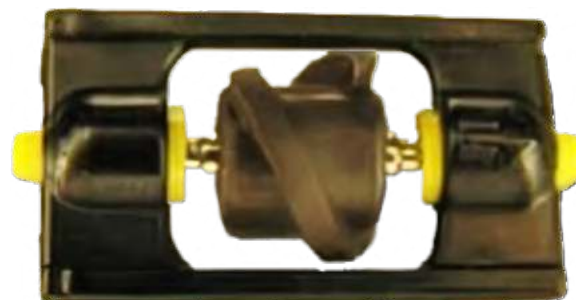
Киргизия +996(312)96-26-47

эл.почта: gsx@nt-rt.ru || сайт: <https://gems.nt-rt.ru/>

FT-100 Series Flow Turbine Insert

- ▶ Low Flow Rates .2 to 2.0 GPM and High Repeatability 2% of Reading
- ▶ Lightweight Turbine Ensures Fast Startup
- ▶ Mounts In Any Orientation

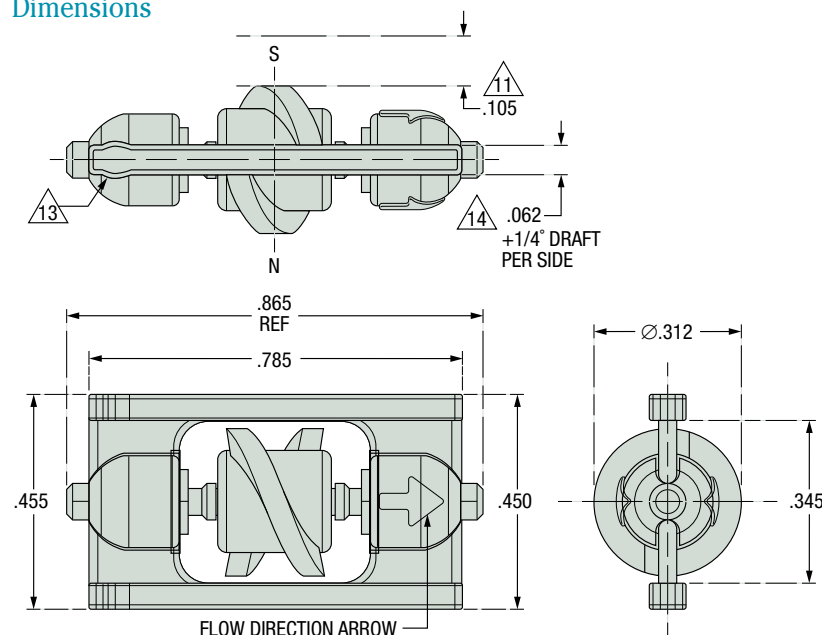
Gems FT-100 Flow Turbine Insert is ideal for OEM applications involving low flow liquid monitoring. Available in four different configurations to meet the needs of multiple applications, including food and beverage with NSF approvals. The low cost and small size provide a great fit for multiple flow-sensing applications. In addition, Turbine technology is not influenced by fluctuations in pressure due to clogged filters.



Specifications

Flow Range	0.2–2.0 gallons/minute 0.75–7.5 liters/minute
Operating Pressure	150 PSI Max (10.34 bar)
Accuracy	5% of Reading
Repeatability	2% of Reading
Viscosity	40 SSU Max (4.3 Centistokes)
Filter	50 Microns
Bore	.335" Diameter
Axle	316 Stainless Steel

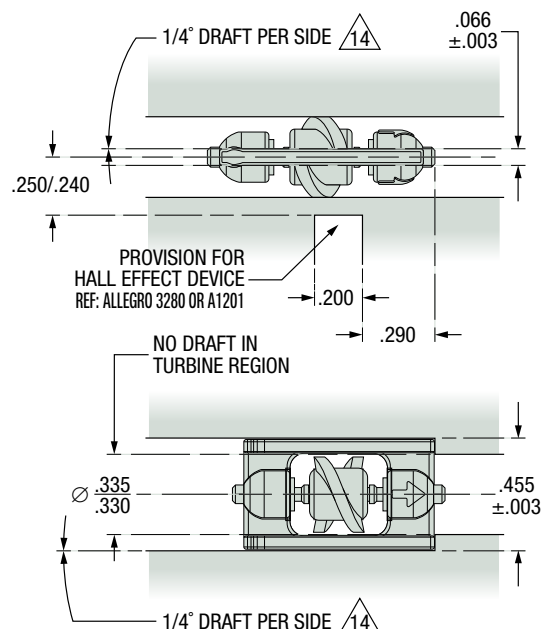
Dimensions



Typical Applications

- Carbonated Beverage Dispensing
- Smart Faucets
- Coffee Makers
- Fertilizer Dispensing

Reference Geometry



How To Order

Specify a Part Number based on desired materials and approvals.

Turbine	Cage	Bearings	Max Temperature	Approvals	Frequency Output	Part Number
Nylon 6	ABS (Black)	Peek (Gray)	160°F (71°C)	NSF 61, WRAS	33–348 Hz	238600
		Nylon 6/12 (Yellow)	100°F (37.78°C)	NSF 61, NSF 18, EU 1935	31–348 Hz	215100
	Polypropylene (White)			N/A	13–325 Hz	253750
Nylon 12	Noryl (Blue)	Peek (Gray)	185°F (85°C)	WRAS	14–320 Hz	241220

31US Series and 32US Heavy Duty Series

UL Listed Intrinsically Safe Industrial Pressure Sensors

For OEMs that need Intrinsically Safe pressure sensors with consistent high levels of performance, reliability and stability, the 31/32US Series sputtered thin film units offer an unbeatable price performance ratio in a small package size. They feature all stainless steel wetted parts, a broad selection of electrical and pressure connections and a wide choice of electrical outputs.

Our manufacturing process includes the latest automated equipment, producing consistent sensor performance.

Additionally the 32US Series sensors feature a thicker diaphragm and a pressure restrictor to withstand the rigors of cavitation or extreme pressure spikes, delivering years of reliable and stable performance in pulsating applications.

The compact construction of both these series makes them ideal for installation where space is at a premium.

Specifications

Performance	
Long Term Drift	0.2% FS/YR (non-cumulative)
Accuracy	0.25% FS
Thermal Error	
31US	±1.5% max, ±1% typical / 212°F (100°C)
32US	±2% max
Operating & Compensated Temperatures	
	-40°F to +176°F (-40°C to +80°C)
Zero Tolerance, Max.	0.5% of span
Span Tolerance, Max.	0.5% of span
Fatigue Life	Designed for more than 100 M cycles
Mechanical Configuration	
Pressure Port	See under "How to Order," last page
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See under "How to Order," last page
Enclosure	IP67 (IP65 for electrical code G)
Vibration	BSEN 60068-2-6 (FC) Sine (20G) BSEN 60068-2-64 (FH) Random (14.1 Grms)
Shock	BSEN 60068-2-27 (Ea) (50G, 11ms)
Approvals	Certified Intrinsically Safe for use in: Class I, Division 1, Groups C and D When used in conjunction with a Zener safety barrier. Fully RoHS Compliant UL Listing: E183854
Weight	1.8 to 5.3 ounces (50-150 grams). Configuration dependant

EMC Specifications

Emissions Tests: EN61326-1:2006 and EN61326-2-3:2006	
EN55011:2007	Radiated Emissions: 30-230MHz 30dB µV/M @10M 230-1000MHz 37dB µV/M @10M
Immunity Tests: EN61326-1:2006 and EN61326-2-3:2006	
EN61000-4-2:2009	Electrostatic Discharge: ±4Kv contact ±8Kv air
EN61000-4-3:2006	Radiated Immunity: 10V/M 80-1000MHz 3V/M 1400-2000MHz 1V/M 2000-2700MHz
EN61000-4-4:2004	Fast Transients: ±0.25, 0.5, 1Kv
EN61000-4-6:2007	Conducted Immunity: 3V 0.15 to 80MHz 80% 1KHz modulation



Individual Specifications

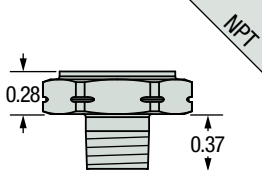
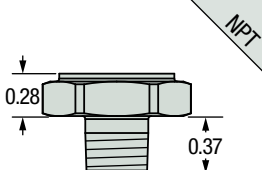
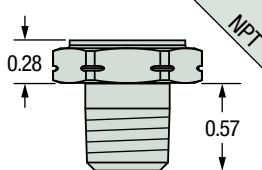
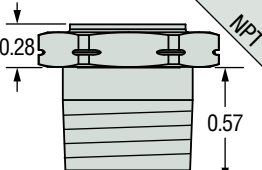
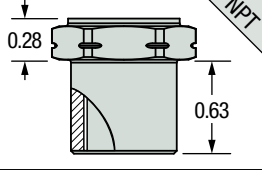
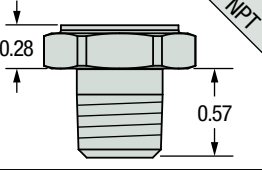
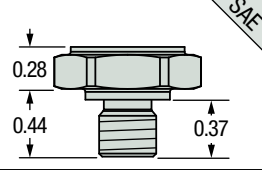
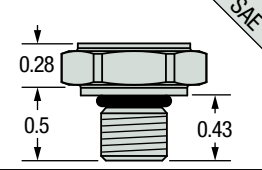
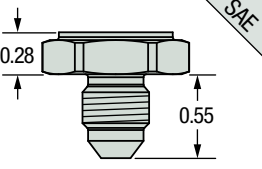
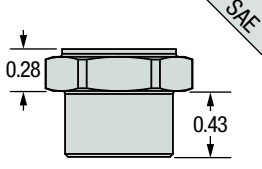
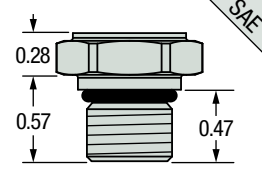
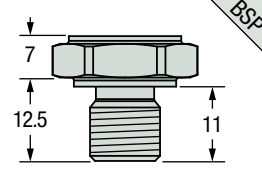
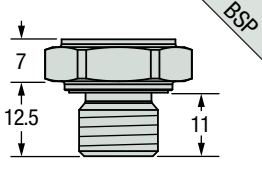
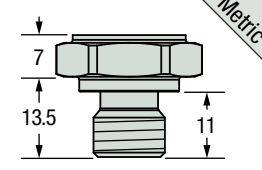
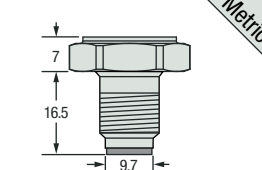
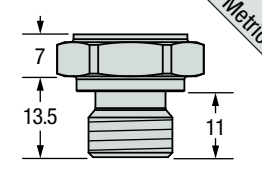
Voltage	
Output (3-wire)	0V min. to 10V max. See under "How to Order," last page
Supply Voltage	1 Volt above full scale with minimum supply of 8V; maximum 30V @ 4.5 mA
Source and Sinks	2 mA
Current	
Output (2-wire)	4-20 mA
Supply Voltage	8-24 Volts measured at the input to the transducer terminals
Maximum Loop Resistance	(Supply Voltage – 8) x 50ohms See Graph
Ratiometric	
Output	0.5 to 4.5V (Source and sink 2mA)
Supply Voltage	5 Vdc ±10% @ 4.5mA

Pressure Capability

Pressure Range PSI (Bar)	Proof Pressure (x Full Scale)		Burst Pressure (x Full Scale)	
	31US	32US	31US	32US
100-300 (7-20)	3.00 x FS	3.00 x FS	40 x FS	
500-1,500 (40-100)	2.00 x FS		20 x FS	
2,000-6,000 (140-400)			10 x FS	
10,000 (700)			> 60,000 PSI	

Pressure Ports

NPT and SAE Dimensions in Inches. Metric and BSP Dimensions in MM.

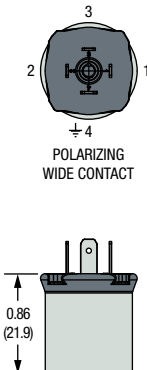
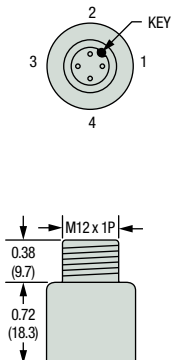
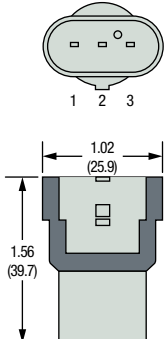
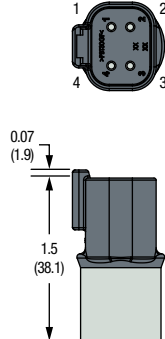
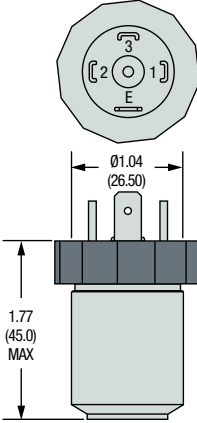
				
Fitting Code	08 = 1/8\"-27 NPT	4D = 1/8\"-27 NPTF Dryseal	02 = 1/4\"-18 NPT	0H = 1/2\"-14 NPT
Torque	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*
				
Fitting Code	0E = 1/4\"-18 NPT Internal	4C = 1/4\"-18 NPTF Dryseal	4N = 3/8\"-24 UNF	1J = 7/16\"-20 UNF
Torque	2-3 TFFT*	2-3 TFFT*	18-20 NM	18-20 NM
				
Fitting Code	04 = 7/16\"-20 UNF with 37° Flare	1G = SAE 4 Female 7/16\" Schraeder	1P = 9/16\"-18 \"Heavy Duty\"	01 = G1/4\"-19 A
Torque	15-16 NM	18-20 NM	18-20 NM	30-35 NM
				
Fitting Code	05 = G1/4\"- 19 A Integral Face-Seal	0L = M12 x 1.5	2T = M12x1.5 HP Metal Washer Seal	0K = M14 x 1.5
Torque	30-35 NM	28-30 NM	30-35 NM	2-3 TFFT*

*NPT Threads 2-3 turns from finger tight. Wrench tighten 2-3 turns.

General Notes:

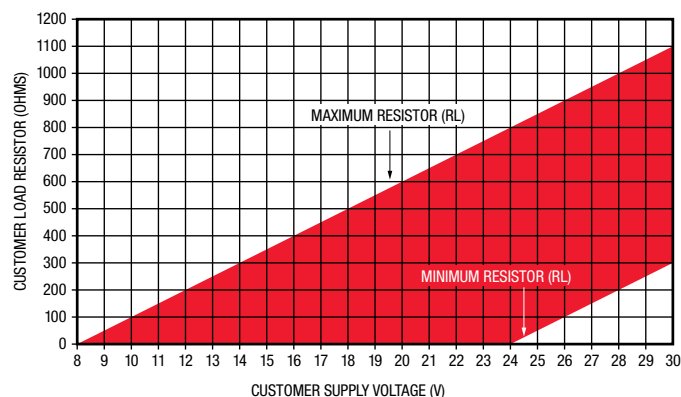
1. The diameter of all cans is 19 mm (0.748")
2. Hex is 22 mm (0.866") Across Flats (A/F) for deep socket mounting
3. O-Ring material, where applicable, is Viton® unless otherwise specified.

Electrical Connector

DIN 9.4 mm			M12 x 1P		Amp Superseal 1.5		Deutsch DT04-4P		DIN 43650A	
										
Code R			Code E		Code 6		Code 8		Code G	
Pin #	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode
1	V _{supply}	Supply	V _{supply}	Supply	V _{out}	No Connect	Ground	Return	V _{supply}	Supply
2	Ground	Return	V _{out}	No Connect	Ground	Return	V _{supply}	Supply	Ground	Return
3	V _{out}	No Connect	Ground	Return	V _{supply}	Supply	No Connect	No Connect	V _{out}	No Connect
4	No Connect	No Connect	No Connect	No Connect	—	—	V _{out}	No Connect	No Connect	No Connect

*This pin is used for temperature sensing output when this option is utilized. Otherwise, the pin is used for PE.

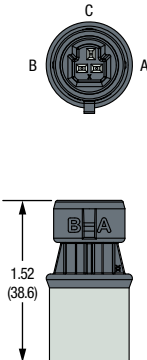
Current Output Mode (Load Resistor Range)

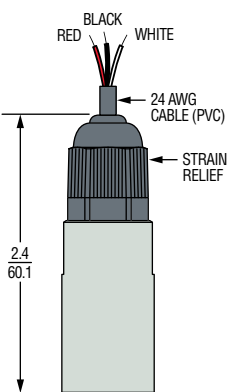
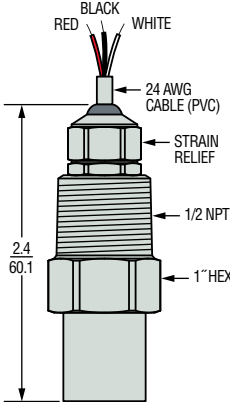


Minimum Resistor Value = $50 \times (+V - 24)$ for $+V > 24V$

Maximum Resistor Value = $50 \times (+V - 8)$ for $+V > 8V$

Cable-Out Types

Packard MetriPack		
		
Code 9		
Pin ID	Voltage Mode	Current Mode
A	Ground	Return
B	V _{supply}	Supply
C	V _{out}	No Connect
E	—	—

Cable			1/2" Conduit Connection	
				
Code F			Code 3	
Wire Color	Voltage Mode	Current Mode	Voltage Mode	Current Mode
Red	Supply	Supply	Supply	Supply
Black	Ground	Return	Ground	Return
White	V _{out}	No Connect	V _{out}	No Connect

How to Order

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

Series	31US / 32US - Pressure Sensor	B	200PG	02	R	R	01	Cable Length (For electrical connections F & 3 only)
Output	B - 4-20 mA N - 0.5-4.5 V T - 0.5-4.5 V Ratiometric	C - 1-6 V R - 0-5 V ¹	H - 1-5 V S - 0-10 V ¹					00 - No Cable 01 - 1 meter 02 - 2 meters 03 - 3 meters 04 - 4 meters 05 - 5 meters 10 - 10 meters
Pressure Range - psi	100PG - 0-100 psiG 150PG - 0-150 psiG 200PG - 0-200 psiG 300PG - 0-300 psiG 500PG - 0-500 psiG 600PG - 0-600 psiG 750PG - 0-750 psiG	10CPG - 0-1,000 psiG 15CPS - 0-1,500 psiS 20CPS - 0-2,000 psiS 25CPS - 0-2,500 psiS 30CPS - 0-3,000 psiS 35CPS - 0-3,500 psiS 40CPS - 0-4,000 psiS 50CPS - 0-5,000 psiS 60CPS - 0-6,000 psiS 75CPS - 0-7,500 psiS	10KPS = 0-10,000 psiS					Optional Restrictor (32US only) R - Restrictor 0 - No Restrictor
Pressure Range - bar	0007G - 0-7 barG 0010G - 0-10 barG 0016G - 0-16 barG 0025G - 0-25 barG 0040G - 0-40 barG 0060G - 0-60 barG 0100S - 0-100 barS	0160S - 0-160 barS 0250S - 0-250 barS 0400S - 0-400 barS 0600S - 0-600 barS	1000S - 1,000 barS					Electrical Connection ³ E - M12 x 1P (4-Pin) F - Cable version G - Large DIN R - Industrial DIN 9.4 mm (alternate pin out) 3 - 1/2" NPT Male Conduit 6 - Amp - Superseal 1.5 Series 8 - Deutsch DT04-4P 9 - Packard MetriPack
Notes:	¹ For use with pull-up or pull-down resistors, contact factory. ² Pressure ports 0E and 1G are NOT available with the Restrictor option. ³ For electrical codes F & 3 , specify cable length in meters.							Pressure Port ² 08 - 1/8"-27 NPT External 02 - 1/4"-18 NPT External 0H - 1/2"-14 NPT External 04 - 7/16"-20 External (SAE #4, J514) 1J - 7/16"-20 External (SAE #4, J1926-2) 0E - 1/4"-18 NPT Internal 0K - M14 x 1.5 Straight 1G - Schrader SAE #4, 7/16" Internal 1P - SAE 6 (9/16"-18 UNF 2A) 4C - 1/4"-18 NPTF External (Dryseal) 4D - 1/8"-27 NPTF External (Dryseal) 4N - SAE 3 (3/8"-24 UNF External) 01 - G1/4 External 05 - G1/4 External Soft Seal 0L - M12 x 1.5 (<1,000 bar, 15,000 psi) 2T - M12 x 1.5 (6g) (≥1,000 bar, 15,000 psi)

FT-210 Series – TurboFlow® Low Flow Turbine Sensor

- ▶ Low Flow Rates .1 to 2.5 LPM and High Accuracy $\pm 3\%$ of Reading
- ▶ Lightweight Turbine Ensures Fast Startup
- ▶ Mounts In Any Orientation

Gems FT-210 features proven turbine technology in a small package for low flow applications. The turbine technology provides a highly repeatable sensor ideally suited for measurement of either volume dispensing and/or flow rate applications. The small turbine reacts quickly to on/off dispensing applications. Each sensor is 100% tested, ensuring years of service life.

Specifications

Wetted Materials	
Body	Nylon 12 (Grilamid TR55)
Turbine	Nylon 12 Composite
Bearings	PTFE/15% Graphite
Operating Pressure	350 PSI (24 bar)
Burst Pressure	1400 PSI (97 bar)
Flow Range	.026-.65 gallons/minute 0.1-2.5 liters/minute 3.4-84.5 ounces/minute
Pulses	83,200 per gallon 22,000 per liter 650 per ounce
Frequency Output	36.6-917 Hz
Operating Temperature	-4°F to 212°F (-20°C to 100°C)
Viscosity	32 to 70 SSU (.8 to 16 Centistokes)
Filter	<50 Microns
Input Power	5 to 24 VDC
Output (Hz)	NPN Sinking Open Collector @ 20mA Maximum Leakage Current 10 μ A (3K-30K Pull up resistor required)
Accuracy	$\pm 3\%$ of Reading
Repeatability	0.5% of Full Scale
Electrical Connection	9.4mm Spacing 3-pole DIN Connector (1" high)
Inlet/Outlet Ports	1/4" NPT (1/4" G Male also available)

How To Order

Specify a Part Number for the Port Connection AND a Part Number for the DIN Electrical Connection. Two Part Numbers are required for a complete part assembly.

FT-210 Sensor

Body Material	Port Size	Part Number
Nylon 12	1/4" NPT	212465 ⚡
	1/4" G	212460

⚡ – Stock Items.

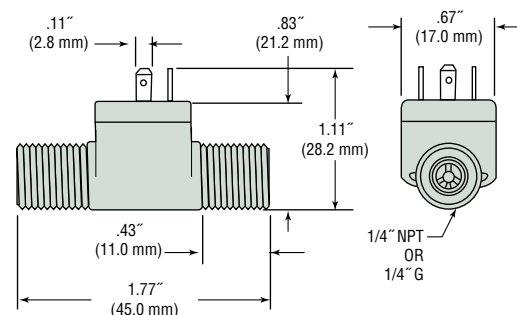
Electrical Connection

Description	Part Number
1 meter DIN PVC Cable Assembly with 10K pull-up resistor	218572
Mating DIN Connector	212404

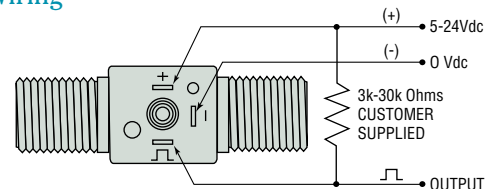


Certified to
NSF/ANSI 61

Dimensions



Wiring

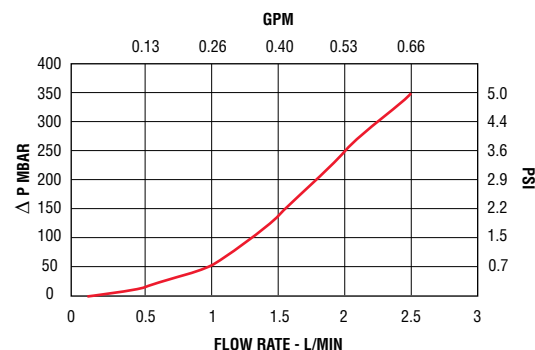


Pin Code: 1 = Output
2 = Supply
4 = Common

For Mating DIN Connector – P/N 212404

Function	DIN Termination
V+	1
-	⊕
Output	2

Pressure Drop—Typical



D-Cryo Series

- ▶ MOPD: 1000 PSI (69 Bar)
- ▶ C_v Range: 0.040 to 0.770 (K_v Range: 0.034 to 0.655)
- ▶ 15 Watts

The D-Cryo Series is a 2-way, high flow, miniature Cryogenic valve designed and built for service down to -320°F (-196°C). Depending on your temperature requirements, the D-Cryo Series can be configured for liquid nitrogen (LN2), liquid carbon dioxide (LCO2), and other extreme temperature media. PTFE coated plungers 316 Stainless Steel guide tubes and plunger springs, encapsulated coils, and Rulon® seat seals produce a truly robust Cryogenic valve for applications requiring high cycle life and media temperature control.

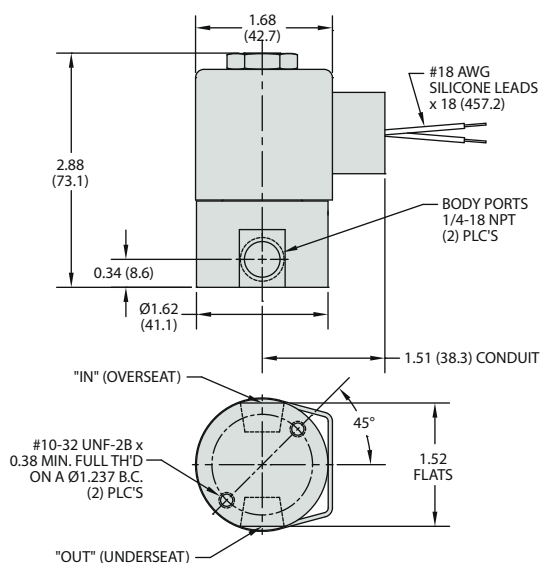
Typical Applications

- Environmental Chambers
- Food Processing
- Laser Surgical Equipment
- Semiconductor Manufacturing

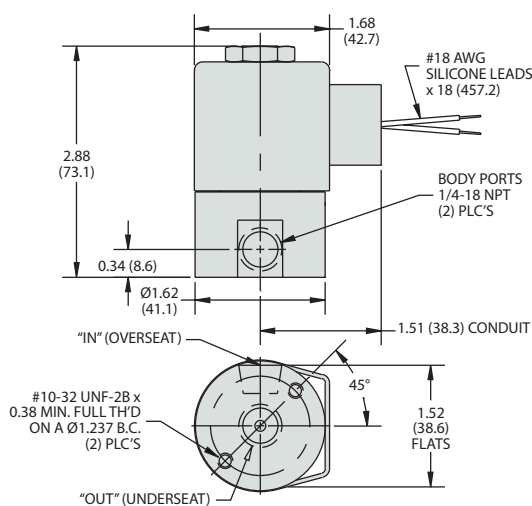


Dimensions

LN2-Liquid Nitrogen



LCO2-Liquid Carbon Dioxide



How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

D	N	20	02	-	05	LB	-	R	-	C6	-	204
Series	1	2	3		4	5		6		7		8
	Model	Function	MOPD		Body Material	Body Port		Seal Material		Coil Construction		Supply Voltage

Product Description from Example Shown Above:

DN2002-05LB-R-C6-204

DN2002 = B Series with LN2 Model, 2-Way Normally Closed Valve **Function**; 900 MOPD

-05LB = 316 Stainless Steel **Body Material**; 1/4" NPT Female **Body Port**

-R = Rulon® **Seal Material** (Plunger Seal and Internal Teflon Variseal)

-C6 = Conduit Housing, Epoxy Encapsulated (Class H) **Coil Construction**

-204 = 24 VDC **Supply Voltage**

D-Cryo Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

D	—	—	—	—	—	—	—	—
Series	1	2	3	4	5	6	7	8

1 Model

C LC02
N LN2

2 + 3 Valve Function & Maximum Operating Pressure Differential

Valve Function	Code	MOPD		Orifice		C _v	K _v
		psig	bar	Body			
				inches	mm	Body	Body
2-WAY Normally Closed	2001	1000	69	3/64	1.19	0.040	0.034
	2002	900	62	1/16	1.59	0.045	0.038
	2003	640	44	3/32	2.38	0.165	0.140
	2006	375	26	1/8	3.18	0.305	0.259
	2013	185	13	5/32	3.97	0.365	0.310
	2019	130	9	3/16	4.76	0.470	0.400
	2031	40	3	1/4	6.35	0.770	0.655

4 Body Material

01 303 Stainless Steel
05 316 Stainless Steel

5 Body Port

LB 1/4" NPT Female

6 Seal Material

R Rulon®

7 Coil Construction

G6 Grommet Housing,
Epoxy Encapsulated (Class H) Lead Wires
C6 Conduit Housing,
Epoxy Encapsulated (Class H) Lead Wires
C9 Conduit Housing (Filled),
Epoxy Encapsulated (Class H) Lead Wires

8 Supply Voltages

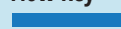
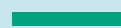
203 12 VDC
204 24 VDC

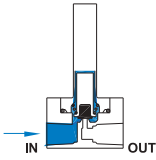
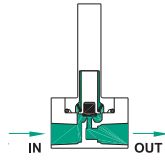
D-Cryo Series – Additional Component Details & Dimensions

2 Valve Function

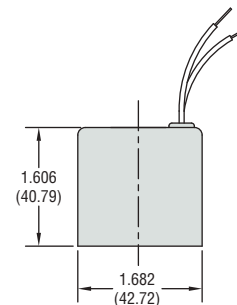
Flow Schematic

Flow Key

 Blocked Flow
 Free Flow
O/S = Over Seat
U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		

7 Coil Construction



Grommet

Large Size – Alloys

LS-800 Series

The General Purpose Workhorse for Water and Oils

- ▶ Stainless Steel or Brass Mountings
- ▶ 1 to 6 Actuation Levels
- ▶ Lengths to over 11 feet (3.4 m)
- ▶ CSA Listed

Rugged construction and multiple options provide the LS-800 Series with exceptional versatility. Longer and more substantial than other metallic models, the LS-800 is capable of supporting larger, more buoyant floats, and is physically stronger for better reliability in contaminated or turbulent media. This series offers SPST or SPDT switches, and a choice of mountings, floats and materials that can be configured for a wide range of applications in water, oils, chemicals and corrosive liquids.

Temperature Sensing

To save space and simplify wiring, GEMS can incorporate a temperature sensor in the end of the float stem on any model type LS-800. Two sensor types are available: Transducers for continuous output, and Thermostats for switch actuation. See Page B-23 for details.



Adjustable Mounting

Allows stem to travel up and down for fine tuning your actuation points. See next page.



LS-800 switches are U.L. Approved for Class I, Division 2, Groups B, C, D hazardous locations

1. Mounting Types

Each mounting type can be configured with stem lengths (L_0) and float material indicated in the table below. Mountings are also continued on following page.

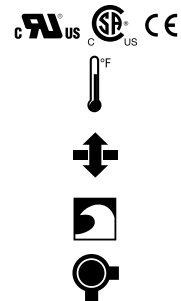
Note: Sanitary flange mountings are also available, but not shown. Please contact factory.

	Type 1 1/2" NPT	Type 8 1" NPT	Type 2 1-1/4" NPT	Type 3 2" NPT	Type 4 3", 150# Dia. Flange
in (mm)					
Stem & Mounting Material	Brass or 316 Stainless Steel				Flange: Carbon Steel or 316 S.S. Stem: 316 S.S.
Max. Length (L_0)	36 inches (91.4 cm)	60 inches (152.4 cm)		140 inches (355.6 cm)	
Mounting Position	Vertical $\pm 30^\circ$ Inclination				
Float Stops*	Brass Units: Beryllium Copper Grip Rings; Stainless Steel Units: S.S. ARMC0 PH-15-7MO Grip Rings				

* Units greater than 72" overall length are supplied with collars with setscrews (made of same material as stem and mounting) in place of float-stop rings. Collars are optional on units less than 72" overall length. Units requiring 316 SS float stops must be special ordered with 316 SS collars instead of grip rings. In some instances, concentration of chlorine and other corrosive compounds in the media require the use of collar type float stops. Consult factory for details.

ORDER IT!

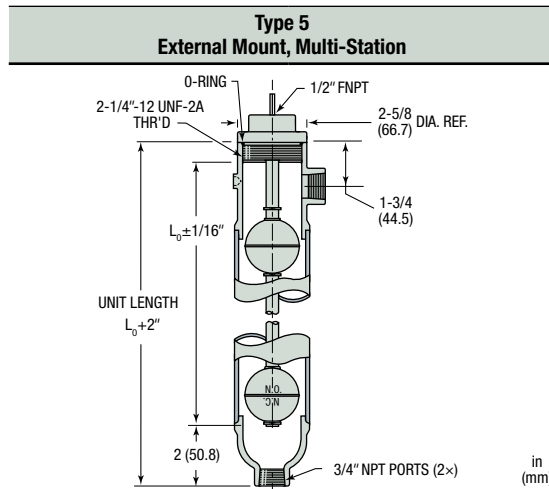
Ordering is Easy! See Page B-24.
Easy online ordering too!



LS-800 Series – Continued

1. Mounting Types – continued

Type 5 External Mounting units are ideal for tanks with limited access to tops or bottoms.



Housing Material	Brass	316 Stainless Steel
Stem & Mounting Material	Brass	316 Stainless Steel
Port Sizes	3/4" NPT	
Maximum Length (L₀)	120 inches (305 cm)	
Float Stops*	Beryllium Copper	S.S. ARMCO PH-15-7MO

* Units greater than 72" overall length are supplied with collars with setscrews (made of same material as stem and mounting) in place of float-stop rings. Collars are optional on units less than 72" overall length. Units requiring 316 SS float stops must be special ordered with 316 SS collars instead of grip rings. In some instances, concentration of chlorine and other corrosive compounds in the media require the use of collar type float stops. Consult factory for details.

2. Float Types

A single float type is selected for use at all actuation points. Be sure, by reviewing the table below, that the desired float is compatible with the Mounting Type selected in Step 1.

Float Material	Buna-N				316 Stainless Steel		
Compatible Mounting Types	1, 2, 3, 4, 8	2	1, 3, 4, 5	3, 4, 5 (Units >72")	1, 3, 4, 5 (Units ≤72")	3, 4, 5 (Units >72")	1, 3, 4
Float Dimensions							
Part Number	253644	26032	10558	24864	14569	15666	138935
Operating Temperature	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)				-40°F to +300°F (-40°C to +149°C)		
Min. Media Specific Gravity	0.55	0.75	0.55	0.55	0.75	0.75	0.80

Maximum Pressure Ratings Chart

Maximum Pressure Ratings Chart			Float Part Number						
			253644	26032	10558	24864	14569	15666	138935
Mounting Type	1, 2, 3		150 psi (10.3 bar)				750 psi (51.7 bar)	300 psi (20.7 bar)	180 psi (12.4 bar)
	4		150 psi (10.3 bar)						180 psi (12.4 bar)
	5	Brass	100 psi (6.9 bar) @ 70°F (21°C)						
		316 S.S.	150 psi (10.3 bar)				750 psi (51.7 bar)	300 psi (20.7 bar)	120 psi (8.3 bar)

Review the Compatible Mounting Type row in the "Float Types" table above this matrix for produceable mounting/float combinations. Not all combinations implied by this Pressure Rating Chart are possible or recommended.

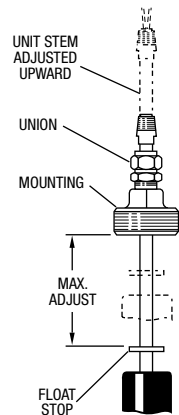
LS-800-A Series

Adjustable Mounting

Available for LS-800 Series Mounting Types 2, 3 and 4.

Special cinch-nut on mounting allows stem to travel up or down for fine tuning the actuation points. The extent of adjustment depends on unit length and distance from mounting to highest float stop. When ordering, specify "LS-800-A" as Series Type.

Note: Maximum overall length is limited to 72" with this option.



Intrinsically-Safe Relays

Using Gems SAFE-PAK® relays and barriers, these switches provide automatic refills/pumpdown and are intrinsically-safe without explosion-proof housing and piping.



See Section L

3. Electrical Specifications

Switch (N.O. or N.C.):

SPST: 20 VA or 100 VA

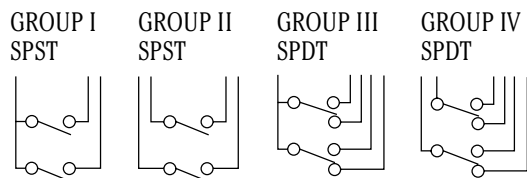
SPDT: 20 VA

Lead Wires: 18 AWG, 24" L., Polymeric (except as noted in Wiring Color Code chart at right).

Approvals: LS-800 Series switches are U.L. Recognized – File No. E45168; CSA Listed – File No. 30200

Typical Wiring Diagrams

For clarity, only two actuation levels are shown in each group diagram.



Wiring Color Code

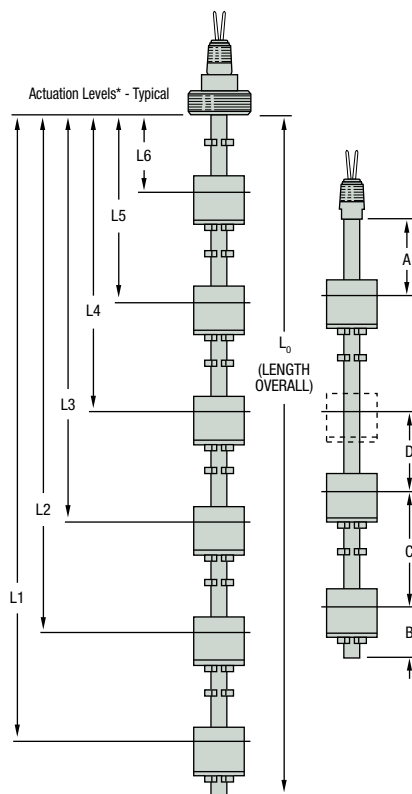
Tinted area designates U.L. Recognized wiring configurations.

SPST Switches				SPDT Switches 20 VA				
Wiring	Group I	Group II		Group III		Group IV		
Com. Wire	Black	None		Black		None		
	NO/NC	SW. Com.	NO/NC	NO	NC	SW. Com.	NO	NC
L ₁	Red	Red	Red	Red	Wh/Red	Red	Wh/Red	Wh/Blk/Red
L ₂	Yellow	Yellow	Yellow	Yellow	Wh/Yel	Yellow	Wh/Yel	Wh/Blk/Yel
L ₃	Blue	Blue	Blue	Blue	Wh/Blue	Blue	Wh/Blue	Wh/Blk/Blu
L ₄	Brown	Brown	Brown	Brown	Wh/Brn	Brown	Wh/Brn	Wh/Blk/Brn
L ₅	Orange	Orange	Orange	Orange	Wh/Orn	Orange	Wh/Orn	Wh/Blk/Orn
L ₆	Gray	Gray	Gray	Gray	Wh/Gra	Gray	Wh/Gra	Wh/Blk/Gra

Notes:

1. Non-U.L. Recognized units (white areas) use 22 AWG, 24" L., PTFE Lead wires.
2. Units with 100 VA switches are not U.L. Recognized or CSA Listed.
3. See "Electrical Data" on Page X-5 for more information.

4. Actuation Level Dimensions



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

** Length Overall L₀ = L₁ + Dimension B.

See Mounting Types for Maximum Length values.

Switch actuation levels are determined following the guidelines below.

All units 72" or less L₀ with Stainless Steel or Buna-N floats. Also any unit over 72" L₀ with Buna-N floats:

A = 1-1/2" (38.1 mm) minimum distance to highest level (2", Type 5 only).

B = 2" (50.8 mm) minimum distance from end of unit to lowest level.

C = 3" (76.2 mm) minimum distance between levels.

D = 1/4" (6.3 mm) minimum distance between actuation levels (Note: One float for two levels can be used only when low level is N.C. dry and high level is N.O. dry).

Types 1, 3, 4, and 5 units with stainless steel float, Part Number 15666:

A = 1-5/8" (41.3 mm) minimum distance to highest level (2", Type 5 only).

B = 2-1/2" (63.5 mm) minimum distance from end of unit to lowest level.

C = 4" (101.6 mm) minimum distance between level.

D = 1/4" (6.3 mm) minimum distance between actuation levels (Note: One float for two levels can be used only when low level is N.C. dry and high level is N.O. dry).

Notes:

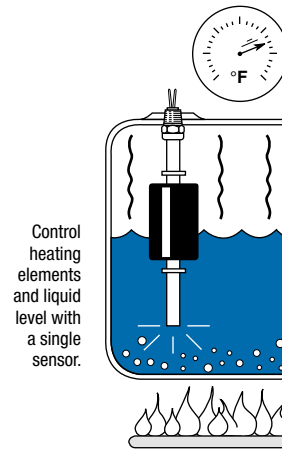
1. A, B and C dimensions based on a liquid specific gravity of 1.0.
2. One float for two levels can be used only when 20 VA switch is used.
3. Actuation levels are calibrated on descending fluid level, with water as the calibrating fluid, unless otherwise specified.
4. Tolerance on actuation levels is $\pm 1/8"$ (3.2 mm).
5. TH (Temperature option) makes "B" dimension a minimum of 2.75" (69.8 mm).

Optional Integrated Temperature Sensors

- ▶ Compatible with LS-700 and LS-800 Series Units
- ▶ Thermostat Switches or Thermistor Versions

Advantages of integrated temperature sensors:

- Space Saving.
- Fewer intrusions into the tank.
- Electrical wiring emanates from a single source – eliminate multiple conduits.
- Economical – typically less expensive than separate sensors.



Thermistor for Continuous Indication – TM-800 and TM-700

- ▶ Excellent repeatability

Value: 10,000 ohms @ 77°F (25°C)

Tolerance: $\pm 0.2^{\circ}\text{C}$ from 32°F to 158°F (0°C to 70°C)

Operating Temperature: 302°F (150°C), Max.

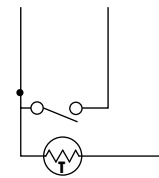
Alpha @ 25°C: $-4.39\%/^{\circ}\text{C}$

Dissipation Constant: 1mW/°C in Still Air;
8mW/°C in Oil Bath.

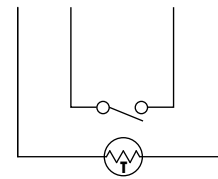
How to Order

Temperature thermistors are available on LS-700 Series units with up to three actuation levels, and on LS-800 Series units with up to five actuation levels. To have thermistor added, order model TM-800 or TM-700.

Note: This option is not CE Approved.



GROUP I



GROUP II

Thermostat for Switch Actuation

- Standard Settings from 100°F to 200°F.
- Open or close switch on increasing temperature.

Use these switches to set off High/Low temperature alarms. Or, combine with GEMS relays to control tank heating and cooling, motor-operated valves, etc.

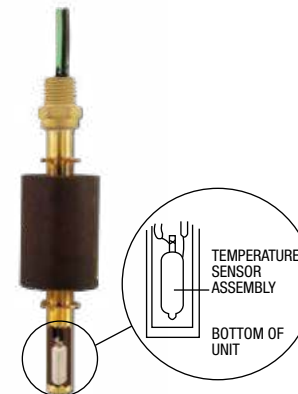
To designate the thermostat switch option, order model TH-700 or TH-800.

Also specify the choice from selections A, B and C below.

- Switch Rating:**
For LS-800 Series: 6A/120V, 4A/240V, 100VA (non-inductive).
For LS-700 Series: 2.6A/120V (inductive).
- Contact Operation on Increasing Temperature:**
“Opens” when Set Point reached or “Closes” when Set Point reached.
- Standard Temperature Set Point ($\pm 7.2^{\circ}\text{F}$; $\pm 4^{\circ}\text{C}$):**
100°F (37.7°C), 125°F (51.6°C), 150°F (65.6°C), 175°F (79.4°C), 200°F (93.3°C)

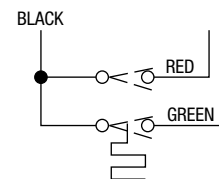
Notes:

- Other temperature settings and tolerances available; 25 piece minimum order quantity applies. Please call GEMS Sensors Inc. for more information.
- This option is not CE Approved.

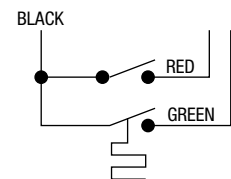


Note: End of unit stem must be submerged a minimum of 2-3/4" for level switch actuation.

Typical Wiring Diagram



GROUP I






GROUP II

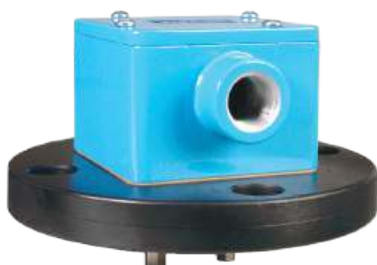

Designed for OEM

- ▶ Compact
- ▶ One-Piece Probe/Body Construction
- ▶ Quick Install & Connect
- ▶ Order Sized to Your Spec

These Warrick fitting are designed for OEM use. They are shipped ready for quick installation. Integrated probes eliminate pre-assembly tasks, and avoid potential vibration-induced loosening when installed with power tools. Choose from single- or multi-electrode probe series. Gems supplies these series with probes pre-cut to lengths you specify.

Series	3J	3H	3L
			
Probe Quantity	1, 2 or 3	1	1
Mounting Size	1" NPT	3/8" NPT or 5/8" NF/NFE	1/8" NPT
Materials			
Body	Case iron or red brass	316 stainless steel	316 stainless steel
Terminal Housing	Diecast aluminum, epoxy coated (optional)	—	—
Probe	316 stainless steel	316 stainless steel	316 stainless steel
Insulation	Teflon®	Teflon®	Teflon®
Probe Diameter	3/16"	1/4"	3/16"
Pressure/Temperature	0 psig @ 500°F	250 psig @ 406°F	150 psig @ 365°F
Approvals	—	U.L. File #MP2489, Vol. 1 Sec. 1; CSA	U.L. File #MP2489
Use the Bold characters from the chart below to construct a product code.	<p>Series 3J X X X X</p> <p>Number of Probes 1 – One 2 – Two 3 – Three</p> <p>Body Material¹ B – Cast Iron C – Red Brass</p> <p>Housing 0 – None 1 – Optional Housing</p> <p>Length of Probes² A – All probes 10-1/4" C – For lengths less than 10-1/4" indicate length as inches in decimal form</p>	<p>Series 3H X X X</p> <p>Thread 1 – 3/8" – 18 NPT 2 – 5/8" – 18 UNF 3 – 5/8" – 24 UNEF</p> <p>Sleeve¹ B – Teflon® 3/4" Long</p> <p>Length (Feet)² 1 – One 2 – Two 3 – Three</p>	<p>Series 3L 1 X XX</p> <p>Connection Size 1 – 1/8" NPT</p> <p>Insulator Length D – Teflon® 1-1/4"</p> <p>Length in Inches^{1, 2} 02 – Two 06 – Six 10 – Ten 03 – Three 07 – Seven 11 – Eleven 04 – Four 08 – Eight 12 – Twelve 05 – Five 09 – Nine</p>
Notes	<p>1. Probes are stainless steel.</p> <p>2. 10-1/4" maximum</p>	<p>1. Longer Teflon® sleeves are available. Contact factory or your representative</p> <p>2. Custom probe and insulation lengths are available. Contact your representative.</p>	<p>1. 12" maximum</p> <p>2. Indicate fractional inches in decimal form (01.75 = 1-3/4")</p>

Top Mounting Fixtures – General Purpose




Series	3F	3G																									
																											
Mounting Connection	Flange — 4.5" to 7.5" Dia.	NPT, Flange, Bracket (Plate)																									
Probe Quantity	1 thru 7	1 thru 7																									
Description	Designed for general purpose service, Series 3F flanged, pressure-tight fittings can handle up to 7 probes. They mate with standard pipe flanges coupled to the top of the vessel. Available in a variety of materials.	Series 3G fittings are designed for general purpose use, and are made of PVC to withstand corrosive conditions. The flanged assemblies are sized to accommodate up to 7 probes and to mate with standard flanges on the tops of vessels.																									
Materials																											
Terminal Housing	Die-cast aluminum, epoxy coated	Polycarbonate																									
Body	Forged steel, red brass, 316 S.S., 1018 C.S, PVC	PVC																									
Probe Insulation	Teflon®	Teflon®																									
Pressure/Temperature	125 psig @ 323°F (cast iron) 225 psig @ 150°F (brass) 230 psig @ 100°F (316 S.S.) 275 psig @ 100°F (1018 C.S.) PVC – not rated	0 psig @ 150°F (PVC)																									
Approvals	CSA	—																									
Dimensions	<table><tr><th>No. of Probes</th><th>Nominal Pipe Flange Size</th><th>Diameter of Flange</th><th>Conduit Boss Thread Size</th><th>Terminal Housing Size (W" x D" x H")</th></tr><tr><td>1</td><td>1</td><td>4-1/2"</td><td>1/2" NPT</td><td>2-1/4 x 2-1/4 x 2-1/4</td></tr><tr><td>2-3</td><td>2</td><td>6"</td><td>1/2" NPT</td><td>3-1/4 x 3-1/4 x 2-3/8</td></tr><tr><td>4</td><td>2-1/2</td><td>7"</td><td>1/2" NPT</td><td>3-1/4 x 3-1/4 x 2-3/8</td></tr><tr><td>5-7</td><td>3</td><td>7-1/2"</td><td>3/4" NPT</td><td>4 x 4 x 2-1/2</td></tr></table>	No. of Probes	Nominal Pipe Flange Size	Diameter of Flange	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")	1	1	4-1/2"	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	2-3	2	6"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	4	2-1/2	7"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	5-7	3	7-1/2"	3/4" NPT	4 x 4 x 2-1/2	
No. of Probes	Nominal Pipe Flange Size	Diameter of Flange	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")																							
1	1	4-1/2"	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4																							
2-3	2	6"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8																							
4	2-1/2	7"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8																							
5-7	3	7-1/2"	3/4" NPT	4 x 4 x 2-1/2																							
How to Order	<p>Use the Bold characters from the chart at right to construct a product code.</p> <p>Electrode Probes are ordered separately.</p> <p>Series 3F X X</p> <p>Number of Probes 1 thru 7</p> <p>Body Material A – Forged Steel (Raised Face) B – Red Brass (Flat Face) C – 316 S.S. (Raised Face) D – 1018 C.S. (Raised Face) E – PVC (Flat Face)</p>	<p>Series 3G X X X</p> <p>Number of Probes 1 thru 7</p> <p>Base Size and Style A – 2" Flange (6" O.D.)³ E – 2" NPT³ B – 3" Flange (7-1/2" O.D.) H – 3" NPT C – 3-1/4" x 6" x 3/4" PVC Plate</p> <p>Probe Type 1 – 316 S.S. Inserts for Use with 1/4" Rod Extensions⁴ 2 – Tapered Probe Assembly⁵ 3 – Wire-Suspended Probes⁶</p>																									
Compatible Electrode Probes (order separately)	3R, 3W ¹ , 3Y ²	3R, 3T, 3W ¹ , 3Y ²																									

Notes:

- Requires 3Z1B Adapter and 3Z1A Wire.
- Requires 3Z1B Adapter.
- Maximum 4 probes.

- Order 3R rods separately. See page E-21.
- Order 3T rods separately. See page E-21.
- Order 3W/3Y probes separately. See page E-22.

Custom options available. Consult factory.

3E		3N		3B	
					
1" to 3" NPT		#10 Machine Screws from Underside		3/8" - 18NPT, 5/8" - 18UNF, 5/8" - 24UNEF	
1 thru 7		1 thru 3		1	
Series 3E fittings are cast metal, pressure-tight assemblies capable of handling 1-7 probes. Attachment to vessels is accomplished with external pipe threading. 3E Fittings require the use of 3R rigid or 3W wire suspended electrodes.		Series 3N fittings accommodate 1-3 probes operating at atmospheric pressure. The assembly mounts on a flat surface atop open tanks or closed vessels. 3N Fittings require the use of 3R rigid or 3W wire suspended electrodes.		Series 3B fittings are compact pressure tight assemblies that hold a single electrode probe for use in water and chemicals. These fittings incorporate a 1/4-20 female thread that must be combined with a Series 3R (rigid rod electrode) or Series 3W/3Y (wire suspended electrode) to make a complete assembly.	
Die-cast aluminum, epoxy coated		Die-cast aluminum, epoxy coated		—	
Cast iron, red brass, 316 stainless steel		PVC, red brass, 316 stainless steel		316 stainless steel	
Teflon®		Teflon®		Teflon®	
125 psig @ 353°F (cast iron) 250 psig @ 406°F (brass, 316 S.S.)		0 psig @ 150°F (PVC) 0 psig @ 500°F (brass, 316 S.S.)		250 psig @ 406°F 500 psig @ 75°F	
U.L. File #MP2489, Vol. 1 Sec. 1; CSA		CSA File #LR11644		U.L. File #MP2489, Vol. 1 Sec. 1; CSA	
	No. of Probes	Attachment to Vessel	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")	
3E	1	1" NPT	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	
	2-3	2" NPT	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	
	4	2-1/2" NPT	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	
	5-7	3" NPT	3/4" NPT	4 x 4 x 2-1/2	
3N	1-3	2-1/4" square flat pad, 1-1/2" dia. hole in top of vessel secured with #10 machine screws at the corners of a 1-1/2" square	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	
Series 3E Number of Probes 1 thru 7 Body Material A – Cast Iron B – Red Brass C – 316 Stainless Steel		Series 3N Number of Probes 1 thru 3 Body Material A – PVC B – Red Brass C – 316 Stainless Steel		Series 3B Thread 1 – 3/8" - 18 NPT 2 – 5/8" - 18 UNF 3 – 5/8" - 24 UNEF Metal Parts B – 316 Stainless Steel	
3R, 3W ¹		3R, 3W ¹		3R solid rod (up to 4') 3W ¹ or 3Y ² (greater than 4')	

Custom options available. Consult factory.

KS Series – 3/8" (9.53 mm) Solenoids

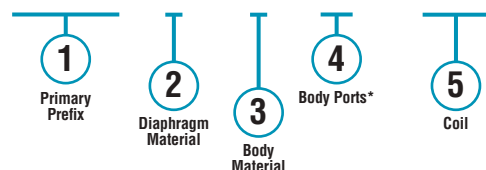
- ▶ 2-Way, Normally Closed
- ▶ MOPD: 20 PSIG (1.38 bar)
- ▶ C_v Range: 0.008 to 0.015
- ▶ 1.8 Watts

KS Series isolation valves are 2-way, Normally Closed (NC) valves featuring 0.38" (10 mm) solenoid shell diameters. The isolation valve design ensures that the only wetted parts are the valve diaphragm and the valve body. For exceptional chemical compatibility the KS Series utilizes PEEK or PPS bodies, with a choice of diaphragm materials to meet your specific needs.

How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

KS201 - P - 4 S1 - C203



* Combination of Body Port Configuration and Port Thread; Manifold Mount (BM) does **not** use the Thread Size designator

Example:

KS201-P-4 S1-C203

Small 2-Way N.C. Perfluoroelastomer solenoid valve, with a Polyaryletheretherketone body and 1/4"-28 UNF flat bottom threaded side ports, operating at 12 VDC.

Part Prefix Table ①

	Orifice (inch)	MOPD*		C _v	Internal Volume (μl)			① Primary Prefix
		psig	bar		Side Ports	Bottom Ports	Manifold Mount	
2-WAY	0.032	20	1.38	0.008	20	18	13	KS201
N.C.	0.054	20	1.38	0.015	42	35	21	KS203

* Maximum Operational Pressure Differential

② Diaphragm Material

T = PTFE Polytetrafluoroethylene
E = EPDM Ethylene Propylene Diene (M)
P = FFKM Perfluoroelastomer

③ Body Material

3 = PPS Polyphenylene Sulfide
4 = PEEK Polyaryletheretherketone

④ Body Port Configuration

BM = Manifold mount
S_ = Threaded side port
B_ = Threaded bottom port

Port Thread (Used in conjunction with Threaded Port Configurations)

1 = 1/4"-28 UNF flat bottom (Standard)
2 = 10-32
3 = 5/16"-24
4 = 1/8" NPT
5 = M6 X 1,0

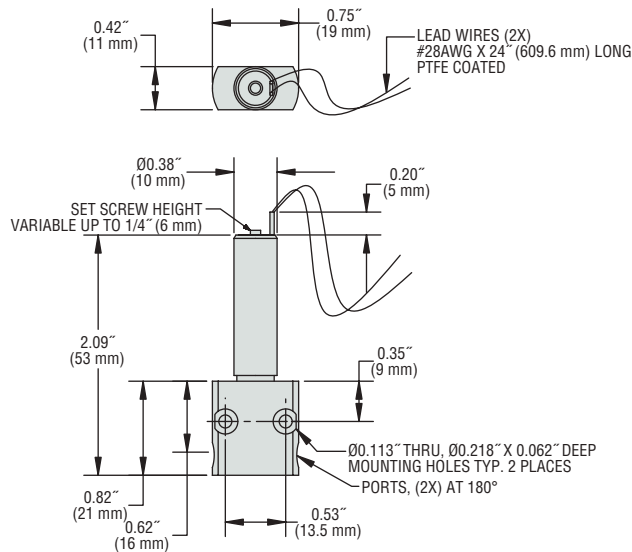
⑤ Coil

C203 = 12 VDC
C204 = 24 VDC

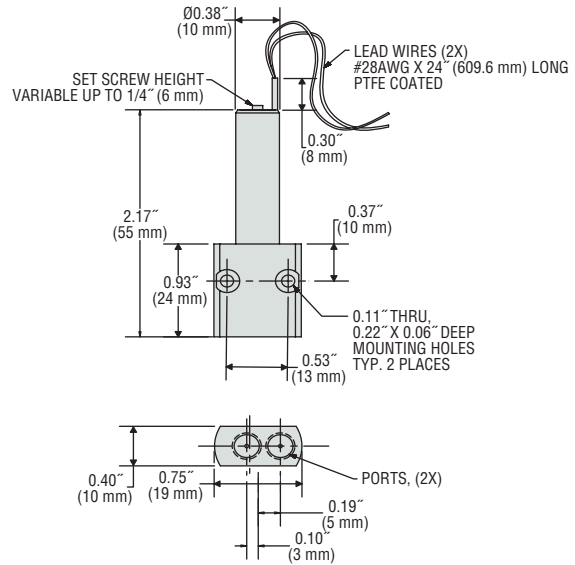


Dimensions – Threaded Port Body

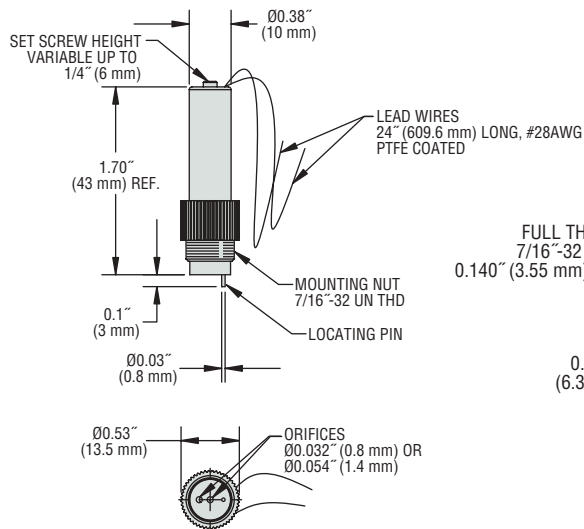
Side Port



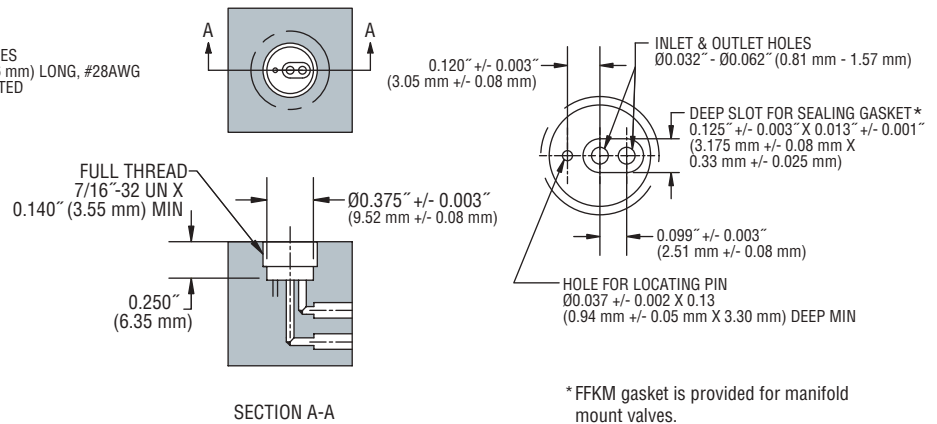
Bottom Port



Dimensions – Manifold Mount Body



Manifold Preparation



* FFKM gasket is provided for manifold mount valves.

DIPTAPE™ Indicators – Alloy Versions

ORDER IT!
Ordering is Easy! See Page D-27.
Easy online ordering too!

- ▶ Temperatures to 300°F (148°C)
- ▶ Pressures to 750 PSI (52 bar)

Rugged brass or stainless steel units are ideal for use in water and oils. Select these units for best temperature and pressure capabilities.

1. Mounting Types

"B" Dimension
(Length Overall):
Indicating Length + A + C

Note: Dimensions "C" and "A"
are dependent on float selected.
See Float Types below.

Type 3 2" NPT	Type 4 3" -150# ANSI Flange
<p>PROTECTIVE CAP</p> <p>CALIBRATED INDICATOR PARTIALLY EXTENDED</p> <p>HIGHEST LEVEL INDICATED</p> <p>1/2" (12.7 mm) DIA. STEM</p> <p>INDICATING LENGTH</p> <p>BUNA N FLOAT SHOWN</p> <p>1-7/8" (47.6 mm) DIA.</p> <p>C*</p> <p>B</p> <p>A*</p>	<p>HIGHEST LEVEL INDICATED</p> <p>1/2" (12.7 mm) DIA. STEM</p> <p>INDICATING LENGTH</p> <p>S.S. FLOAT SHOWN</p> <p>2-1/16" (52.4 mm) DIA.</p> <p>C*</p> <p>B</p> <p>A*</p>
Brass or 316 Stainless Steel	316 Stainless Steel Stem with Carbon Steel or 316 Stainless Steel Flange

* Dimensions listed below, under "Float Types."

** For longer lengths, please contact factory.

2. Float Types

	Buna N*	Stainless Steel	
Float Part Number	73710	73709	138935
Min. Liquid Specific Gravity	0.45	0.67	0.67
Operating Temperatures	Oil: -40°F to +230°F (-40°C to +110°C) Water: to 180°F (+82.2°C)	-40°F to +300°F (-40°C to +148.8°C)	-40°F to +220°F (-40°C to +104°C)
Operating Pressure, Max.	300 psi (21 bar) max. @ 77°F (25°C)	750 psi (52 bar) Mounting Type 3 150 psi (10 bar) Mounting Type 4	150 psi (10 bar)
"A" Dimension (From Mounting Types)	1-1/4" (31.7 mm)	1-3/8" (34.9 mm)	1" (25.4 mm)
"C" Dimension (From Mounting Types)	11/16" (17.5 mm)	3/4" (19.05 mm)	9/16" (14.3 mm)

* Other Wetted Material: Hysol.



All-PVC Versions Are Economical for Light Duty

- ▶ Temperatures to 140°F (60°C)
- ▶ Pressures to 15 PSI (1 bar) Max.

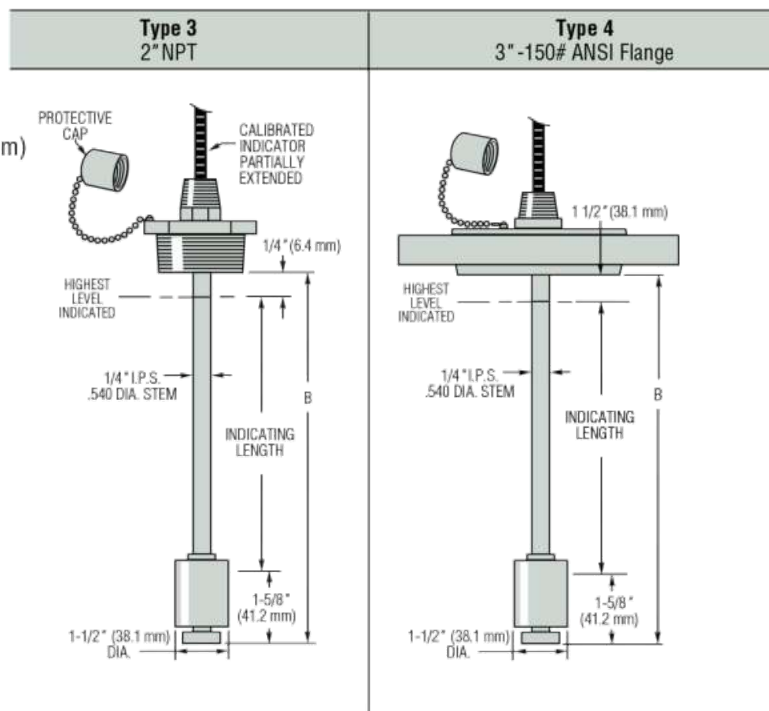
Ideal for chemical storage tanks, our all-PVC DIPTAPE Indicators provide one of your best values for liquid level monitoring. These light duty versions are recommended for use in calm liquids and ambient temperature and pressure levels. See Engineered Plastic versions on the next page for enhanced performance characteristics.

ORDERIT!

Ordering is Easy! See Page D-27.
Easy online ordering too!

1. Mounting Types

"B" Dimension (Length Overall):
Indicating Length + 1-7/8" (47.6 mm)



Stem, Float and Mounting Material	PVC
Min. Liquid Specific Gravity	0.65
Operating Temperatures	0°F to +140°F (-17.7°C to 60°C)
Operating Pressure, Max.	15 psi (1 bar)
Indicating Length*	6" to 72" (15.2 cm to 182.9 cm)
Std. Indication Markings	1/16" or 1 mm increments

*For longer lengths, please consult factory.

Ordering Is Easy

1. To specify DIPTAPE Level Indicators, start by photocopying the OrderIt! Product Check List located on Page D-27.
2. Use the product information in this section to make your selections on the Check List. Please use a separate Check List for each unique configuration.
3. Fax your completed OrderIt! Check List to Gems for a price quotation.
Fax: 860-747-4244

Large Size – Engineered Plastics

LSP-800 Series – Features Inert Materials for Corrosive Liquids

- ▶ All-Plastic Wetted Parts - PVC or Polypropylene
- ▶ 1 to 6 Actuation Levels
- ▶ Lengths to 70 inches

Specifically designed for corrosive liquids and vapors. Three standard model types in a choice of materials offer broad chemical compatibility.



ORDER IT!

Ordering is Easy! See Page B-26.
Easy online ordering too!

CE

1. Mounting Types

Each mounting type can be configured with stem lengths (L_o) and materials indicated in the table below. Floats and float stop collars are of same material specified for mounting.

Type A 1" NPT	Type B 3" NPT	Type C 3", 150# Flange

Stem, Mounting, Float and Collar Material	PVC or Polypropylene
Max. Length(L_o)	70 inches (177.8 cm)
Mounting Position	Vertical $\pm 30^\circ$ Inclination

2. Float Types

Float Material	PVC	Polypropylene
Float Dimensions		
Operating Temperature and Pressure	See Ratings Chart at top of following page	
Min. Liquid Specific Gravity	0.60	0.40

Note: Floats are always supplied in same material as specified for mounting.

LSP-800 Series – Continued

Temperature and Pressure Ratings Chart

Maximum Pressure vs. Temperature

LSP-800 Material	Operating Temperature							
	0°F (-17.7°C)	70°F (21.1°C)	100°F (37.7°C)	125°F (51.7°C)	140°F (60.0°C)	170°F (76.6°C)	200°F (93.3°C)	210°F (98.8°C)
PVC	50 PSI (3.4 bar)	50 PSI (3.4 bar)	35 PSI (2.4 bar)	20 PSI (1.4 bar)	10 PSI (0.68 bar)	X	X	X
Polypropylene	50 PSI (3.4 bar)	50 PSI (3.4 bar)	40 PSI (2.7 bar)	35 PSI (2.4 bar)	30 PSI (2.0 bar)	25 PSI (1.7 bar)	X	X

3. Electrical Specifications

Switch (N.O. or N.C.):

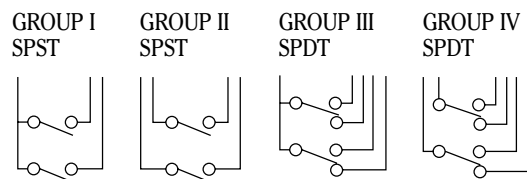
SPST: 20 VA or 100 VA

SPDT: 20 VA

Lead Wires: #22 AWG, 24" L., Polymeric

Typical Wiring Diagrams

For clarity, only two actuation levels are shown in each group diagram.

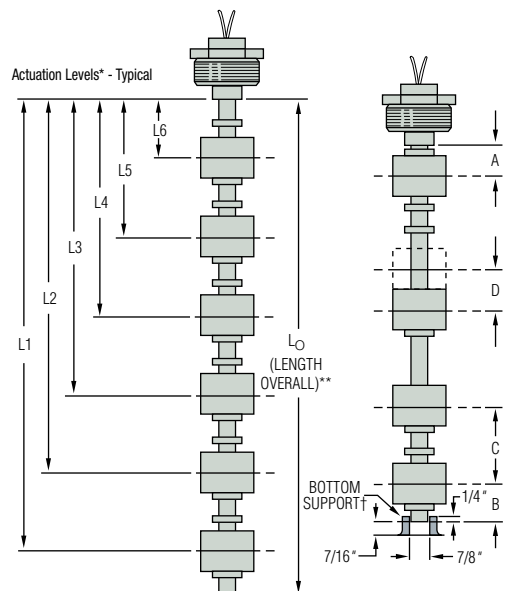


Wiring Color Code

SPST Switches				SPDT Switches 20 VA				
Wiring	Group I	Group II		Group III		Group IV		
Com.W-ire	Black	None		Black		None		
	NO/NC	SW. Com.	NO/NC	NO	NC	SW. Com.	NO	NC
L1	Red	Red	Red	Red	Wh/Red	Red	Wh/Red	Wh/Blk/Red
L2	Yellow	Yellow	Yellow	Yellow	Wh/Yel	Yellow	Wh/Yel	Wh/Blk/Yel
L3	Blue	Blue	Blue	Blue	Wh/Blue	Blue	Wh/Blu	Wh/Blk/Blu
L4	Brown	Brown	Brown	Brown	Wh/Brn	Brown	Wh/Brn	Wh/Blk/Brn
L5	Orange	Orange	Orange	Orange	Wh/Orn	Orange	Wh/Orn	Wh/Blk/Orn
L6	Gray	Gray	Gray	Gray	Wh/Gra	Gray	Wh/Gra	Wh/Blk/Gra

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

4. Actuation Level Dimensions



* Actuation level distances and L_0 (overall unit length) are measured from inner surfaces of mounting plug or flange.

** Length Overall $L_0 = L_1 + \text{Dimension B}$. See Mounting Types for Maximum Length values.

† Bottom support recommended for units longer than 36 inches, or in applications having turbulent conditions.

Switch actuation levels are determined following the guidelines below.

A = 2-1/16" (52.4 mm) $\pm 1/16$ " minimum distance to centerline of float (ref. mounting).

B = 2-11/16" (68.3 mm) $\pm 1/16$ " minimum distance to centerline of float (ref. stem end).

C = 3-1/2" (88.9 mm) minimum distance between actuation levels.

D = Distance between actuation levels using one float.

Minimum = 1/4" (6.3 mm)

Maximum = 3-1/2" (88.9 mm)

Notes:

- The centerline of the float is used as a standard reference for actuating the switches.
- All levels are set on descending float travel with overtravel = 1/4" (6.3mm) $\pm 1/8$ " (3.2mm).
Overtravel on Ascending = 1/8" (3.2mm) min.
- Tolerance on all actuation levels is $\pm 1/8$ " (3.2 mm) Ref.

876 Series – Barometric Pressure Transducers

- ▶ Instant Warm-Up
- ▶ Barometric Pressure: 600 to 1100 or 800 to 1100 hPa/mb
- ▶ Low Power Consumption (for Battery or Solar Power)

The 876 Series features an extremely accurate and stable ceramic sensor to deliver a great value in environmental pressure measurement. Gems' glass-fused ceramic capacitive sensing capsule offers inherent thermal stability and low hysteresis in a proven, simple design. A custom ASIC used in the 876 Series achieves long-term stability and high accuracy, and its low power requirements (as low as 5 VDC) allow the sensor to operate in remote battery or solar powered applications. An integrated mounting bracket and 1/8" tube pressure connection ease installation.

Common Specifications

Input	
Pressure Range	See ordering chart
Proof Pressure	20 psia (30 psia for 20 psia range)
Fatigue Life	>1 million cycles
Performance	
Long Term Drift	0.25% FS/6 months
Accuracy	±0.25% FS
Thermal Error Zero	1% FS
Thermal Error Span	1% FS
Compensated Temperatures	30°F to +130°F (0°C to +55°C)
Operating Temperatures	0°F to +175°F (-18°C to +79°C)
Storage Temperatures	-65°F to +250°F (-55°C to +121°C)
Zero Tolerance	±25 mV
Span Tolerance	±50 mV
Mechanical Configuration	
Pressure Port	1/8" Tube Fitting
Wetted Parts	Stainless Steel, Alumina Ceramics, Gold, Elastomer
Electrical Connection	2 ft. Multiconductor Cable
Enclosure	Stainless Steel with Mounting Bracket
Vibration	2g from 5 Hz to 400 Hz
Acceleration	10g
Shock	50g (operating, 1/2 sine 10mg)
Approvals	CE
Weight	3.5 oz.

Individual Specifications

Supply Voltage (Vs)	Excitation	Output (3-wire)
9.0-14.5 VDC	12 VDC	0.1-5.1 VDC
21.6-26.0 VDC	24 VDC	0.1-5.1 VDC
4.9-7.1 VDC	5 VDC	0.5-4.5 VDC



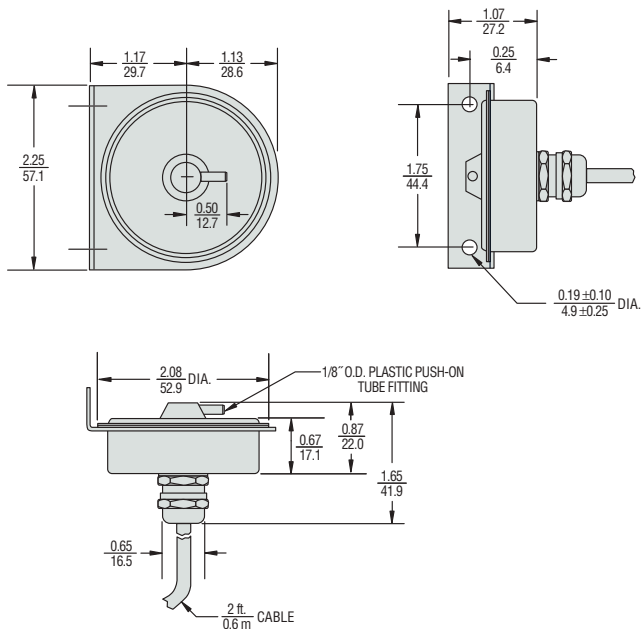
Applications

- Environmental Monitoring Systems
- Weather Measurement Systems
- Weather and Environmental Data Logging
- Barometric Pressure Compensation for Internal Combustion Engine Performance
- Cleanroom Barometric Pressure Compensation
- Automotive Emissions Test Equipment

How They Operate

A glass-fused ceramic sensing capsule detects changes in barometric pressure. As pressure increases or decreases, the capacitance changes. This change in capacitance is detected and converted to a linear analog signal by Gems' custom ASIC-based circuit, producing an output signal proportional to applied pressure.

Dimensions



How to Order

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

SELECT

1. Series **876** - 876 Series

2. Pressure Range Code

Barometric:

- 6-11mb** - 600 to 1100 mb
- 8-11mb** - 800 to 1100 mb
- 0-20P** - 0 to 20 psia

3. Excitation/Output

Code	Excitation	Output
12 V	12 VDC	0.1-5.1 VDC
24 V	24 VDC	0.1-5.1 VDC
5 V	5 VDC	0.5-4.5 VDC

4. Options (*Add as suffix to base part code as needed)

- 715** - 0.1% FS accuracy.
- 839** - 1/8" NPT pressure port.
- Cable Length:
- 803-810** - For cable length of 3 to 10 feet (2 ft. is standard).
Please specify cable length by code (e.g., 810 for 10 ft. cable).
Consult factory for cable longer than 10 ft.
- Calibration Certification:
- 901** - 11-point calibration certificate.

876 - 6-11mb - 12 V - * - * - * - *

ELS-950M Series

Rugged Electro-Optic Level Sensors

The ELS-950M Series represents Gems' most compact alloy-housed electro-optic level sensors. They monitor a broad range of media including OHV type fluids.

Our UL-approved design features a brass housing, fused glass prism, and TPE insulated wires. They provide a durable, watertight, and environmentally resistant assembly, ideally suited for use in harsh environments including outdoors and engine bays. They offer excellent temperature and pressure capabilities. The ELS-950M is excellent for industrial OEMs requiring a solid-state sensor for small space and high temperature environments.

Specifications

Materials	
Housing	Brass
Prism	Fused Glass
O-Ring	Fluorocarbon (1/4-18 NPSM - None)
Electronics	Over-molded TPE
Max. Operating Pressure	0 to 250 psi (0 to 17 bar)
Operating Temperature*	-40°F to +230°F (-40°C to 110°C)
Current Consumptions (No Load)	
5 VDC	4 mA No Load
12 VDC	10mA No Load
Output	Sink 40 mA max., up to 30 VDC
Repeatability	±1 mm
Lead Wires	3× TPE Insulated; 22 AWG
Approvals	CE, UL file No. E108913
	IP66/67 Rating

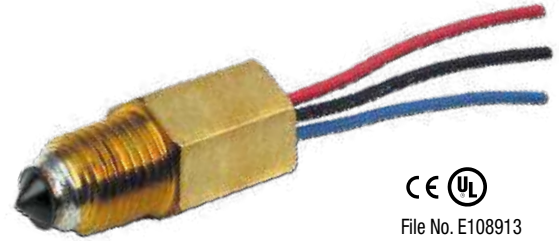
* These switches are not for use in freezing liquids or steam/high condensation environments. Contact Gems for alternative solutions.

How To Order

Specify Part Number based on Input and Output Condition required.

Input Power	Actuation Condition	Lead Wire Length	Mounting Type		
			1/4-18 NPSM	1/2-20 UNF-2B*	M12 × 1 – 8g*
5 VDC ±10%	Dry	6"	232176	232172	232180
12 VDC ±10%	Wet	6"	232177	232173	232181

* Supplied with standard fluorocarbon o-ring.

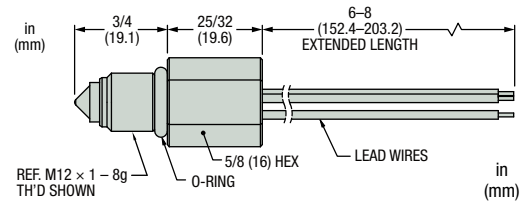


CE UL
File No. E108913

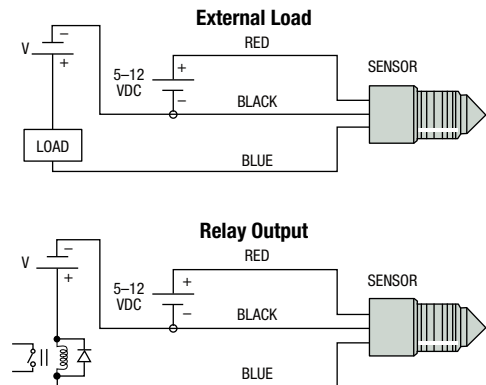
Typical Applications

- Coolant reservoir monitoring and warning
- Low lubricant warning on machine tools, generator sets, on- or off-highway vehicles
- Low level warning in hydraulic reservoirs
- Leak detection for drip pans

Dimensions



Wiring Diagrams



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

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

Specifications

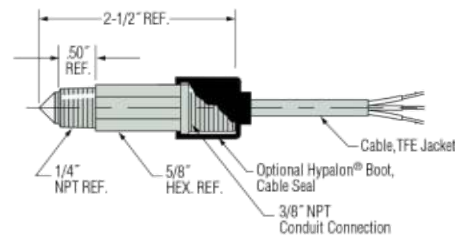
Materials	
Housing and Prism	Teflon®
Operating Pressure	0 to 150 PSI, Maximum
Operating Temperature*	0°F to 176°F (-17.8°C +80°C)
Input Voltage	10 - 28 VDC
Current Consumption	18 mA, Approximately
Output†	TTL/CMOS Compatible. Open Collector Output May Sink 40 mA Up to 30 VDC.
Repeatability	±1 mm
EMI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

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

† See Page A-25 for Wiring Diagrams



Dimensions



How To Order

Specify Part Number based on Output Condition and Boot Option.

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

ELS-1100FLG Flange Mounting for Installations Without Threaded Holes

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

Specifications

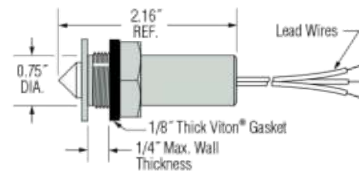
Materials	
Housing and Prism	Polysulfone
Operating Pressure	0 to 150 PSI, Maximum
Operating Temperature*	0°F to 176°F (-17.8°C +80°C)
Input Voltage	10 - 28 VDC
Current Consumption	18 mA, Approximately
Output†	TTL/CMOS Compatible. Open Collector Output May Sink 40 mA Up to 30 VDC.
Repeatability	±1 mm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

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

† See Page A-25 for Wiring Diagrams



Dimensions



How To Order

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

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

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

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-33.



PS71 – General Purpose Mini Pressure Switches

► 10 to 5000 psi (0.7 to 344 bar)

These versatile general purpose switches with snap action microswitches can be used in a wide range of hydraulic and pneumatic applications. Their proven piston/diaphragm design offers outstanding accuracy over a very wide pressure range with an outstanding 6000 psi proof pressure. Their modular construction allows Gems to offer a large number of standard pressure fittings in two materials as well as numerous electrical ratings and terminations. Users can easily configure this model to meet their needs.

Specifications

Switch	SPST; SPDT
Repeatability	See Table 1
Wetted Parts	
Diaphragm	Nitrile (optional EPDM, Viton® or Neoprene)
Fitting	Zinc-Plated Steel (Optional 316 SS)
Electrical Termination	DIN 43650A IP65; Spade Terminals IP00; Flying Leads IP65; Conduit with Flying Leads IP65; IP option IP66
Proof Pressure	6000 psi (414 bar)
Burst Pressure	9000 psi (621 bar)
Approvals	CE, UL Approved units available
Weight, Approximate	0.4 lbs. (0.15 kg)

Recommended Operating Temperature Limits

Diaphragm Material	Options Selected		
	No option, -10A, -SP or -RD	-RD or -RD and -G	-SP or -10A
Nitrile	15°F to 185°F (-9°C to +85°C)	15°F to 250°F (-9°C to +121°C)	15°F to 212°F (-9°C to +100°C)
Viton®	0°F to 185°F (-18°C to +85°C)	0°F to 250°F (-18°C to +121°C)	0°F to 212°F (-18°C to +100°C)
EPDM	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)	-10°F to +212°F (-23°C to +100°C)
Neoprene	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)	-10°F to +212°F (-23°C to +100°C)

Note: Switches may function below the cold temperature limit but the set points and deadband will increase. Consult factory for details.

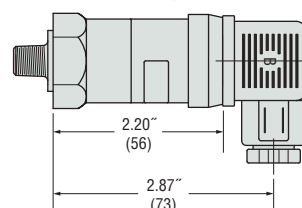
Electrical Switch Ratings

Options Selected	AC	DC
No option or -RD	5 amps @ 125/250 Volts	5 amps resistive, 3 amps inductive @ 28 Volts
-G only or -RD with -G	1 amp @ 125 Volts	1 amp resistive, 0.5 amp inductive @ 28 Volts
-10A only or -SP without -G	10.1 amps @ 125/250 Volts	—
-SP with -G	2 amps @ 125/250 Volts	—

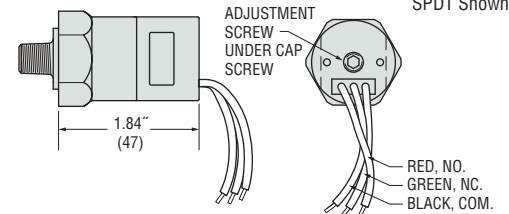


Dimensions

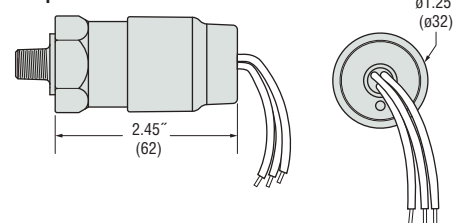
DIN 43650A with Cable Clamp



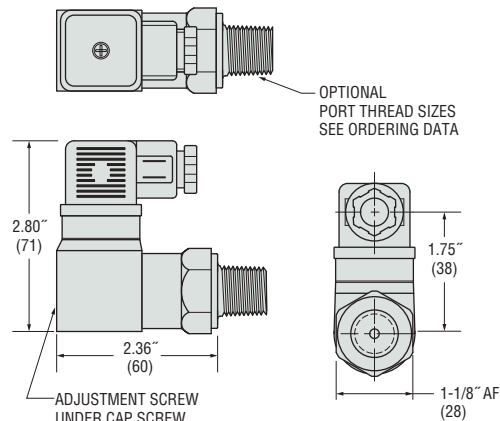
Flying Lead



IP66 Option



Right Angle DIN 43650A with Cable Clamp



How To Order

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

PS71 **-10** **-4MNZ** **-C** **-H** **-XX** **-XXXX**

1
2
3
4
5
6

① Pressure Range Code

Insert Pressure Range Code from Table 1, below.

② Pressure Fitting¹

12L14 Zinc-Plated Steel

- 2MNZ=1/8" NPTM
- 4MNZ=1/4" NPTM
- 8MNZ=1/2" NPTM
- 2MGZ=1/8" BSPM (G type)
- 4MGZ=1/4" BSPM (G type)
- 4MSZ=7/16"-20 SAE Male
- 6MSZ=9/16"-18 SAE Male
- M10Z=M10 x 1.0, Straight
- M12Z=M12 x 1.5, Straight
- M14Z=M14 x 1.5, Straight

316 Stainless Steel

- 2MNS=1/8" NPTM
- 4MNS=1/4" NPTM
- 2MGS=1/8" BSPM (G type)
- 4MGS=1/4" BSPM (G type)

③ Circuit

- A=SPST/N.O.
- B=SPST/N.C.
- C=SPDT

④ Electrical Termination

- SP=Spade Terminals²
- FLXX=Flying Leads³
- FLSXX=Flying Leads w/PVC Shrink Tubing³
- ELXX=1/2" NPT Male Conduit w/Flying Leads⁴
- CABXX=18 AWG PVC Cable⁵
 - H=DIN 43650A Male Half Only⁶
 - HR=Right Angle DIN 43650A Male Half Only⁶
 - HC=DIN 43650A 9mm Cable Clamp⁶
 - HCR=Right Angle DIN 43650A 9mm Cable Clamp⁶
 - HN=DIN 43650A with 1/2" Female NPT Conduit⁶
 - HNR=Right Angle DIN 43650A with 1/2" Female NPT Conduit⁶

⑤ Options⁷

- V=Viton® Diaphragm
- E=EPDM Diaphragm
- N=Neoprene Diaphragm
- 10A=10A @ 125/250 VAC Max. Rating
- G=Gold Contacts
(for loads less than 12 mA @ 12 VDC)
- RD=Reduced Differential
(25% reduction typical)
- IP=Ingress Protection⁸
- OF=Oil Free Cleaned⁹
- R=Restrictor (low damping coefficient) Brass
- SR=Spiral Restrictor (high damping coefficient)
300 Series Stainless Steel¹⁰
- WF=Weather Pack Connector, Female
- WM=Weather Pack Connector, Male
- DE=Deutsch Connector, Male, DT04 Series

⑥ Fixed Set Point (optional)

- A. Specify set point **-FS**
(in PSI or BAR, see example)¹¹
- B. Set Point Actuation
R on Rising Pressure
F on Falling Pressure
Example: **-FS2BARF** for 2 BAR Falling
or **-FS20PSIR** for 20 PSI Rising

Notes:

1. Other fittings available. Consult factory.
2. 20% increase in deadband typical.
3. 18" is standard. Specify lead length in inches (max. 48"). e.g. **-FL18** or **-FLS30**.
4. 18" is standard. Specify lead length in inches (max. 48"). e.g. **-EL18** or **-EL30**.
5. 36" is minimum. Specify cable length in inches. e.g. **-CAB36** or **-CAB120**.
6. DIN connectors require **-C** SPDT circuit.
7. Options **-10A**, **-G** or **-RD** cannot be combined.
8. Ingress Protection is available only with **-FL**, **-FLS** or **-CAB** Electrical Termination choices. Ingress Protection requires Fixed Set Point **-FS**.
9. Requires stainless steel housing.
10. **-SR** will result in wider deadbands and slower response time.
11. Set Point must be within Pressure Range selected in Step 1.

Table 1 — Pressure Range Codes

Pressure Range Code	Pressure Range	Accuracy*	Average Deadband**
10	10-30 psi (0.7-2.1 bar)	±1.5 psi (0.103 bar) +2% of setting	3.5 psi (0.28 bar) +11% of setting
20	25-75 psi (1.7-5.2 bar)	±2.5 psi (0.172 bar) +2% of setting	3.5 psi (0.28 bar) +11% of setting
30	65-300 psi (4.5-20.7 bar)	±5.0 psi (0.345 bar) +2% of setting	20 psig (1.38 bar) +11% of setting
40	250-1000 psi (17.2-69.0 bar)	±15 psi (1.03 bar) +2% of setting	45 psig (3.10 bar) +12% of setting
50	1000-3000 psi (69-206.8 bar)	±30 psi (2.06 bar) +3% of setting	70 psig (4.83 bar) +12% of setting
60	2500-5000 psi (172.4-344.7 bar)	±50 psi (3.45 bar) +4% of setting	140 psi (9.65 bar) +13% of setting

* Accuracy and set point of units may change due to the effects of temperature.

** These numbers are for the standard microswitch. With either the **-SP** or **-10A** option, the values are typically 20% greater than those listed. With the **-RD** option, the values will be typically 25% less than those listed. In certain applications deadband can be tailored and controlled to customer specifications. Consult factory for details.

Series 3R/3T General Purpose Probes

- ▶ Metallic Rods
- ▶ Available in Many Materials for Various Requirements
- ▶ Adaptable for Various Fittings

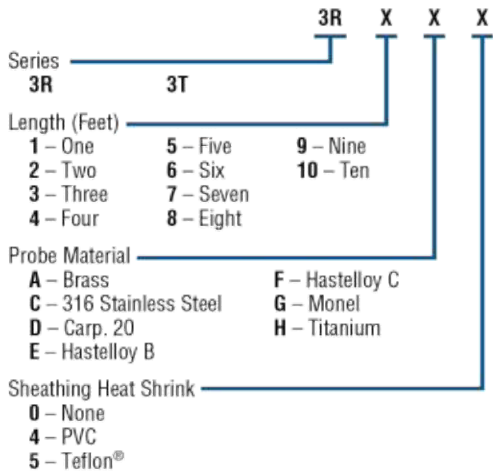
For general purpose use, Series 3R probes are metallic rods with threaded ends that screw into a fitting that extends vertically down into the liquid. Available in a variety of materials for different applications. 3T tapered rods are also available.

Specifications

Style	
Series 3R	1/4" (.64 cm) threaded rod
Series 3T	1/4" (.64 cm) tapered rod
Material	Brass, Hastelloy C, Monel, 316 stainless steel, titanium, Carp. 20
Sheathing (optional)	PVC heat shrink 200°F (93°C), Teflon® heat shrink 350°F (177°C)

How to Order

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



Contact your representative for custom lengths.

Note: Long lengths can be coupled to facilitate shipping and installation. Consult factory.

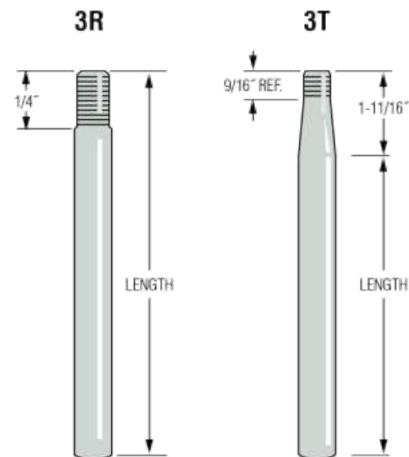


Applications

3R: For use with Series 3E, 3F, 3G, 3B fittings

3T: For use with Series 3G and other custom configurations

Dimensions



Series 47 4-Channel Relay, Alarm Panel Control

- ▶ Solid State Reliability
- ▶ 0-50K Ohm/cm Sensitivity
- ▶ Alarm Contacts for Audible and Visual Alarms
- ▶ 4 Channel Relay
- ▶ Removable Terminal Strips
- ▶ Inverse or Direct Acting Field Selectable
- ▶ U.L. Listed

Series 47 controls offer complete alarm panel control in a single package. Powered output contacts allow quick connection of lights and audible alarms. Test and silence functions are built in. Unit also carries one SPDT master alarm contact for remote alarm activation.

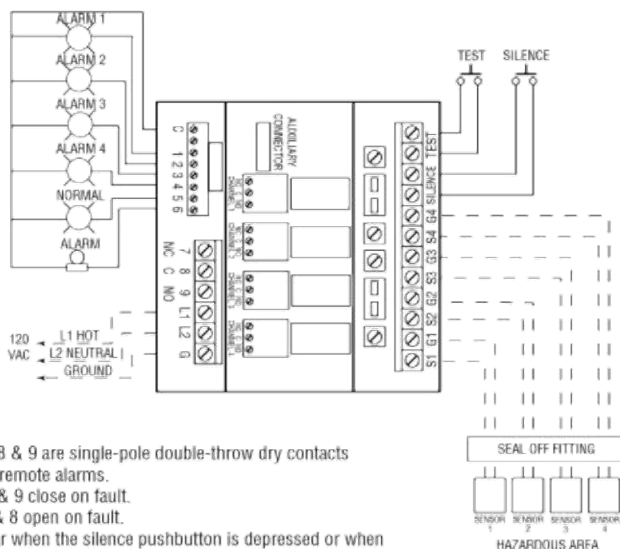
Approved for Class I, II, III, Division 1, Groups C, D, E, F, G hazardous atmospheres, Series 47 controls supply four channels which can be used with conductivity liquid level sensors or dry contact sensors.

This device functions as an alarm or single point control. Field adjustable for direct or inverse operation, it can operate separate visual alarms with a common audible alarm channel. Silence and test terminals are standard. For additional lights, alarms or outputs, auxiliary contacts must be ordered.

Alarm Specifications

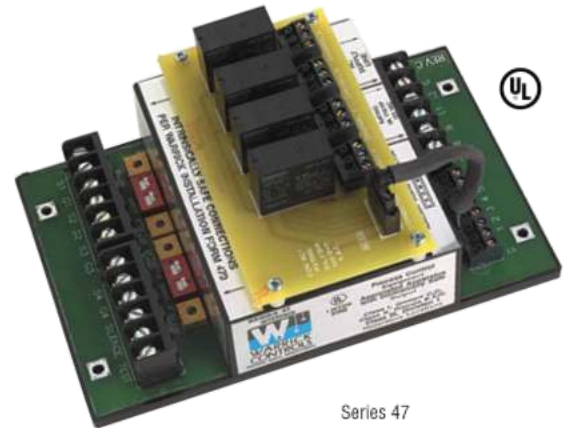
Contact Design	SPDT 1 N.O. & 1 N.C.
Master Alarm Contact Rating (30VDC, 120/240VAC)	5 amp Resistive, 1/10 hp
Indicator Contacts	Powered 120 VAC 25mA
Indicator Contacts for Audible Alarm	Powered 120 VAC 5A
Auxiliary Contacts (optional)	SPDT 120 VAC 10A (not powered)
Sensitivity	0-50K ohm maximum specific resistance
Primary Voltage	120 VAC (+10%/-15%) 50/60 Hz
Secondary Voltage	12 VAC @ 6mA RMS
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals	U.L. 913 File # E44570

Wiring



Notes:

1. Terminals 7, 8 & 9 are single-pole double-throw dry contacts designed for remote alarms.
2. Terminals 8 & 9 close on fault.
3. Terminals 7 & 8 open on fault.
4. Contacts clear when the silence pushbutton is depressed or when the fault condition is cleared.

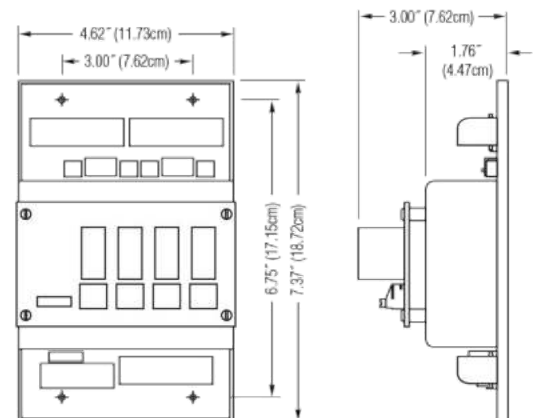


Series 47

Applications

- Hazardous Atmospheres
- Monitoring and Control
- Storage Tank Alarm Panels
- Input for Computer
- Input for Phone Dialer

Dimensions



How to Order

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

Series	47	X	X	X	XXX
Sensitivity (ohms)	C - 26K	D - 50K	E - 100K		
Supply Voltage	1 - 120 VAC				
Auxiliary Contacts	A - Auxiliary Contacts	B - No Auxiliary Contacts			
Number of Probe Channels	3A1 - One	2A2 - Two	1A3 - Three	0A4 - Four	

See Our Interstitial Tank Monitoring Products on page A-22.



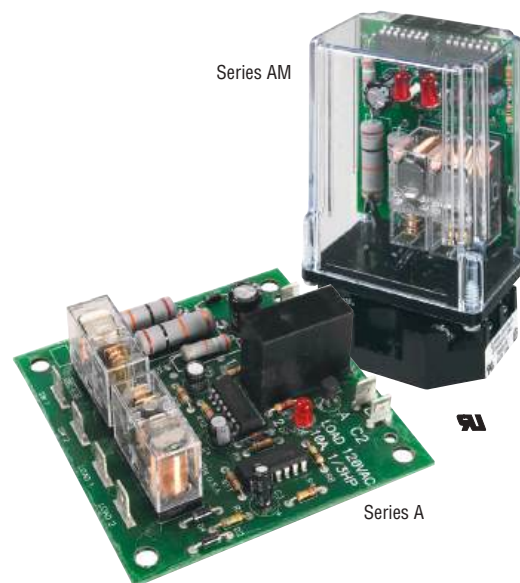
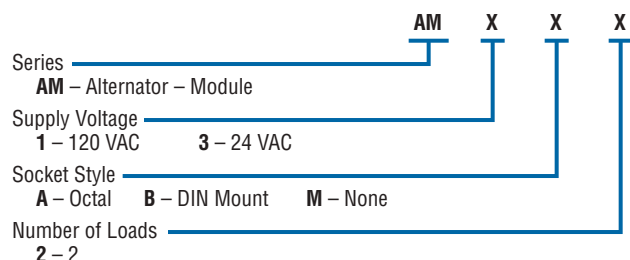
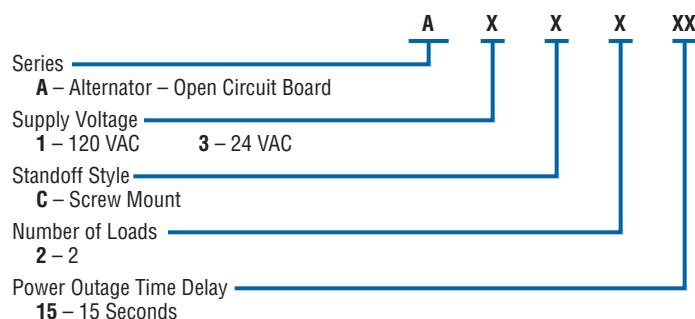
Series A & AM Solid State Alternators

Series A has an open circuit board design. Series AM provides convenient plug-in design, either octal socket or DIN mount. The housing carries no NEMA rating.

Contact Rating	10 amp @ 120 VAC or 24 VAC Resistive
Primary Voltage	120 VAC, 24 VAC (+10%/-15%) 50/60 Hz
Secondary Voltage	20 mA @ 120 VAC, 80 mA @ 24 VAC
Temperature	-40°F to +150°F (-40°C to +65°C)
Terminal Style	
Series A	1/4" spade
Series AM	Screw connector
Approvals	U.L. 508 Recognized Motor Control

How to Order

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

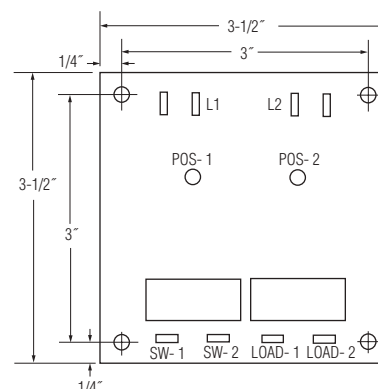


Applications

- Duplex Pumping
- Single or Dual Switch Operation
- Power Outage Time Delay Available on Open Version (Series A)

Dimensions

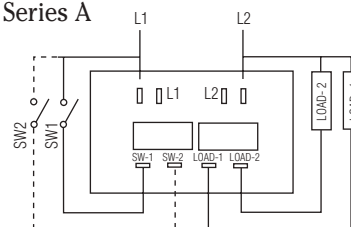
Series A



Series AM dimensions are the same as Series DC above.

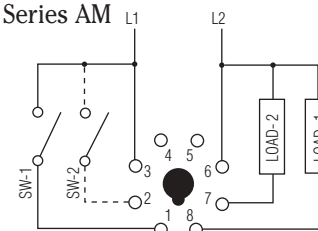
Wiring

Series A



Note: For ease of wiring, L1 and L2 each have two tabs.

Series AM



Large Size – Alloys

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

Excellent stability for general use in oils and water.

LS-1800 Series –
Buna N Float



LS-1800 Series –
Teflon® Float



LS-1900 Series –
Buna N Float



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

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

Dimensions

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

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

Common Specifications

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

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

RoHS – In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

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

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

Material				Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.	Switch* SPST	Part Number
Series Number	Stem and Mounting	Float	Other Wetted					
LS-1800	Brass	Buna N	316 Stainless Steel, Hysol	.75	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA	01801 ⚡
		Buna N		.75			100 VA**	35651 ⚡
	316 Stainless Steel	Buna N		.65	-40°F to +250°F (-40°C to +121°C)	300	20 VA	01807 ⚡
		Teflon®		.65			100 VA**	35657 ⚡
LS-1900	Brass	Buna N	316 Stainless Steel, Hysol	.55	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA, N.O.	01811 ⚡
		Buna N		.55			20 VA	01901 ⚡
	316 Stainless Steel	Buna N		.55			100 VA***	35676 ⚡
		Buna N		.55			20 VA	01907 ⚡
							100 VA	35682 ⚡

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

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

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

Specialty Switches

GEMS Excels in Switches for Special Requirements

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



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



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

LS-270 Series –
Bracket Mounting
Slosh Shield

U.L. Recognized – File No. E45168



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

Dimensions

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

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

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

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

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

Notes:

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

2. Switches are not U.L. Recognized or CSA Listed.

3. See Page B-21 for thermostat ratings and wiring diagram. Other temperature settings are available; consult factory.

Specialty Switches – Continued

Portable Level Switch —
Integral Mounting Magnet

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

LS-750 Series — Weighted
for Suspension Cable

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

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

LS-700F Series



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

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

Dimensions

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

L_1 = Switch actuation level. In liquid with specific gravity of 1.0, switch actuation is approximately half the distance from end of stem to mounting, or at the halfway point of float travel.

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

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

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

⚡ — Stock Items.

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

E & EH Series – Subminiature Gas

- ▶ MOPD: 175 PSI (12 Bar)
- ▶ C_v Range: 0.018 to 0.070 (K_v Range: 0.015 to 0.060)
- ▶ 0.65 Watts or 2 Watts

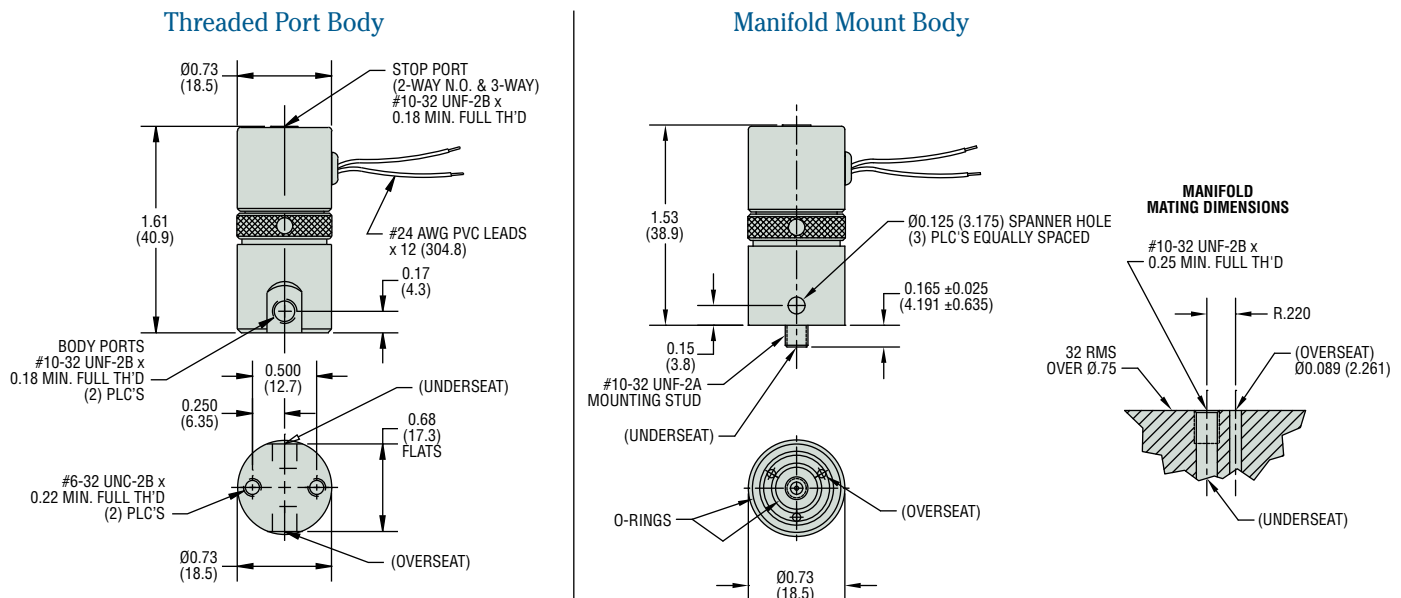
A 2- or 3-way sub-miniature solenoid valve that delivers faster response times—and higher flow rates, the E & EH Series is specifically engineered for air and dry gas applications. A nickel-plated body and coil housing construction produces a highly durable, corrosion resistant valve. With a wattage range of 0.65–2 the E & EH Series provides versatility for power conserving, high pressure, and high flow applications.

Typical Applications

- Medical and Respiratory Healthcare
- Printing Machinery and Sorting Equipment
- Automated Packaging Equipment
- Air Monitoring Systems



Dimensions



How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

E2010	-	W24-1	-	V	-	V0	-	24VDC	-	OC
1		2		3	4	5	6	7		8
Primary Prefix		Coil Construction		Body Material*	Plunger Seal Material	O-Ring Material	Body Port Configuration*	Voltage		Additional Options

* Blank entry indicates a "Standard" selection (#10-32 straight thread ports, in this case).

Example:

E2010-W24-1-V-V0-24VDC-OC

E-Series 2-Way N.C. solenoid valve, with 24" (61cm) lead-wires from an encapsulated coil, nickel-plated brass body, Viton® plunger seal, Viton® o-ring, #10-32 straight thread ports, operating at 24 VDC, and is cleaned for oxygen use.

Part Prefix Table ①

	Power Rating	Orifice				MOPD		C _v		K _v		① Primary Prefix
		Body		Stop		psig	bar	Body	Stop	Body	Stop	
		inches	mm	inches	mm							
2-WAY N.C.	0.65W	1/32	0.79	—	—	125	9	0.018	—	0.015	—	E2010
		3/64	1.19	—	—	70	5	0.023	—	0.020	—	E2011
		1/16	1.59	—	—	40	3	0.036	—	0.031	—	E2012
		5/64	1.98	—	—	20	1	0.070	—	0.060	—	E2013
	2W	1/32	0.79	—	—	175	12	0.018	—	0.015	—	EH2010
		3/64	1.19	—	—	150	10	0.023	—	0.020	—	EH2011
		1/16	1.59	—	—	100	7	0.036	—	0.031	—	EH2012
5/64		1.98	—	—	50	3	0.070	—	0.060	—	EH2013	
2-WAY N.O.	0.65W	—	—	1/32	0.79	125	9	—	0.018	—	0.015	E2210
		—	—	3/64	1.19	70	5	—	0.023	—	0.020	E2211
		—	—	1/16	1.59	40	3	—	0.032	—	0.027	E2212
	2W	—	—	1/32	0.79	175	12	—	0.018	—	0.015	EH2210
		—	—	3/64	1.19	150	10	—	0.023	—	0.020	EH2211
		—	—	1/16	1.59	100	7	—	0.032	—	0.027	EH2212
3-WAY N.C. Line Connection	0.65W	1/32	0.79	1/32	0.79	125	9	0.018	0.018	0.015	0.015	E3110
		3/64	1.19	3/64	1.19	70	5	0.023	0.023	0.020	0.020	E3111
		1/16	1.59	1/16	1.59	40	3	0.036	0.032	0.031	0.027	E3112
	2W	1/32	0.79	1/32	0.79	175	12	0.018	0.018	0.015	0.015	EH3110
		3/64	1.19	3/64	1.19	150	10	0.023	0.023	0.020	0.020	EH3111
		1/16	1.59	1/16	1.59	100	7	0.036	0.032	0.031	0.027	EH3112
3-WAY N.O.	0.65W	1/32	0.79	1/32	0.79	125	9	0.018	0.018	0.015	0.015	E3210
		3/64	1.19	3/64	1.19	70	5	0.023	0.023	0.020	0.020	E3211
		1/16	1.59	1/16	1.59	40	3	0.036	0.032	0.031	0.027	E3212
	2W	1/32	0.79	1/32	0.79	175	12	0.018	0.018	0.015	0.015	EH3210
		3/64	1.19	3/64	1.19	150	10	0.023	0.023	0.020	0.020	EH3211
		1/16	1.59	1/16	1.59	100	7	0.036	0.032	0.031	0.027	EH3212
3-WAY Multi Purpose	0.65W	1/32	0.79	1/32	0.79	80	6	0.018	0.018	0.015	0.015	E3310
		3/64	1.19	3/64	1.19	40	3	0.023	0.023	0.020	0.020	E3311
		1/16	1.59	1/16	1.59	20	1	0.036	0.032	0.031	0.027	E3312
	2W	1/32	0.79	1/32	0.79	150	10	0.018	0.018	0.015	0.015	EH3310
		3/64	1.19	3/64	1.19	100	7	0.023	0.023	0.020	0.020	EH3311
		1/16	1.59	1/16	1.59	50	3	0.036	0.032	0.031	0.027	EH3312
3-WAY Directional Control	0.65W	1/32	0.79	1/32	0.79	135	9	0.018	0.018	0.015	0.015	E3410
		3/64	1.19	3/64	1.19	80	6	0.023	0.023	0.020	0.020	E3411
		1/16	1.59	1/16	1.59	45	3	0.036	0.032	0.031	0.027	E3412
	2W	1/32	0.79	1/32	0.79	190	13	0.018	0.018	0.015	0.015	EH3410
		3/64	1.19	3/64	1.19	165	11	0.023	0.023	0.020	0.020	EH3411
		1/16	1.59	1/16	1.59	80	6	0.036	0.032	0.031	0.027	EH3412

② Coil Construction

(blank) = Tape-wrapped, Class B (130°C), with 12" (30.5cm) lead wires*

W__ = Lead-wires, non-standard length (specify in inches)

10 = Externally rectified coil for AC voltages

(2 watt and lead wires only)

1 = Encapsulated coil, Class B (130°C), lead wires

5 = Encapsulated coil, Class B (130°C), .110" spade terminals

③ Body Material

(blank) = Nickel-plated brass*

④ Plunger Seal Material

(blank) = Nitrile*

V = Viton®

E = EPR

MQ = Silicone

⑤ O-Ring Material

(blank) = Nitrile*

VO = Viton®

EO = EPR

MQO = Silicone

⑥ Body Port Configuration

(blank) = #10-32 straight thread ports*

BM = M5 x 0.8 ports

MM = Manifold mount with #10-32 threaded stud†

MM2 = Manifold mount with M5 x 0.8 threaded stud†

BO = Bottom under-seat port – max orifice = 1/16" (1.59mm)

⑦ Voltage

__VDC = DC (specify voltage)

__VAC = AC rectified 2-watt only (specify voltage)

⑧ Additional Options

OC = Cleaned for oxygen use

QO = Quiet operation (2-way N.C.)

VAC = Vacuum application – 0 to 29.5" Hg (0 to 1000 mBar)

* Standard selection; will be used unless otherwise specified. Standard selections are not referenced in final part number.

† Teflon® o-ring not suitable for manifold mount.

22CS Series / 26CS Series – CSA Intrinsically Safe Industrial Pressure Transmitters

- ▶ Ranges from 7.5 to 6000psi (0.5 to 400 bar) and 0-300psi (0-25 bar) Absolute
- ▶ Voltage and 2 Wire 4-20mA output models
- ▶ All stainless steel wetted parts

Certified by CSA for Canada and USA, the 22CS and 26CS Series intrinsically safe pressure transmitters are designed to withstand the rigors of the most difficult applications. An all-stainless steel construction, eliminates the need for seals and oil barriers that can deteriorate over time.

Incorporating Gems CVD Sensors and ASIC technology the 22CS and 26CS Series offer long term reliability, excellent performance and long term stability ensuring long service life without routine maintenance.

Available with a wide choice of pressure fittings and electrical connections rated from IP65 to fully immersible (IP68 200m WG).

Specifications

Input	
Pressure Range	Vacuum to 6000 psi G (400 bar); 300 psi Absolute (0-25 bar)
Proof Pressure	2 x Full Scale (FS) (1.5 x FS for 400 bar, ≥ 5000 psi)
Burst Pressure	>35 x FS ≤ 100 psi (6 bar); >20 x FS ≤ 1000 psi (60 bar); >5 x FS ≤ 6000 psi (400 bar)
Fatigue Life	Designed for more than 100 million FS cycles
Performance	
Long Term Drift	0.2% FS/year (non-cumulative)
Accuracy	0.25% FS typical (optional 0.15% FS)
Thermal Error	1.5% FS typical (optional 1% FS)
Compensated Temperatures	-5°F to +180°F (-20°C to +80°C)
Operating Temperatures	-40°F to +260°F (-40°C to +125°C) for elec. codes A, B, C -5°F to +180°F (-20°C to +80°C) for elec. codes G -5°F to +125°F (-20°C to +50°C) for elec. codes F, M, 3
Zero Tolerance	1% of span
Span Tolerance	1% of span
Mechanical Configuration	
Pressure Port	See ordering chart
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See ordering chart
Enclosure	316 SS, 17-4 PH SS IP65 for elec. codes A, B, C, 3 and G (with DIN connector fitted) IP67 for elec. code F IP68 for elec. codes M
Vibration	35g peak sinusoidal, 5 to 2000 Hz
Acceleration	100g steady acceleration in any direction 0.032% FS/g for 15 psi (1 bar) range decreasing logarithmically to 0.0007% FS/g for 6000 psi (400 bar) range.
Shock	Withstands free fall to IEC 68-2-32 procedure 1
Approvals	CSA Certified Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III When used in conjunction with a Zener safety barrier
Weight	Approx. 3.5 ounces (100 grams) (additional cable; 75 g/m)

Series 22CS



Series 26CS



Individual Specifications

Voltage Output units	
Output	See ordering chart
Supply Voltage (Vs)	1.5 VDC above FS output to 28 VDC
Supply Voltage Sensitivity	0.01% FS/Volt
Min. Load Resistance	(FS output / 2) Kohms
Current Consumption	Approx 6 mA at 7.5V output
Current Output units	
Output	4-20 mA (2 wire)
Supply Voltage (Vs)	24 VDC, (7-28 VDC)
Supply Voltage Sensitivity	0.01% FS/Volt
Max. Loop Resistance	(Vs-7) x 50 ohms

Electrical Connections

	Connection Code	mA Output			Voltage Output			
		+VE	-VE	EARTH	-VE	COMMON	EARTH	EARTH
22CS	A, B	1	2	E	1	2	2	4
	2, D, F	R	BK	DRAIN	R	BK	W	DRAIN
26CS	1	A	B	D	A	B	C	D
	C	A	B	E	A	B	C	E
	G	1	3	E	1	2	3	E
	3 (Cable)	R	BK	DRAIN	R	BK	W	DRAIN
	F (Leads)	R	BK	GR	R	BK	W	GR
	M	R	BL	DRAIN	R	W	Y	DRAIN

Electromagnetic Capability

Meets the requirement for CE marking of EN50081-2 for emissions and EN50082-2 for susceptibility.



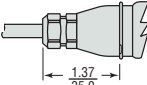
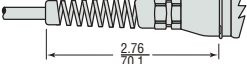
Test Data:

- EN61000-4-2 Electrostatic Discharge. 8kV air discharge, 4kV contact discharge. Unit survived.
- ENV50140 Radiated RF Susceptibility. 10V/m, 80MHz-1GHz, 1kHz mod. Maximum recorded output error was $\leq \pm 1\%$
- ENV50204 Radiated RF Susceptibility to Mobile Telephones. 10V/m, 900MHz. Maximum recorded output error was $\leq \pm 1\%$.
- EN61000-4-4 Fast Burst Transient. 2kV, 5/50ns, 5kHz for 1 minute. Unit survived.
- ENV50141 Conducted RF Susceptibility. 10Vms, 1kHz mod, 150kHz - 80MHz. Maximum recorded output error was $\leq \pm 1\%$



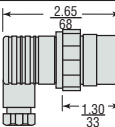
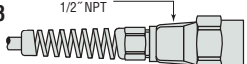
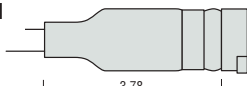
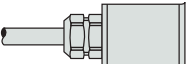
Cable Legend:

R = Red
BK = Black
W = White
G = Green
BL = Blue
Y = Yellow

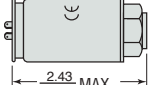
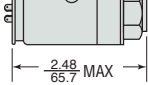
Dimensions
22CS Series

Industrial DIN Connector	
Code B	
Industrial DIN Connector (mate supplied)	
Code A	
IP67 Cable	
Code F	
24 AWG Shielded PVC	
IP65 or NEMA4 Cable	
Code D or 2	
24 AWG Shielded PVC	


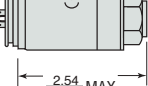
26CS Series

10-6 or 8-4 Mil-C Connector	
10-6 Code C	
8-4 Code 1	
Large DIN 43650 Plug (mate supplied)	
Code G	
Conduit Connector with Cable	
Code 3	
24 AWG Shielded PVC	
Conduit Connector with Flying Leads	
Code M	
Code F	










inch
mm

Amplified Gauge

2.43 61.60 MAX
Amplified Absolute

2.48 65.7 MAX

Maximum diameter 1.07" (27.3 mm)

Amplified Gauge

2.09 53.2 MAX
Amplified Absolute

2.54 64.4 MAX

Maximum diameter 1.07" (27.3 mm)

1/8-27 NPT	
Code 08	 0.59 15
1/4 - 1/8 NPT	
Code 02	 0.79 20
7/16-20 UNF-2A	
Code 04	 0.75 19
G1/8 Internal	
Code 09	
G1/4 Internal	
Code 00	 0.75 19
G1/4 External	
Code 01	 0.67 17
G1/4 Soft Seal	
Code 05	 0.67 17
G1/2 Manometer	
Code 03	 0.87 22.0
R1/4	
Code 0A	 0.79 20

How to Order

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

Series	22CS	26CS	B	G	A60	01	A	C	U	A	Performance Code
Output	B - 4-20mA	C - 1-6V D - 1-11V H - 1-5V G - 0.2-10.2V	J - 0.5-5.5V R - 0-5V S - 0-10V F - 0.1-5.1V								Accuracy/Thermal A - .25%/1.5% B - .15%/1.0%
Pressure Datum	A - Absolute	G - Gauge									Cable Length U - No Cable Fitted D - 3 feet (1 Meter) E - 9 feet (3 Meters) F - 16 feet (5 Meters) G - 32 feet (10 Meters) H - 50 feet (15 Meters) J - 65 feet (20 Meters) K - 82 feet (25 Meters) L - 98 feet (30 Meters) M - 132 feet (40 Meters) N - 164 feet (50 Meters) P - 246 feet (75 Meters) Q - 328 feet (100 Meters) R - 410 feet (125 Meters) S - 525 feet (160 Meters)
Pressure Range ¹ - psi	F15 - 0-15 F30 - 0-30 F60 - 0-60 G10 - 0-100 G15 - 0-150 G20 - 0-200 G30 - 0-300 G50 - 0-500	G60 - 0-600 H10 - 0-1,000 H15 - 0-1,500 H20 - 0-2,000 H30 - 0-3,000 H40 - 0-4,000 H50 - 0-5,000 H60 - 0-6,000	Vac = -15 psi 1F5 - Vac-0 3F0 - Vac-15 6F0 - Vac-45 1G0 - Vac-85 1G5 - Vac-135 2G0 - Vac-185 3G0 - Vac-285								Apparatus Protection C - CSA Approved Intrinsically Safe
Pressure Range ¹ - bar	A10 - 0-1 A16 - 0-1.6 A25 - 0-2.5 A40 - 0-4 A60 - 0-6 B10 - 0-10 B16 - 0-16	B25 - 0-25 B40 - 0-40 B60 - 0-60 C10 - 0-100 C16 - 0-160 C25 - 0-250 C40 - 0-400	Vac = -1 bar 1A0 - Vac-0 1A6 - Vac-0.6 2A5 - Vac-1.5 4A0 - Vac-3 6A0 - Vac-5 1B0 - Vac-9 1B6 - Vac-15 2B5 - Vac-24 4B0 - Vac-39								Electrical Connection 22CS Series A - Industrial DIN Mating Connector Supplied B - Industrial DIN Mating Connector Not Supplied F - Cable Gland Metal IP67 2 - IP65 - NEMA4 Cable D - IP65 - NEMA4 Cable 26CS Series C - Fixed Plug Size 10-6 Mating Plug Not Supplied G - Fixed Plug To DIN 43650 Mating Plug Supplied M - Immersible Max. Depth 200 Meters 1 - Fixed Plug Size 8-4 Mating Plug Not Supplied 3 - Conduit Connector 1/2 NPT Ext. 1M Cable F - Cable Gland Metal IP67
Pressure Port ²	01 - G1/4 External 02 - 1/4-18 NPT External 03 - G1/2 Manometer 04 - 7/16-20UNF to SAE J514 05 - G1/4 Ext. Soft Seal	08 - 1/8-27 NPT External 09 - G1/8 Internal 00 - G1/4 Internal 0A - R1/4 External									

Notes:

1. Additional Pressure Ranges are available. Please consult factory.
2. For other Pressure Ports, please consult factory.

Small Size – Alloys

XM-860 Series – Compact, Resistive Output Level Sensors

- ▶ High Volume/Low Cost OEM Design
- ▶ Brass or Stainless Steel Construction
- ▶ 1/2" or 1" Resolution
- ▶ Lengths to 24 inches (610 mm)

OEMs with fluid gauging requirements now have an affordable, yet robust continuous output sensor they can use to great value. Gems XM-860 liquid level sensors are a durable, low-cost solution for applications that don't require high-resolution output. Made of brass or stainless steel, this series offers rugged construction, utilizing a new, coated reed switch core that stands up to high levels of shock and vibration. They are equally at home in applications ranging from tranquil storage day tanks to the challenge of off-highway vehicle fluids tank gauging.

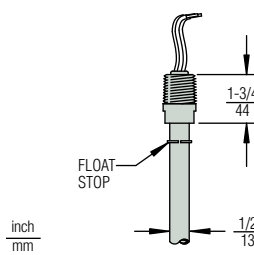
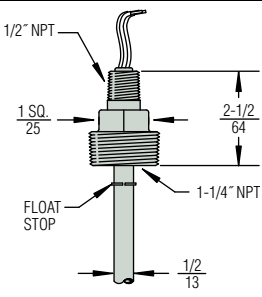
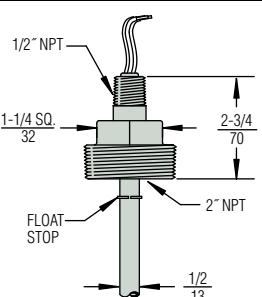
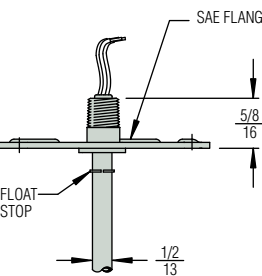
Gems XM-860 Advantages

- Floats provide true reading of liquid's surface position
- Floats can be used to sense dissimilar liquid interfaces (e.g. water/oil interface), including resulting emulsions.
- Unaffected by dielectric property of fluid
- Intrinsically-safe and Explosion-proof models available
- Unaffected by turbulence and motion

Typical Applications

- Generator Sets Fuel Tanks
- Auto Transmissions Fluid Reservoirs
- Reclamation Systems
- OHV Fuel Tanks
- Coolant Reservoirs
- Storage Day Tanks

1. Mounting Types

Type 1 1/2" NPT Internal Mount		Type 2 1-1/4" NPT External Mount		Type 3 2" NPT External Mount		Type 4 SAE Flange External Mount	
							
Stem Material		Brass or 316 Stainless Steel				Brass	
Mounting Material		Brass or 316 Stainless Steel				Brass	
Float Stop Material		Brass Units: Beryllium Copper Grip Rings; Stainless Steel Units: S.S. ARMCO PH-15-7MO Grip Rings					
Stem Length		24 inches (610 mm), Max.					
Output Wiring		Lead Wires Only		Lead Wires or Junction Box*			

* Explosion-Proof (EP) units are supplied with junction box. Junction boxes for IS- or non-rated units may be ordered separately—P/N 113873.

ORDER IT!
Ordering is Easy! See Page C-15.
Easy online ordering too!



2. Output Types

Make ordering selections from *either* the 2-wire or 3-wire output types detailed below.

2a. 2-Wire Versions, 1-inch Resolution

Designed for simplicity and economy, 2-wire resistive-output versions connect directly to many common automotive-type panel meters. Accuracy is 1 inch. Select the output resistance code from the table below for your Order Check List.

Output Resistance				
Resistance Code	Top Hard Stop	Individual Step R	Full Transition	Unit
R1	33	$\frac{240-33}{A \text{ (In.)}}$	240	Ohms
R2	33	$\frac{255-33}{A \text{ (In.)}}$	255	Ohms
R3	240	$\frac{240-33}{A \text{ (In.)}}$	33	Ohms
R4	255	$\frac{255-33}{A \text{ (In.)}}$	33	Ohms

High Resistance = $\pm 2.75\Omega$
Low Resistance = $33 \pm 0.50\Omega$

Electrical Rating – Red to Black Wire

Resistance	33-240 or 33-255
Minimum Resistance	1000 Ohms
Maximum Voltage	30.0 VDC
Maximum Current	0.030 Amps
Maximum Power Dissipation	0.10 Watts/Inch of Indication

2b. 3-Wire Versions, 1/2-inch Resolution

These versions connect to Gems signal-conditioners (optionally selected in step 6b) for a variety of VDC and mA outputs. Accuracy is 1/2 inch. The standard resistance code is shown below. Consult factory for other resistance values.

Resistance Code	Resistance Value			
	R _{Lead}	R	R _{Lag}	Unit
P1	0	100	0	Ohms

Total Indicating R = $R_{\text{Lead}} + (A \text{ (In.)} \times R) + R_{\text{Lag}}$

Electrical Rating – Red to Black Wire

Minimum Resistance	1000 Ohms
Maximum Voltage	30.0 VDC
Maximum Current	0.030 Amps
Maximum Power Dissipation	0.10 Watts/Inch of Indication

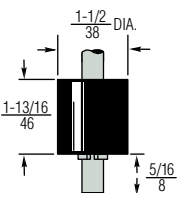
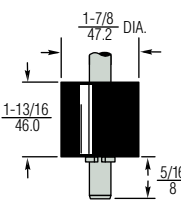
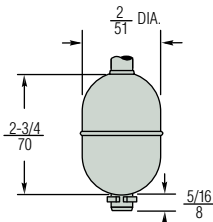
3. Output Options

- A. Non-Rated Units.** Supplied with lead wire output; junction box optional.
- B. Explosion-Proof Rated Units.** Supplied from factory with explosion-proof junction box.
- C. Intrinsically-Safe Rated Units.** Supplied with lead wire output; junction box optional.

4. Float Types

Make selection based on Mounting Type being used and performance requirements.

IMPORTANT: If you are specifying either an Explosion-Proof or Intrinsically-Safe output, you must select a stainless steel float here.

Float Material	Buna N	Buna N	316 Stainless Steel
Compatible Mountings	Type 1, 2, 3, 4	Type 1 & 3	Type 1 & 3
Float Dimensions			
Part Number	197428	43359	43590
Min. Liquid Specific Gravity	.63	.55	.75
Operating Pressure, Max*	150 PSI (10.3 bar)		300 PSI (20.7 bar)
Operating Temperature, Max.	Water: 180°F (82°C) Oil: 230°F (110°C)		300°F (149°C)

*@ Ambient Temperature

5. To Determine Dimensions

X: Dimensional factor based on selected float (see table below)

B: Overall Length = Inches of Indication + C** + X

C: Distance from bottom of mounting to float stop (customer specified):

- 1/4" (6.4mm) minimum
- 1-1/4" (31.8mm) minimum on Type 1, XT Series only

M: Distance from stem bottom to lowest level of indication

N: Distance from upper float stop to highest level of indication

Calculating Length

Note: 2-wire output units must specify Inches of Indication in even increments of 1 inch;

3-wire output units must be specified in even increments of 1/2 inch.

To find Overall Length when Inches or Indication is known:

- Inches of Indication + C** + X = Overall Length

To find Maximum Inches of Indication when Overall Length is known:

- Overall Length - C** - X = Maximum Inches of Indication

** C dimension is determined by customer.

If not specified, the float stop will be located at the minimum value (1/4").

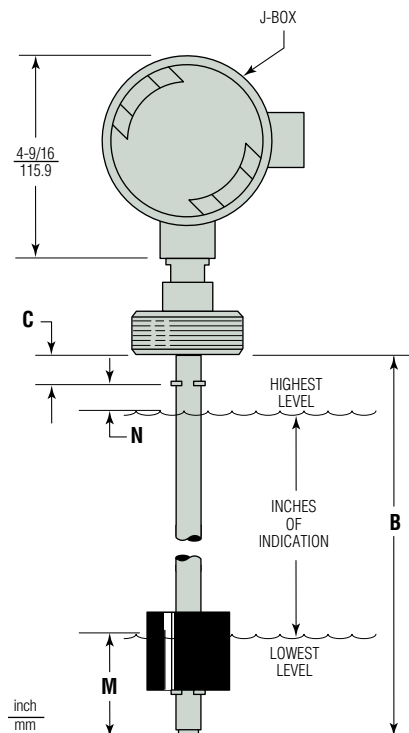
Float Factors

Float Part Number	X Factor	M Dimension	N Dimension
197428	2.5 (63.5)	1.312 (33.3)	1.187 (30.1)
43359	2.5 (63.5)	1.312 (33.3)	1.187 (30.1)
43590	3.437 (87.3)	2.187 (55.5)	1.25 (31.7)

inch (mm)

M and N Dimensions are based on water (specific gravity 1.0).

Typical Configuration



Small Size – Engineered Plastics

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

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

LS-3 Series are available in FDA compliant materials, consult GEMS for details.

Polysulfone Float



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

Polypropylene Float (Hollow)



Features a low specific gravity float offering broad chemical compatibility.

Polypropylene Float (Solid)



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

Buna-N Float



Ideal for oils and fuels.

ALL-PVDF



Wetted materials of construction comply with FDA food contact regulations. Stem and float of corrosion-resistant PVDF for ultra-pure applications.

New 3/4" Polypropylene Float



See next page for details.



RoHS Compliant:

All LS-3 Series level switches featured on this page and the next are in compliance with EU-directive 2011/65/EC.

Common Specifications

Approvals: U.L. Recognized – File No. E45168; CSA Listed – File No. 30200. CE Declaration Available Upon Request.

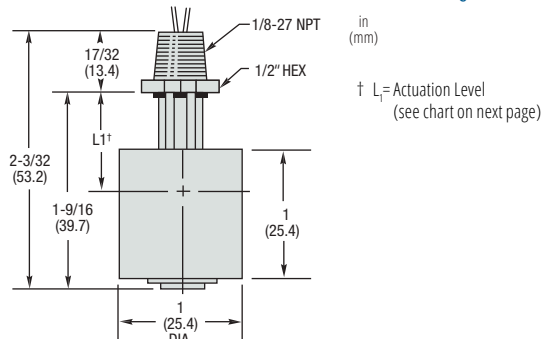
RoHS – In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

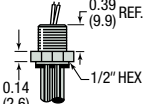
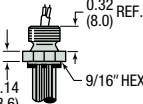
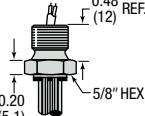
For NSF certified level switch products, contact Gems.

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

For LS-3 Micro: 20 VA, 140 VAC/200 VDC

Dimensions – 1" Float Models only



Alternate Mountings			
	3/8-16 UNC	ISO 228 - G 1/8	M12 × 1.75
in (mm)			
	Electrical Termination	Lead Wires	Cable

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

Stem and Mounting Material	Float Material	Float Dia.	Actuation Level ¹	Min. Liquid Sp. Gravity	Pressure Max. @ 70°F (21°C)	Operating Temperature	Mounting Type	Electrical Termination	Part Number
Polysulfone	Polysulfone	1"	3/4" (19.0 mm)	0.75	50 psi (3 bar)	-40°F to +225°F (-40°C to +107°C)	1/8-27 NPT	Lead Wires	42295 ✓
Polypropylene ²	Polypropylene (Hollow)	1"	13/16" (20.6 mm)	0.60	50 psi (3 bar)	-40°F to +225°F (-40°C to +107°C)	1/8-27 NPT	Lead Wires	142505 ✓
						-40°F to +176°F (-40°C to +80°C)	3/8-16 UNC	Lead Wires	171517 ✓
						-40°F to +176°F (-40°C to +80°C)	M12 × 1.75	Cable	171518
Polypropylene ²	Polypropylene (Solid)	1"	9/16" (14.3 mm)	0.90	150 psi (10.3 bar) @ 68°F (20°C)	-40°F to +150°F (-40°C to +66°C)	1/8-27 NPT	Lead Wires	116826 ✓
						-40°F to +176°F (-40°C to +80°C)	3/8-16 UNC	Lead Wires	171514 ✓
						-40°F to +176°F (-40°C to +80°C)	M12 × 1.75	Cable	189787
Nylon	Buna-N	1"	13/16" (20.6 mm)	0.45	150 psi (10.3 bar)	-40°F to +250°F (oil) (-40°C to +121°C [oil])	1/8-27 NPT	Lead Wires	162745 ✓
						-40°F to +176°F (water) (-40°C to +80°C [water])	M12 × 1.75	Cable	189786
Polypropylene (PVDF float retaining clip) LS-3N ³	Polypropylene (Hollow) LS-3N ³	1"	13/16" (20.6 mm)	0.60	50 psi (3 bar)	-40°F to +225°F (-40°C to +107°C)	1/8-27 NPT	Lead Wires	209475
							3/8-16 UNC	Lead Wires	209455
							ISO 228 - G 1/8	Lead Wires	209460
							M12 × 1.75	Lead Wires	209465
PVDF LS-3F ⁴	PVDF LS-3F ⁴	1"	1/2" (12.7 mm)	0.86	50 psi (3 bar)	-40°F to +250°F (-40°C to +121°C)	1/8-27 NPT	Teflon® Jacketed Lead Wires	173250 ✓

Notes:

- Based on a liquid specific gravity of 1.0.
 - All Polypropylene units carry a Kynar® retaining clip. Accessories Available in OEM Quantities: Jam Nut, Gaskets, and Slosh Shields.
 - LS-3N is an NSF certified product, for water use only.
 - LS-3F is an NSF certified product for all food contact.
- ✓ Stock items.

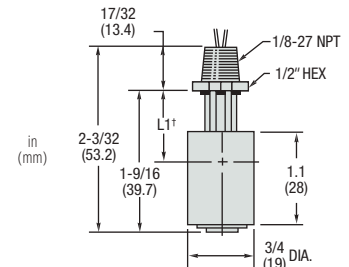
Miniature Floats for Tiny Tanks

Our smallest LS-3 Series switches yet!

Small yes, but with BIG performance. No other miniature float switches match our LS-3 specs. These units are ideal for potable water, medical devices and other compact appliances, such as printers. Gems proprietary float enables use in lighter-than-water fluids. Switches are made from FDA compliant materials.



Dimensions



† L₁ = Actuation Level (see chart below)

Series	Stem and Mounting Material	Float Material	Actuation Level ¹	Min. Liquid Sp. Gravity	Pressure Max. @ 70°F (21°C)	Operating Temperature	Electrical Termination	Mounting Type	Switch Logic	Part Number
LS-3 3/4"	Polypropylene ²	Polypropylene (Solid)	7/16" (11.1 mm)	0.95	100 psi (6.9 bar)	-40°F to +212°F (-40°C to +100°C)	Lead Wires or Cable	1/8-27 NPT	N.C./N.O. Reverse Float Position	201540
	Nylon	Buna-N	11/16" (17.5 mm)	0.85	150 psi (10.3 bar)	-40°F to +250°F (oil) (-40°C to +121°C [oil])	Lead Wire			177818

Notes:

- Based on a liquid specific gravity of 1.0.
- Utilizes a Kynar® retaining clip.

Unique Features Make These LS-3 Models Special

These small switches feature unique configurations for special applications.

**Part No. 142545
With Slosh Shield**



Cut-away version shown

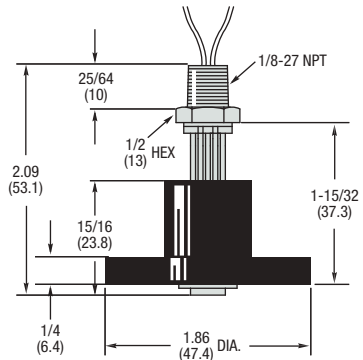
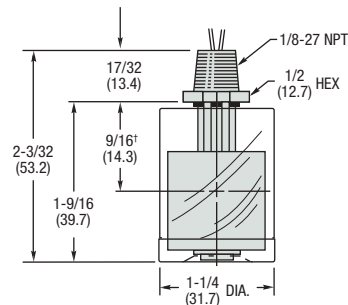
Compact, all-polypropylene switch with slosh shield is ideal for use with turbulent liquids in small tanks. FDA compliant materials.

**Part No. 76707
For Low Level**



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

in
(mm)



Order By Part Number	142545 ✓	76707 ✓
Materials		
Stem and Mounting	All Polypropylene (Including Shield ⁴)	All Polysulfone (Including Collar)
Float	Polypropylene (Solid)	Buna-N
Other Wetted	—	Epoxy
Min. Liquid Sp. Gr.	0.90	—
Operating Temperature	-40°F to +150°F (-40°C to +65.6°C)	-40°F to +180°F (-40°C to +82.2°C)
Maximum Pressure ³	150 psi (10.3 bar)	50 psi (3 bar)
Switch ¹ , SPST	20 VA, N.C./N.O. Dry ²	20 VA, N.C. Dry
Electrical Termination	22 AWG, 22" L., PVC Lead Wires	22 AWG, 72" L., PVC Lead Wires

Notes:

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

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

✓ Stock items.

Engineered Plastics Versions – Standard Size

- ▶ Temperatures to 280°F (139°C)
- ▶ Pressures to 150 psi (10.3 bar)
- ▶ Up to 19 feet (5.8 meters) of continuous visual indication

The 2" Schedule 80 pipe design is ideal for use on chemical storage tanks, or with almost any liquid where temperature and pressure requirements are moderate. All SureSite Indicators feature the same patented flag and guide assemblies used on our alloy versions, so you can be assured of excellent visibility and long-life reliability.

1. Mounting Configuration Types

To choose the best configuration for your application, focus on the process connections (connections where the liquid typically enters/leaves the SureSite).

	Type AP Top and Bottom Process Connections	Type BP Side and Side Process Connections	Type CP Top and Side Process Connections	Type DP Side and Bottom Process Connections
Typical Lengths*	C to C = L + 11" (279 mm) Overall Length = C to C	C to C = L + 8" (203 mm) Overall Length = C to C + 11" (279 mm)	C to C = L + 9.5" (241 mm) Overall Length = C to C + 5-1/2" (140 mm)	C to C = L + 9.5" (241 mm) Overall Length = C to C + 5-1/2" (140 mm)
Flag Indicator Material	Plastic			
Length of Indication, Max.	228" (579 cm)			

* Dimensional data varies due to connections, material and specific gravity.

Note: Additional materials, floats, connections and manufacturing techniques are available to extend lengths and operational capabilities. Please contact GEMS Sensors if the parameters above do not meet your requirements.



Type BP Shown

2. Material

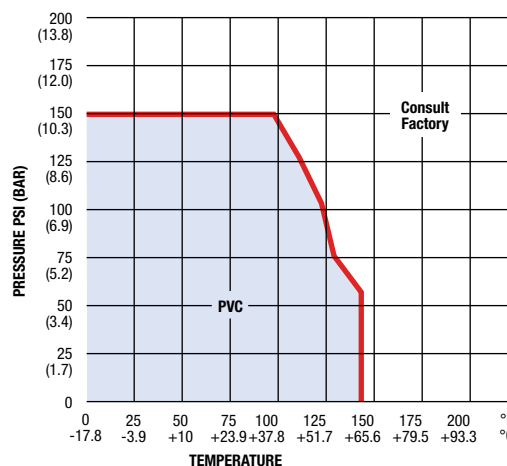
Select desired material from those tabulated below. Mark the Code Number on your Order! Check List. The pressure/temperature performance parameters are specified in the charts at right. Consult the factory with pressure/temperature requirements that fall outside the parameters shown here.

Materials	Code
Housing & Float	
PVC	1
Clear PVC Housing/ PVC Float	1A*

* 2" Schedule 40 pipe












= Stock Material
(Best economy and delivery).






Pressure/Temperature Performance














3. Connection Codes

(See complete descriptions below)

TOP 											
	Blind			NPT						Flange	
	Fixed		Removable	Fixed		Removable			Fixed		Removable
	T1	T2	T3	Female T4	Male T5	Male T6	T7	Female T9	T10	T11	
											

SIDE 				
	Blind	NPT		Flange
		Male	Female	
	S1	S2	S3	S4
				

BOTTOM 											
	Blind			NPT						Flange	
	Fixed		Removable	Fixed		Removable			Fixed		Removable
	B1	B2	B3	Female B4	Male B5	Male B6	B7	Female B9	B10	B11	
											

— Connection Codes and Materials background-shaded in this color are stocked by Gems. Select these connections where possible to obtain the most economical SureSite Indicators.

Connection Code Descriptions

Please provide all connections when completing the Order! Product Check List.

Note: Before selecting your connections, consider incorporating your vent and drain requirements.

T & B (Top and Bottom)

- T/B 1. Welded cap
- T/B 2. Threaded cap (PVC only)
- T/B 3. Fixed flange/blind mating flange
- T/B 4. Welded coupling/FNPT
- T/B 5. Welded coupling/MNPT
- T/B 6. Threaded union/MNPT
- T/B 7. Fixed flange/mating flange MNPT
- T/B 9. Fixed flange/mating flange/FNPT
- T/B 10. Welded coupling flange
- T/B 11. Threaded union flange

Sa & Sb (Sides)

- S1 – Blind–No Connection
- S2 – MNPT nipple
- S3 – FNPT coupling
- S4 – ANSI flange

Accessories – Pages D-17 to D-19

Make more of your SureSite® Indicator with the productivity-enhancing accessories found at the end of this section.

- **Indicating Scales**
Add graduations to your flag indication.
- **Switch Modules**
Control pumps, valves, alarms, etc. Mount externally on housing for infinite positioning.
- **Continuous Output Transmitters**
Signal conditioned for compatibility with most electronic instruments.

Alloy Versions—Miniature Size

- ▶ Lengths to over 20 feet (6.1 meters)
- ▶ 316 Stainless Steel construction
- ▶ Pressures to 400 psi (27 bar) – Temperature to 400°F (204°C)

Use these Mini SureSite Indicators where space is tight—they feature a diameter of only 1-1/4"! They can replace existing, antiquated sightglasses for excellent external, visual liquid level indication. Mini SureSite Indicators are ideal for use with clean, low viscosity liquids.

Typical Applications

- Pharmaceuticals • Medical Equipment • Food and Beverages
- Semiconductor Manufacturing • Boilers

1. Mounting Configuration Types

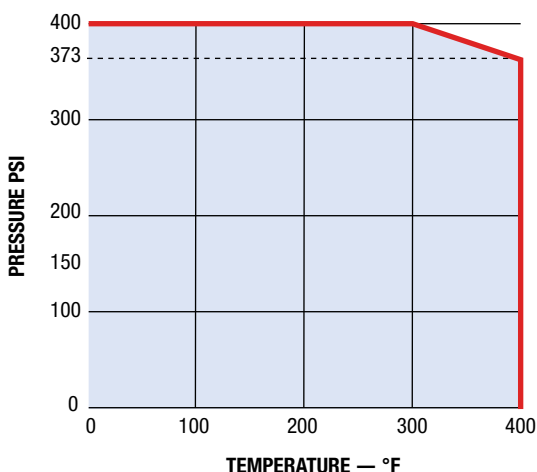
	Type AM	Type BM	Type CM	Type DM
	Top and Bottom Process Connections	Side and Side Process Connections	Top and Side Process Connections	Side and Bottom Process Connections
L = Length of Visual Indication				
Typical Lengths*	C to C = L + 7.72" (196 mm)	C to C = L	C to C = L + 3" (76 mm)	C to C = L + 5" (127 mm)
Flag Material	Plastic (300°F / 148.9°C) or Aluminum (400°F / 204°C)			
Length of Indication (Uninterrupted)	240" (610 cm)			

* Dimensions vary due to connections, material and specific gravity.

Note: Additional materials, floats, connections and manufacturing techniques are available to extend lengths and operational capabilities. Please contact Gems if the parameters above do not meet your requirements.

Miniature SureSite Performance

Gems configures Miniature SureSite Indicators, using various materials and fittings, to perform within the Pressure/Temperature parameters specified in the chart at right. Consult the factory with pressure/temperature requirements that fall outside the parameters shown here.



Note: SureSite Indicators are available for temperatures as low as -200°F (-129°C)

















ORDER IT!

Ordering is Easy! See Page D-6.
Easy online ordering too!



2. Connection Codes

(See complete descriptions below)

		Blind		NPT				Flange		Weld	
				Fixed		Removable					
		Fixed	Removable	Female	Male	Female	Male	Fixed	Removable	Socket Butt	Removable Butt
TOP  T	Standard Connections	 T1	 T10	 T2	 T3	 T11	 T12	 T19	 T20	 T18	 T13
	Sanitary Connections							 T7	 T8		
SIDE  Sa											
SIDE  Sb											
BOTTOM  B											

— Connection Codes and Materials background-shaded in this color are stocked by Gems. Select these connections where possible to obtain the most economical SureSite Indicators with a prompt 3-day delivery.

Note: Gems recommends a removable top and/or bottom connection for float access.

Connection Code Descriptions

Please provide all connections when completing the Order! Product Check List (located on the following page).

Note: Before selecting your connections, consider incorporating your vent and drain requirements.

T & B (Top and Bottom)

- T/B 1. Welded cap
- T/B 2. Welded cap with FNPT
- T/B 3. Welded cap with MNPT
- T/B 7. Sanitary flange
- T/B 8. Sanitary flange with mating blind flange
- T/B 10. Standard fixed flange/mating blind flange
- T/B 11. Standard fixed flange/mating FNPT reducing flange
- T/B 12. Standard fixed flange/mating flange with MNPT nipple
- T/B 13. Standard fixed flange/mating flange with butt weld nipple
- T/B 18. Welded cap with butt weld nipple
- T/B 19. Welded cap with ANSI flange
- T/B 20. Standard fixed flange/mating reducing flange spool with ANSI flange

Sa & Sb (Sides)

- S1. No connection
- S2. MNPT nipple
- S3. FNPT coupling
- S4. ANSI flange
- S5. Sanitary flange
- S6. Butt weld nipple



Performance Notes:

- As an option **either** the Switch Modules or Transmitter can be used on a Miniature SureSite Indicator - **Not Both**.
- Minimum specific gravity is 0.7.
- Standard O-ring seal material is Viton®. Others available upon request.
- Electropolished Outer Diameter (OD) and/or Inner Diameter (ID) housings available upon request.

Accessories – Pages D-13 to D-15

Make more of your SureSite® Indicator with the productivity-enhancing accessories found at the end of this section.

- Indicating Scales**
Add graduations to your flag indication.
- Switch Modules**
Control pumps, valves, alarms, etc. Mount externally on housing for infinite positioning.
- Continuous Output Transmitters**
Signal conditioned for compatibility with most electronic instruments to 300°F (149°C).

865 Series – Very Low Differential Pressure Transducers

- ▶ For Air or Non-Conductive Gas
- ▶ 0.25 to 100 Inches in W.C.(differential)/
±0.1 to ±50 Inches in W.C. (bidirectional)
- ▶ High Proof Pressure

The 865 Series are very low-pressure transducers for ranges as low 0.25" W.C. and feature ±1% full scale static accuracy. Primarily used in Building Energy Management, these transducers are capable of measuring pressures and flows with the accuracy necessary for proper building pressurization and air flow control. 865 Series transducers utilize an all-stainless steel micro-tig welded sensor that allows up to 10 psi overpressure (in either direction) with no damage to the unit. All sensor components have thermally matched coefficients, which promote improved temperature performance and excellent long-term stability.

Common Specifications

Input	
Pressure Range	0.25" to 100" WC
Proof Pressure	10 psi (700 mbar)
Fatigue Life	10 psi, max. (700 mbar)
Performance	
Supply Voltage (Vs)	9-30 VDC
Accuracy	±1.0% FS (Standard); .4% & .25% versions available
Thermal Error Zero	±0.033% FS/°F (±0.06% FS/°C)
Thermal Error Span	±0.033% FS/°F (±0.06% FS/°C)
Compensated Temperatures	0°F to +150°F (-18°C to +65°C)
Operating Temperatures	0°F to +150°F (-18°C to +65°C)
Storage Temperatures	-40°F to +185°F (-40°C to +85°C)
Zero Tolerance	1% (.5% for high accuracy option)
Span Tolerance	1% (.5% for high accuracy option)
Mechanical Configuration	
Pressure Port	1/4" Fitting
Wetted Parts	Stainless Steel and Glass-Filled Polyester
Electrical Connection	Screw Terminal Strip
Enclosure	Fire Retardant Glass-Filled Polyester; Option A1 Conduit Enclosure Available
Approvals	CE
Weight	3 oz

Individual Specifications

Voltage Output Units	
Output	0-5 VDC (see ordering chart)
Min. Load Resistance	5000 kohms
Current Output Units	
Output	4-20 mA (2 wire)
Max. Loop Resistance	(Vs-9) x 50 ohms



Applications

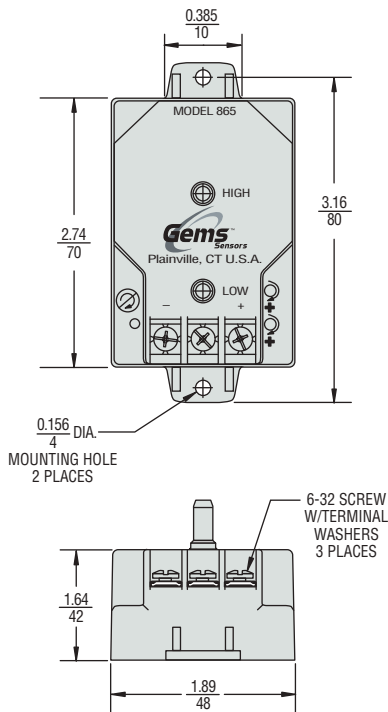
- HVAC
- Energy Management Systems
- Variable Air Volume and Fan Control (VAV)
- Environmental Pollution Control
- Static Duct and Clean Room Pressures
- Oven Pressurization and Furnace Draft Controls

How They Operate

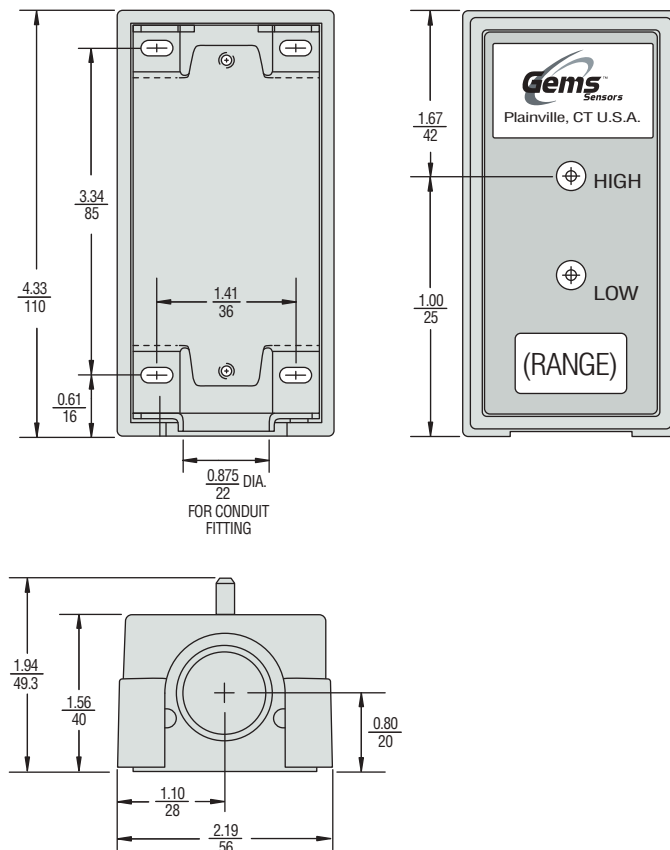
A tensioned stainless steel diaphragm and insulated stainless steel electrode, positioned close to the diaphragm, form a variable capacitor. Positive pressure moves the diaphragm toward the electrode, increasing the capacitance. A decrease in pressure moves the diaphragm away from the electrode, decreasing the capacitance. The change in capacitance is detected and converted to a linear DC electrical signal by Gems' unique electronic circuitry.

Dimensions

Standard 865 Series



Optional Conduit Enclosure – Code A1



How to Order

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

SELECT

Series
8651 - 865 Series

Pressure Range Code

Unidirectional		Bidirectional	
Code	Range (Inches W.C.)	Code	Range (Inches W.C.)
R25WD	0 to 0.25	OR1WB	±0.1
OR5WD	0 to 0.5	R25WB	±0.25
001WD	0 to 1.0	OR5WB	±0.5
2R5WD	0 to 2.5	001WB	±1.0
005WD	0 to 5.0	2R5WB	±2.5
010WD	0 to 10.0	005WB	±5.0
025WD	0 to 25.0	010WB	±10.0
050WD	0 to 50.0	025WB	±25.0
100WD	0 to 100.0	050WB	±50.0

Output
11 - 4-20 mA (9-30 VDC excitation)
2B - 0-5 VDC (9-30 VDC excitation)

8651 - OR5WD - 2B - T1 - C

Accuracy

C - ±1% FS (Standard)

Options:

E - ±0.4% FS – Calibration Certificate supplied

F - ±0.25% FS – Calibration Certificate supplied

G - ±1% FS – Calibration Certificate supplied

Electrical Connection

T1 - Terminal Strip

A1 - Supplied with Optional 7/8" Knock-Out Hole for 1/2" Conduit Enclosure

1200 Series / 1600 Series – OEM Transducers Featuring Exceptional Proof Pressure and Stability Specifications

- ▶ Gauge, Vacuum, and Compound Pressure Models
- ▶ General Purpose and Wash down Enclosures
- ▶ High Proof Pressure Achieved by Thicker Diaphragm Construction
- ▶ Voltage and Current Output Models

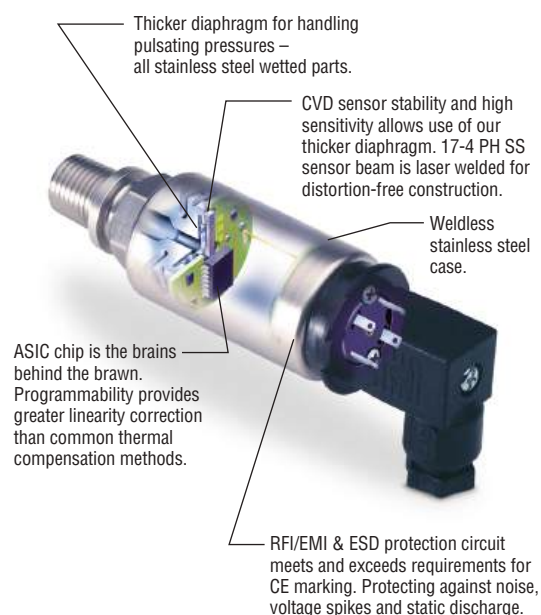
The 1200 Series features stability and toughness via its CVD and ASIC design coupled with a thicker diaphragm. The thicker diaphragm enables these sensors to survive most pressure spikes caused by pump ripple, solenoid valves, etc. The 1600 Series extends the packaging options by providing an all welded stainless steel back end for demanding industrial applications. A modular design allows special ordering of fittings, electrical cables, etc. for OEM applications. The ASIC and CVD technology enables Gems to offer almost any output over any pressure range.

Specifications

Input	
Pressure Range	Vacuum to 6000 psi (400 bar)
Proof Pressure	4 x Full Scale (FS) (<1% FS Zero Shift)
Burst Pressure	>35 x FS <= 60 psi (4 bar); >20 x FS <= 600 psi (40 bar); >5 x FS <= 6000 psi (400 bar)
Fatigue Life	Designed for more than 100 million FS cycles
Performance	
Supply Voltage Sensitivity	0.01% FS/Volt
Long Term Drift	0.2% FS/year (non-cumulative)
Accuracy	0.5% FS typical
Thermal Error	2.0% FS typical
Compensated Temperatures	-5°F to +180°F (-20°C to +80°C)
Operating Temperatures	-40°F to +260°F (-40°C to +125°C) for elec. codes A, B, C, 1 -5°F to +180°F (-20°C to +80°C) for elec. codes 2, D, G, 3 -5°F to +125°F (-20°C to +50°C) for elec. code F temperatures >100°C supply is limited to 24 VDC
Zero Tolerance	1% of span
Span Tolerance	1% of span
Response Time	0.5 ms
Mechanical Configuration	
Pressure Port	see ordering chart
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	see ordering chart
Enclosure	316 SS, 17-4 PH ss IP65 NEMA 4 for elec. codes A,B,C,D,G,1,2,3 IP67 for elec. codes F IP30 for elec. code "3" with flying leads
Vibration	70g, peak to peak sinusoidal, 5 to 2000 Hz (Random Vibration: 20 to 200 Hz @ ≈20g Peak per MIL-STD.-810E Method 514.4)
Acceleration	100g steady acceleration in any direction 0.032% FS/g for 15 psi (1 bar) range decreasing logarithmically to 0.0007% FS/g for 6000 psi (400 bar) range.
Shock	20g, 11 ms, per MIL-STD.-810E Method 516.4 Procedure I
Approvals	CE, UR
Weight	approx. 100 grams (additional; cable 75 g/m)



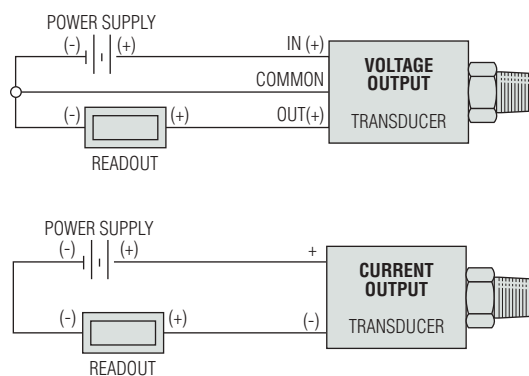
Along with the superiority of the CVD strain gauge, Psibar® transducers incorporate components to leverage the sensing element's strength. The output is a product with a unique balance of performance and value unmatched in today's pressure sensing market.



Individual Specifications

Voltage Output units	
Output	See ordering chart
Supply Voltage (Vs)	1.5 VDC above span to 35 VDC
Min. Load Resistance	(FS output / 2) Kohms
Current Output units	
Output	4-20 mA (2 wire)
Supply Voltage (Vs)	24 VDC, (7-35 VDC)
Max. Loop Resistance	(Vs-7) x 50 ohms

Electrical Connection Cable		Voltage Units				Current Units (4-20 mA)			
		IN+	COM	OUT+	EARTH	(+)	(-)	EARTH	
A, B, G	“DIN”	PIN	1	2	3	4	1	2	4
C	“10-6 Bayonet”	PIN	A	C	B	E	A	B	E
D	“cable”		R	BK	W	DRAIN	R	BK	DRAIN
F	“IP 67 cable”		R	BK	W	DRAIN	R	BK	DRAIN
1	“8-4 Bayonet”	PIN	A	C	B	D	A	B	D
2	“cable”		R	BK	W	DRAIN	R	BK	DRAIN
3	“conduit & cable”		R	BK	W	DRAIN	R	BK	DRAIN



Cable Legend:

R = Red
BL = Blue
BK = Black
W = White
Y = Yellow

Electromagnetic Capability

Meets the requirement for CE marking of EN50081-2 for emissions and EN50082-2 for susceptibility.

Test Data:

- EN61000-4-2 Electrostatic Discharge. 8kV air discharge, 4kV contact discharge. Unit survived.
- ENV50140 Radiated RF Susceptibility. 10V/m, 80MHz-1GHz, 1kHz mod. Maximum recorded output error was $\leq \pm 1\%$
- ENV50204 Radiated RF Susceptibility to Mobile Telephones. 10V/m, 900MHz. Maximum recorded output error was $\leq \pm 1\%$.
- EN61000-4-4 Fast Burst Transient. 2kV, 5/50ns, 5kHz for 1 minute. Unit survived.
- ENV50141 Conducted RF Susceptibility. 10Vms, 1kHz mod, 150kHz - 80MHz. Maximum recorded output error was $\leq \pm 1\%$

Table 1 - Cable Length

Code	Length (M)	Code	Length (M)
U	No Cable Fitted	M	40
D	1	N	50
E	3	P	75
F	5	Q	100
G	10	R	125
H	15	S	150
J	20	4	170
K	25	5	200
L	30	6	225

Monitor Liquid Level with Gems Psibar® Pressure Transducers

- ▶ Continuously Monitor Liquid Levels
- ▶ Stainless Steel Wetted Parts are Compatible With Most Fluids
- ▶ Mount Through Top or Side of Tanks

Gems Psibar® pressure transducers provide a great, cost-effective method for measuring liquid levels. From measuring inventories in process storage tanks to monitoring hot water feed tanks, our design flexibility promotes easy installation, with mounting either through the tank top or from the side.

Getting Started...

Tank content is determined from the pressure exerted on the sensor, so you need to know the depth **and** the specific gravity of the liquid being measured. When these two factors are known, the following equation can be used to determine the pressure range needed to specify an applicable pressure transducer:

$$\text{Pressure in PSI} = \text{Liquid Level (in feet)} \times (\text{Specific Gravity} \times 0.433)$$

Example:

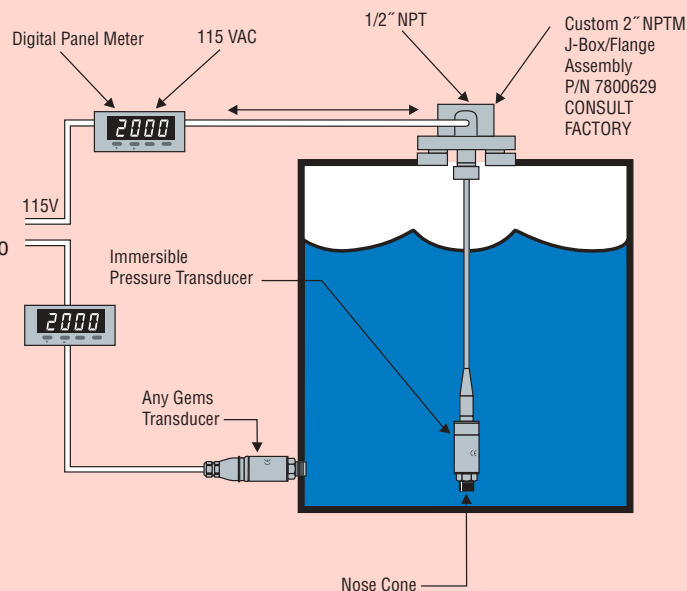
Tank Level:

$$\text{Pressure in PSI} = \text{Liquid Level (in feet)} \times (\text{Specific Gravity} \times 0.433)$$

$$\text{Pressure in PSI} = 30 \times (1.0 \times 0.433)$$

$$\text{Pressure in PSI} = 12.99 \text{ PSI}$$

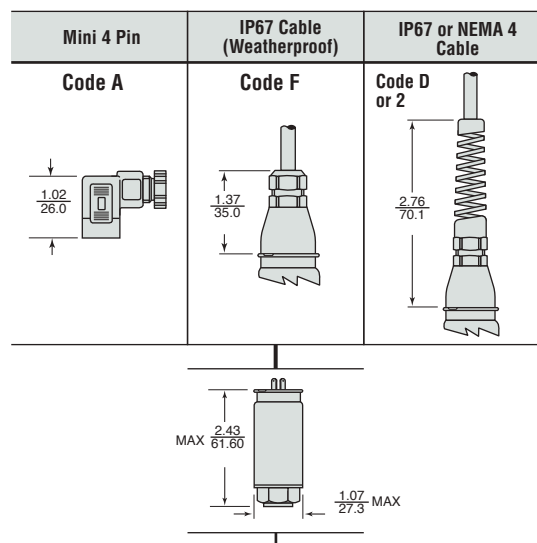
Using a Psibar Series 1200, 1600, 2200 or 2600 transducer, specify Pressure Range code **F15** (0-15 PSI).



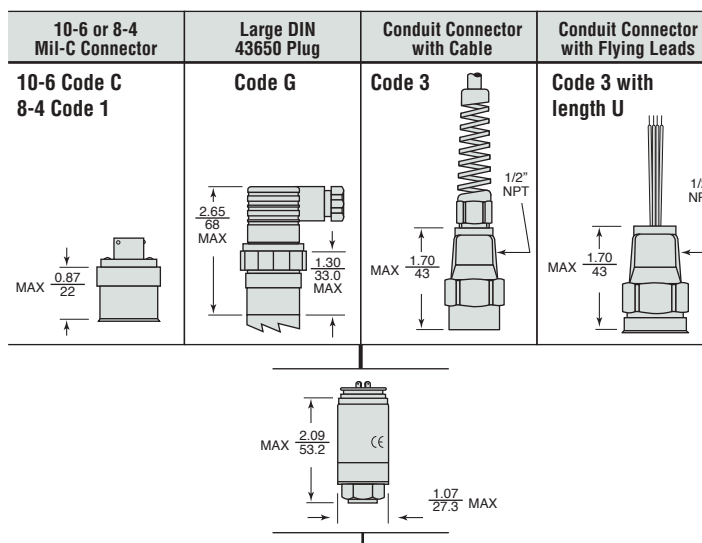


Dimensions

1200 Series



1600 Series



1/8 NPT	1/4-18 NPT	1/4-18 NPT Internal	1/2-14 NPT	7/16 - 20 UNF-2A (SAE J514)	9/16-18 UNF-2A	G 1/8	G1/4 External	R 1/4
Code 08	Code 02 (0J with snubber)	Code 0E	Code 0H	Code 04	Code 1P	Code 09	Code 01	Code 0A

How to Order

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

Series	1600	B	G	A60	01	D	3	D	A	Performance Code
1200	1600									Cable Length ¹
Output	B - 4-20mA C - 1-6V D - 1-11V H - 1-5V	J - 0.5-5.5V R - 0-5V S - 0-10V								U - None D - 1m (3ft) E - 3m (9ft) F - 5m (16ft) G - 10m (32ft)
Datum	G - Gauge									Apparatus Protection
Pressure Range ³ - psi	F15 - 0-15 F30 - 0-30 F60 - 0-60 G10 - 0-100 G15 - 0-150 G20 - 0-200 G30 - 0-300 G50 - 0-500	G60 - 0-600 H10 - 0-1.000 H15 - 0-1.500 H20 - 0-2.000 H30 - 0-3.000 H40 - 0-4.000 H50 - 0-5.000 H60 - 0-6.000	Vac = -15 psi 1F5 - Vac-0 3F0 - Vac-15 6F0 - Vac-45 1G0 - Vac-135 1G5 - Vac-135 2G0 - Vac-185 3G0 - Vac-285							Electrical Connection
Pressure Range ³ - bar	A10 - 0-1 A16 - 0-1.6 A25 - 0-2.5 A40 - 0-4 A60 - 0-6 B10 - 0-10 B16 - 0-16	B25 - 0-25 B40 - 0-40 B60 - 0-60 C10 - 0-100 C16 - 0-160 C25 - 0-250 C40 - 0-400	Vac = -1 bar 1A0 - Vac-0 1A6 - Vac-0.6 2A5 - Vac-1.5 4A0 - Vac-3 6A0 - Vac-5 1B0 - Vac-9 1B6 - Vac-15 2B5 - Vac-24 4B0 - Vac-39							1200 Series A - Mini Din with mate B - Mini Din without mate F - IP67 Weatherproof Cable Gland ² 2 - NEMA 4 Cable ²
										1600 Series C - 10-6 Mil C Connector 1 - 8-4 Mil C Connector G - Large DIN 43650 Plug 3 - Conduit Connector with 1 Meter Leads (for cable specify length code)
										European Threads 08 - G 1/8 Internal 09 - G 1/8 Internal 01 - G 1/4 External 0A - R 1/4 External
										Pressure Port 08 - 1/8-27 NPT External 02 - 1/4-18 NPT External 0J - 1/4 NPT External w/snubber 0E - 1/4 NPT Internal 0H - 1/2-14 NPT External 04 - 7/16-20 External (SAE #4, J514) 1P - 9/16-18 External (SAE #6, J1926-2) 1J - 7/16-20 External (SAE #4, J1926-2)

Notes:

- When electrical connection is cable please select a cable length from Table 1 (opposite page). When electrical connection is DIN or plug style "U" must be specified.
- Electrical Connections "F" and "2" are 24AWG, Shielded, PVC Cable.
- Additional Pressure Ranges are available. Please consult factory.

PS61 – OEM Subminiature Pressure Switch

- ▶ 10 to 4,350 psi (0.7 to 300 bar)
- ▶ Exceptional Size-to-Pressure-Range Ratio
- ▶ Perfect for Demanding Applications

Available with enhanced ingress protection and integral electrical connections. These subminiature pressure switches are suitable for a wide range of hydraulic and pneumatic applications including medical, general industrial, fire suppression, and off highway vehicle.

Specifications

Switch*	100 VA Max.
Repeatability	See Table 2
Deadband	See Table 2
Wetted Parts (Pressure Range Codes 10-60)	
Diaphragm	Low-Temp Nitrile (optional FKM, FVMQ [Fluorosilicone] or EPDM)
Fitting	Zinc-Plated Steel (316 L Stainless Steel available)
Wetted Parts (Pressure Range Codes 70-100)	
Seal	Internally Lubricated Nitrile (optional FKM or EPDM)
Piston	Hardened alloy steel
Bearing	Proprietary plastic resistant to almost all chemicals
Fitting	Zinc-Plated Steel
Temperatures	
Fluid	See Table 1
Ambient	-40°F to +250°F (-40°C to +121°C)
Storage	-65°F to +275°F (-54°C to +135°C)
Vibration	
Sinusoidal	MIL-STD-202G, Method 204D, 173m ² /sec, 91-2000Hz, 8 hours/axis
Random	MIL-STD-202G, Method 214A, 146m ² /sec, 5-2000 Hz, 8 hours/axis
Shock, Operating	MIL-STD-202G, Method 213B, 500m ² /sec, 18X
Salt Spray	ASTM B117, 95°F (35°C) for 96 hours
Thermal Shock	-40°F to +250°F (-40°C to +121°C), 1 hour dwells, 1 minute change, 15 cycles
Life Cycle**	2 MM cycles with checks every 250k for all 10 pressure ranges. Range 10-40: 0 - 500 - 0 PSI @ ~1Hz Range 40-60: 0 - 3000 - 0 PSI @ ~1Hz Range 70-100: 0 - 6000 - 0 PSI @ ~1Hz
Approvals	CE, RoHS

* Gold contacts (option G) may be required for less than 12 VDC and 20 mA.

** Contact Factory for life cycle on FVMQ (Fluorosilicone) diaphragm option.

Electrical Connectors

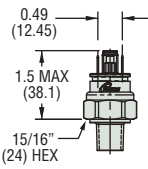
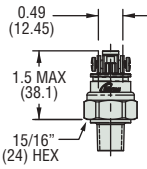
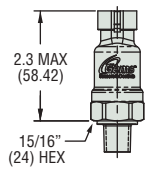
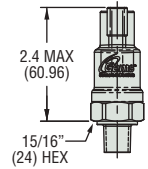
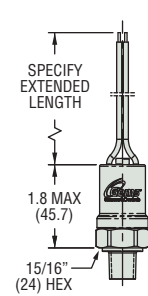
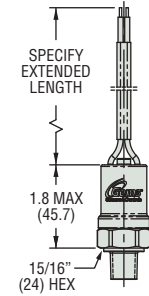
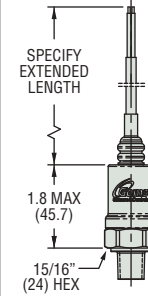
	1/4" Spade	6-32 Terminal Screws	Amp Superseal 1.5	Deutsch DT04-2P	Flying Leads	Flying Leads with Shrink Tubing	Cable
							
Ingress Protection	IP00		IPX7 Per IEC 60529 (1 Meter Submergence) IPX9K Per DIN40050-9 (High Pressure/High Temperature Washdown) IP6KX Per DIN40050-9 (Inorganic Dust Intrusion)				



Table 1 – Recommended Fluid Temperature Limits

Seal Material	Range
Nitrile (Pressure Range Codes 10-60)	-22°F to +250°F (-30°C to +121°C)
FVMQ (Pressure Range Codes 10-40)	-40°F to +250°F (-40°C to +121°C)
Nitrile (Pressure Range Codes 70-100)	15°F to 250°F (-9°C to +121°C)
FKM (All Ranges)	0°F to 250°F (-18°C to +121°C)
EPDM (All Ranges)	-10°F to +250°F (-23°C to +121°C)

Notes:

- Switches may function below the cold temperature limit but the set points and deadband will increase. Consult factory for details.
- Temperature performance is dependent on set point and fluid viscosity (fluids must remain free flowing liquids for Ranges 70-100).
- Ranges 70-100 not recommended for use with gases.

How To Order

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

PS61 **-10** **-4MNZ** **-A** **-SP** **-X-X-XX**

1
2
3
4
5

① Pressure Range Code

Insert Pressure Range Code from Table 2, below.

② Pressure Fitting¹

12L14 Zinc-Plated Steel

-2MNZ=1/8" NPT Male

-4MNZ=1/4" NPT Male

-2MGZ=1/8-28 BSPP; ISO 228-G 1/8 B

(Pressure Range Codes 10-60 Only)

-4MGZ=1/4-19 BSPP; ISO 228-G 1/4 B

-4MSZ=7/16"-20 SAE J1926-2

-6MSZ=9/16"-18 SAE J1926-2

-M10Z=M10 x 1.0 ISO 6149-2

-M12Z=M12 x 1.5 ISO 6149-2

-M14Z=M14 x 1.5 ISO 6149-2

316 Stainless Steel (Range 10-60 Only²)

-2MNS=1/8" NPT Male

-4MNS=1/4" NPT Male

-4MGS=1/4-19 BSPP; ISO 228-G 1/4 B

-4MSS=7/16"-20 SAE J1926-2

-6MSS=9/16"-18 SAE J1926-2

③ Circuit

-A=SPST/N.O.

-B=SPST/N.C.

④ Electrical Termination

-SP=2x 1/4" x 1/32" Spade, Factory Set or Adjustable³

-TS=6-32 Terminal Screws, Factory Set or Adjustable³

-SS=Amp Superseal 1.5 Integral Male, Factory Set

-DT=Deutsch DT04-2P Integral Male, Factory Set

-FLAXX=18 AWG Flying Leads⁴, Adjustable³

-FLFXX=18 AWG Flying Leads⁴, Factory Set

-FLSAXX=18 AWG Flying Leads w/PVC Shrink Tubing⁴, Adjustable³

-FLSFXX=18 AWG Flying Leads w/PVC Shrink Tubing⁴, Factory Set

-CABXX=18 AWG PVC Cable⁵, Factory Set

⑤ Options

-V=FKM

-E=EPDM

-F=FVMQ (Fluorosilicone; Pressure Range Codes 10-40 Only)⁶

-G=Gold Contacts

-OF=Oil Free Cleaned (Pressure Range Codes 10-60 Only; Stainless Steel Housing Required)

-RB=Rubber Boot (Shipped Loose)

-WF=Weather Pack Connector, Female P/N 12015792

-WM=Weather Pack Connector, Male P/N 12010973

-DE=Deutsch Connector, Male P/N DT04-2P-E003

-FS=Factory Set Specify Value & Rising/Falling

Notes:

1. Other fittings and materials available. Consult factory.
2. Consult factory for use with Pressure Range 70-100.
3. Use a Security hex key, 5/32" or 4mm, to adjust set point. (Tamper-resistant hex bit available as Gems P/N 249230)
4. 18" is standard. Specify lead length in inches (max. 48"). e.g. -FLA18 or -FLF30.
5. 36" is minimum. Specify cable length in inches. e.g. -CAB36 or -CAB120.
6. Consult factory for life cycle information.

Table 2 – Pressure Range Codes

Pressure Range Code	Style	Recommended Media	Pressure Range	Repeatability*	Average Deadband**	Proof Pressure	Burst Pressure
10	Diaphragm	Liquids & Gases	10-60 psig (.7-4.1 bar)	±1.5 psi (0.10 Bar) +3% of setting	12% of setting	6,000 psi (414 bar)	9,000 psi (620 bar)
20			40-150 psig (2.8-10.3 bar)	±2.5 psi (0.17 Bar) +3% of setting	13% of setting		
30			75-275 psig (5.2-19 bar)	±3.75 psi (0.26 Bar) +3% of setting	13% of setting		
40			150-500 psig (10.3-34.5 bar)	±5 psi (0.34 Bar) +3% of setting	14% of setting		
50			275-800 psig (19-55.1 bar)	±8 psi (0.55 Bar) +3% of setting	15% of setting		
60			400-1,350 psig (27.6-93 bar)	±13 psi (0.90 Bar) +3% of setting	17% of setting		
70	Piston	Liquids	510-1,235 psig (35-85 bar)	±30 psi (2.1 Bar) +4% of setting	14% of setting	7,000 psi (483 bar)	22,000 psi (1517 bar)
80			800-1,960 psig (55-135 bar)	±48 psi (3.3 Bar) +4% of setting	17% of setting		
90			1,835-3,115 psig (125-215 bar)	±110 psi (7.6 Bar) +6% of setting	21% of setting		
100			2,970-4,350 psig (205-300 bar)	±190 psi (13.1 Bar) +6% of setting	24% of setting		

* Repeatability and set point of units will vary depending on temperature, fluid viscosity, cycle rate and ramp rate. Repeatability values are based on room temperature. Long term inactuation will lead to a higher initial set point reading due to the non-linear behavior of the elastomer diaphragms or seals. Fluids with low and stable viscosities over the expected temperature range will exhibit better performance.

** Deadband values are an approximation at room temperature with nitrogen or compressed air (Ranges 10-40) or a 100 Cp fluid (Ranges 40-100). At lower temperatures and/or higher fluid viscosities the deadband will be much larger than the value shown. At high fluid temperature and a rapid cycle rate, the deadband may be lower than the approximations given. Please consult the factory if specific statistical analysis is required.

Large Size – Engineered Plastics

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

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

LS-74780 –
All CPVC



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

LS-1900TFE



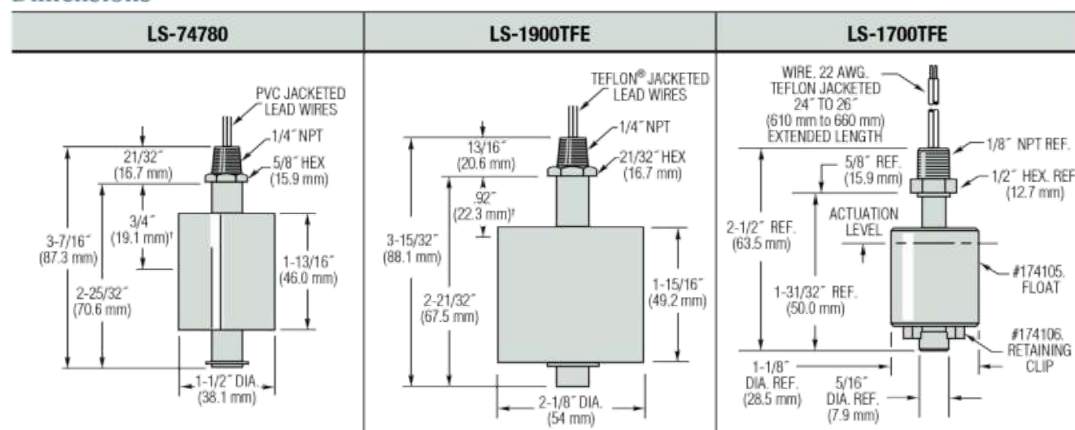
Resists build-up of foreign material or sticky media. Float travel remains uninhibited in viscous or corrosive liquids. SPDT switch.

LS-1700TFE



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

Dimensions



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

Common Specifications

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

(Jacket material is indicated on dimensional drawings, above).

RoHS: In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

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

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

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

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

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

⚡ — Stock Items.

Series 16 Modules Controls – Solid State Plug-In Modules

- ▶ Compact Size
- ▶ Modular Plug-in Design
- ▶ Various Time Delays
- ▶ Low Voltage Sensor
- ▶ Solid State Reliability
- ▶ LED Monitoring
- ▶ U.L. "Motor Control"

Series 16M – General Purpose Control

- New Microprocessor Design

Designed for either differential or single-level service. U.L. "Motor Controller" listing, 8 pin socket with screw-type connections make the unit easy to install and service. Sensitivity of up to 1 million ohm/cm.

Series 16HM – High Sensitivity Control

Series 16HM is similar to Series 16M but provides higher sensitivity up to 5.5 million ohm/cm. Probe voltage is 12 VDC for applications with low conductive media.

Series 16DM – DPDT Load Contact

Similar to Series 16M but with DPDT load contacts. Eliminates the need for slave relays. 11 pin octal plugs. Requires little panel space. General purpose single-level or differential applications. U.L. listed.

Series 16VM – Field Selectable Sensitivity

Similar to Series 16M but with the added flexibility of field adjustable sensitivity, made possible through external setpoint resistors. Uses 11pin octal socket. U.L. listed.

Specifications

Contact Design	
Series 16M & 16HM	1 N.O. & 1 N.C. (1 form C)
Series 16DM	2 N.O. & 2 N.C. (2 form C)
Series 16VM	1 N.O. & 1 N.C. (1 form C)
Contact Rating (120, 240 VAC)	
Series 16M & 16HM	10 amp Resistive 1/3 hp
Series 16DM	5 amp Resistive 1/10 hp
Series 16VM	10 amp Resistive 1/3 hp
Mode of Operation	Direct/Inverse, factory set
Sensitivity	
Series 16M	0-1M ohm, factory set
Series 16HM	0-5.5M ohm, factory set
Series 16DM	0-1M ohm, factory set
Series 16VM	0-1M ohm, field adjustable
Primary Voltage	
	24 VAC, 120 VAC, 240 VAC (+10%/-15%)
	208/240: 187 V min. to 255 V max. VAC 50/60 Hz
Secondary Voltage	
Series 16M	12 VAC, 1.5 mA
Series 16HM	12 VDC
Series 16DM & 16VM	12 VAC, 1.5 mA
Temperature	
	-40°F to +150°F (-40°C to +65°C)
Approvals	
	U.L. 508 File #E44426
Terminal Style	
	Screw connector
Options	
	Time Delays



Series 16M/16HM

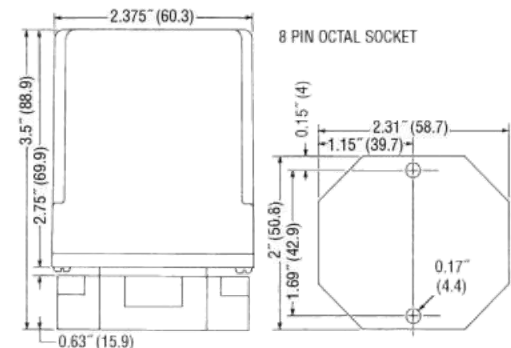
Series 16DM/16VM

Applications

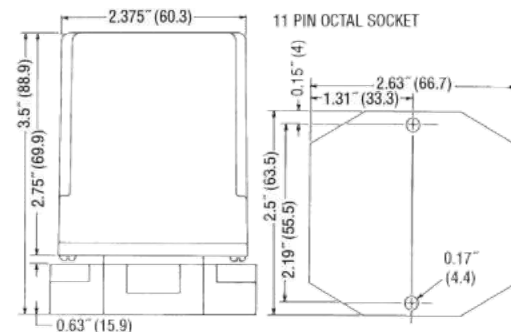
- Single-Level Service
- Point Level
- Valve Control
- Differential Service
- Alarms
- Pump Control

Dimensions

Series 16M & 16HM



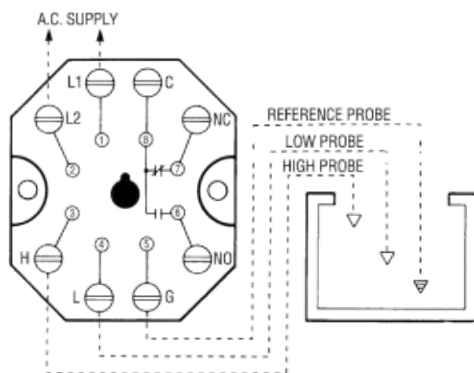
Series 16DM & 16VM



Note: Controls also available with DIN mount socket.

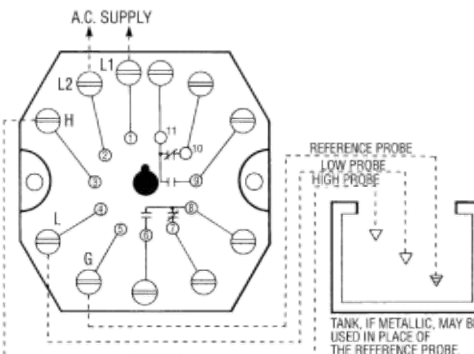
Wiring

Series 16M & 16HM

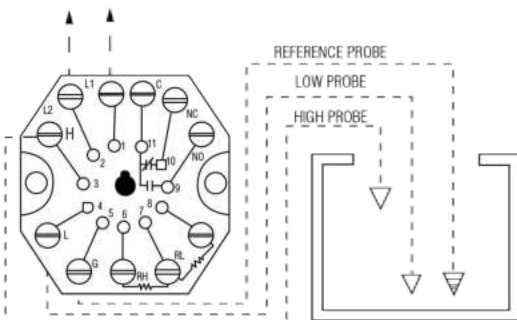


Note: For single level service, use "H" and "G" connections.

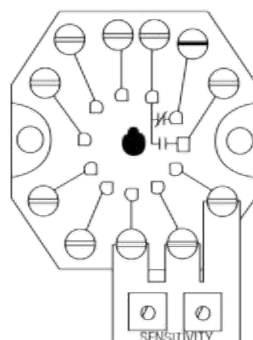
Series 16DM



Series 16VM



Variable Sensitivity Option



Part number 16Z1VG Potentiometer Board available for 16VM only. Consult factory.

How to Order

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

16M Series – Microprocessor Version

- Series **16M** X X X X X XX XX
- Mode of Operation **Direct** Inverse
A – 4.7K **E** – 100K **K** – 4.7K **P** – 100K
B – 10K **F** – 470K **L** – 10K **R** – 470K
C – 26K **G** – 1M **M** – 26K **S** – 1M
D – 50K **N** – 50K
- Supply Voltage **1** 120 VAC; **2** 240 VAC; **3** 24 VAC; **8** 208/240 VAC
- Socket Style* **A** 8 Pin Octal **M** Module Only
B 8 Pin DIN
- Enclosure **0** None; **1** NEMA 1; **4** NEMA 4
- Time Delay (increasing level) Option **00-90** seconds
Blank 0 seconds
- Time Delay (decreasing level) Option **00-90** seconds
Blank 0 seconds
- Time Out Option See page E-11, Chart A

*See page E-11 for descriptions.

16 HM, 16DM or 16VM Series

- Series **16HM** X X X X XX XX
- Mode of Operation² **Direct** Inverse
A – 4.7K⁴ **F** – 470K⁴ **K** – 4.7K⁴ **R** – 470K⁴
B – 10K⁴ **G** – 1M⁴ **L** – 10K⁴ **S** – 1M⁴
C – 26K⁴ **H** – 3M³ **M** – 26K⁴ **T** – 3M³
D – 50K⁴ **J** – 5.5M³ **N** – 50K⁴ **W** – 5.5M³
E – 100K⁴ **Y** – 0-700K^{5,7} **P** – 100K⁴ **Z** – 0-700K^{5,7}
- Supply Voltage **1** 120 VAC; **2** 240 VAC; **3** 24 VAC; **8** 208/240 VAC
- Socket Style **A** 8 Pin Octal (16M & 16HM), 11 Pin Octal (16DM & 16VM);
B DIN Mount; **M** None, Module Only⁶
- Enclosure **0** None; **1** NEMA 1; **4** NEMA 4
- Time Delay (increasing level) Option **01-20** seconds; **0V** variable (16VM only)
- Time Delay (decreasing level) Option **01-20** seconds; **0V** variable (16VM only)

Notes:

- 16VM select modes **A**, **K**, **Y** or **Z** only.
- 16HM & 16DM only. Series 16VM includes full set of the resistors listed above. Specify a sensitivity to determine mode of operation.
- 16VM only.
- All Series except 16HM.
- 16VM only.
- Socket style M requires enclosure **0** – None.
- Mounting style A (11 pin octal only)

Socket Details and Option Availability are located on web site.

LWC-800 Series Low Level Cut Off Control

- ▶ External Mounting
- ▶ Meets CSD1 Requirements
- ▶ U.L. Recognized "Limit Control"
- ▶ Compact Size
- ▶ Options Include: Manual Reset, Power Outage Feature, and Test Feature

Gems LWC-800 is designed for boiler low-water cutoff protection, and offers the most compact package for boiler and steam generators. For added safety, the sensor assembly incorporates redundant reed switches at the actuation level. The LWC-800 Series is ideal for R.O., distilled, or deionized water systems.

Optional Features:

- Power Outage feature allows for resets after nuisance power outages;
- Reset Button feature to be used when device has been deactivated due to low water condition. A Reset is activated only after water has returned to normal level.

Specifications

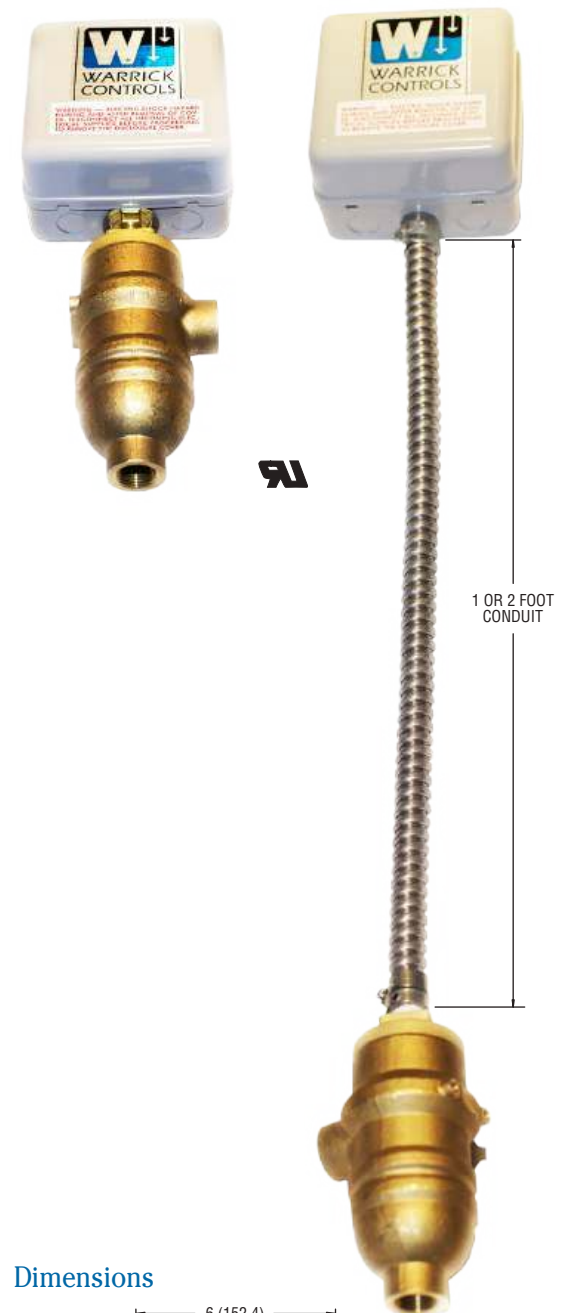
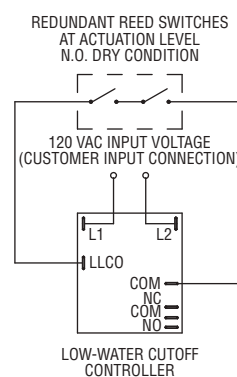
Wetted Materials	
Bottle Housing	Brass
Stem and Mounting	Brass
Float Assembly	316 Stainless Steel
O-Ring	Viton®
Retaining Ring	Beryllium Copper
Pressure Rating	150 PSI (1034 KPA)
Temperature Range	0°F to 305°F (-18°C to 151°C); 350°F (176°C) max. intermittent
Mounting Attitude	Vertical, J-Box Up
Controller	
Contacts	SPDT, Dry Contacts
Contact Ratings	10A @ 120/220/240 VAC Resistive (120°F/49°C) 1A @ 120, 208/240, 240 Resistive (150°F/66°C) 1/3 HP @ 120, 208/240, 240 VAC
Secondary Circuit	2.3 VAC RMS, <1 mA
Sensitivity	10K
Ambient Temperature	-40°F to +150°F (-40°C to +66°C)
Time Delay	0.5 Seconds on Rising Level
Approvals	UL Recognized per UL-353, Limit Controls (for supply voltages of 120 VAC or less)

How to Order

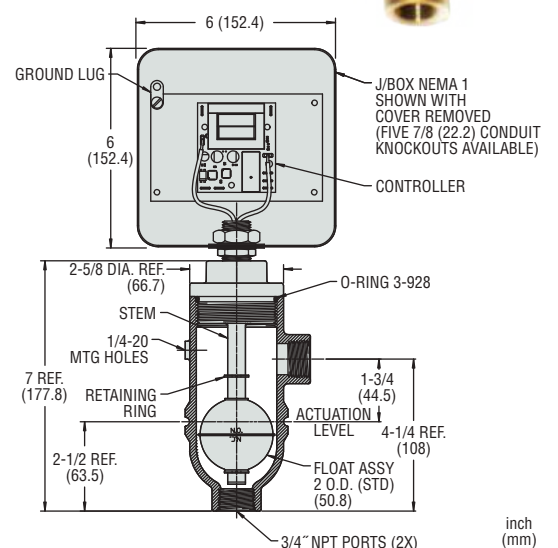
Specify Part Number based on configuration.

Description	Part Number
LWC-800 Integrated	243340
LWC-800 – 1-Foot Conduit	243345
LWC-800 – 2-Foot Conduit	243350

Switch Actuation



Dimensions



Series DC For Remote Applications

Series DC controls are designed for applications where only direct current power is available. DC units can be used as differential level controls or single point alarm contactors. Because of solid state reliability, plug-in convenience, and choice of 12 or 24 VDC supply voltage, Warrick DC controls can be used with confidence in many applications.

Contact Design	SPDT 1 N.O. & 1 N.C. (1 form C), non-powered contacts
Contact Rating	5 amp @ 30 VDC or 120 VAC Resistive 1/8 hp
Mode of Operation	Direct/Inverse, factory set
Sensitivity	0 - 1M ohm maximum, factory set
Primary Voltage	12 VDC, 24 VDC, negative ground ($\pm 20\%$)
Supply Current	40 mA when relay energized, 10 mA w/relay de-energized
Secondary Voltage	12 VDC
Terminal Style	Screw connector
Temperature	-50°F to +150°F (-46°C to +65°C)
Options	Time Delay



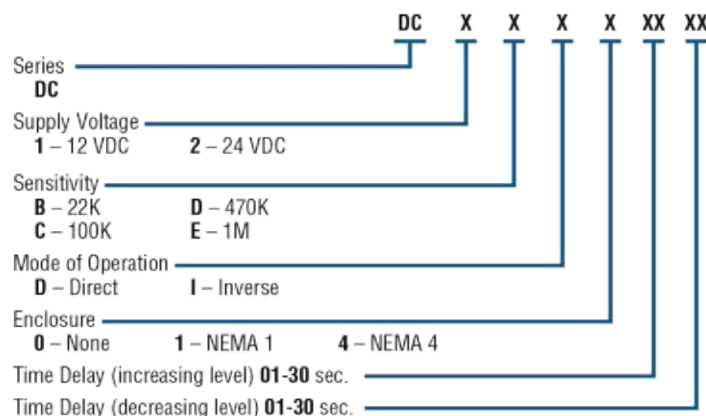
Series DC

Applications

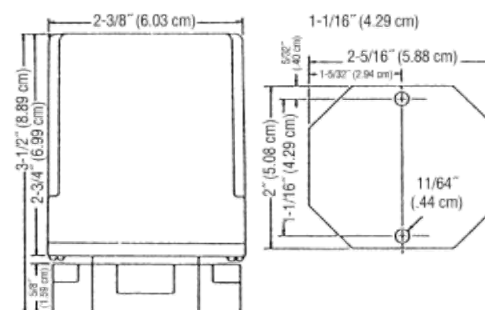
- Single and Differential Service
- Solar and Wind Powered Pumps
- Portable Cleaning Equipment
- Battery-Powered Level Control
- Well Pumps
- Remote Reservoirs
- Remote Irrigation
- Onboard Ship Level Control

How to Order

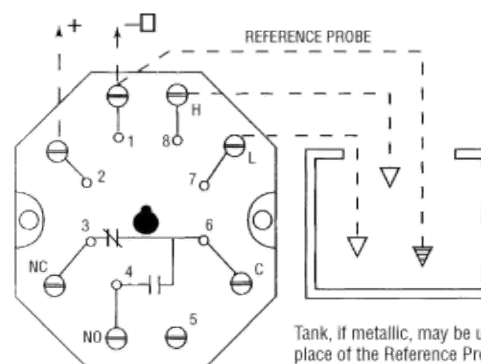
Use the **Bold** characters from the chart below to construct a product code.



Dimensions



Wiring



Tank, if metallic, may be used in place of the Reference Probe.

B-Cryo Series

- ▶ MOPD: 900 PSI (62 Bar)
- ▶ C_v Range: 0.045 to 0.440 (K_v Range: 0.038 to 0.374)
- ▶ 9 Watts

The B-Cryo Series is a 2-way miniature Cryogenic valve designed and built for service down to -320°F (-196°C) in applications needing a C_v between 0.045 and 0.440 (K_v between 0.038 and 0.374). Depending on your temperature requirements, the B-Cryo Series can be configured for liquid nitrogen (LN2), liquid carbon dioxide (LCO2), and other extreme temperature media. PTFE coated plungers, 316 Stainless Steel guide tubes and plunger springs, encapsulated coils, and Rulon® seat seals produce a truly robust Cryogenic valve for applications requiring high cycle life and media temperature control.

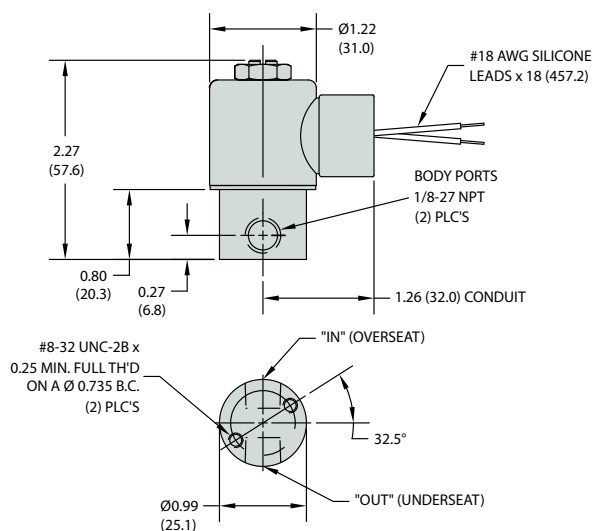
Typical Applications

- Environmental Chambers
- Food Processing
- Laser Surgical Equipment
- Semiconductor Manufacturing

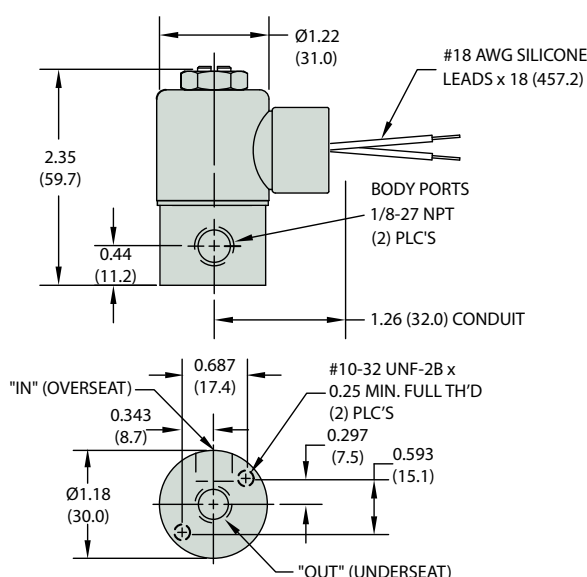


Dimensions

LN2-Liquid Nitrogen



LCO2-Liquid Carbon Dioxide



How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

B	C	20	05	-	01	LC	-	R	-	G6	-	203
Series	1	2	3		4	5		6		7		8
	Model	Function	MOPD		Body Material	Body Port		Seal Material		Coil Construction		Supply Voltage

Product Description from Example Shown Above:

BC2005-01LC-R-G6-203

BC2005 = **B Series** with LCO2 Model, 2-Way Normally Closed Valve **Function**; 405 **MOPD**

-01LC = 303 Stainless Steel **Body Material**; 1/8" NPT Female **Body Port**

-R = Rulon® **Seal Material** (Plunger Seal and Internal Teflon Variseal)

-G6 = Grommit Housing, Epoxy Encapsulated (Class H) **Coil Construction**

-203 = 12 VDC **Supply Voltage**

B-Cryo Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

B	—	—	—	—	—	—	—	—
Series	1	2	3	4	5	6	7	8

1 Model

C LCO2
N LN2

2 + 3 Valve Function & Maximum Operating Pressure Differential

Valve Function	Code	MOPD		Orifice		C _v	K _v
		psig	bar	Body			
				inches	mm	Body	Body
2-WAY Normally Closed	2002	900	62	3/64	1.19	0.045	0.038
	2005	405	28	1/16	1.59	0.075	0.064
	2008	270	19	5/64	1.98	0.105	0.089
	2016	160	11	3/32	2.38	0.160	0.136
	2021	110	7.6	7/64	2.78	0.190	0.162
	2025	80	5.5	1/8	3.18	0.255	0.217
	2028	65	4.5	5/32	3.97	0.365	0.310
	2033	30	2.1	3/16	4.76	0.440	0.374

4 Body Material

01 303 Stainless Steel
05 316 Stainless Steel

5 Body Port

LC 1/8" NPT Female

6 Seal Material

R Rulon®

7 Coil Construction

G6 Grommet Housing, Epoxy
Encapsulated (Class H) Lead Wires
C6 Conduit Housing, Epoxy
Encapsulated (Class H) Lead Wires
C9 Conduit Housing (Filled), Epoxy
Encapsulated (Class H) Lead Wires

8 Supply Voltages

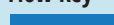
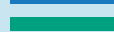
203 12 VDC
204 24 VDC

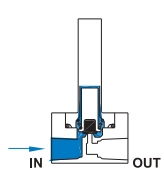
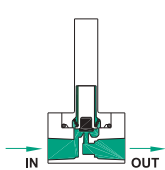
B-Cryo Series – Additional Component Details & Dimensions

2 Valve Function

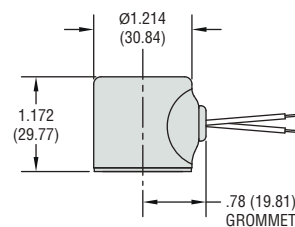
Flow Schematic

Flow Key

 Blocked Flow
 Free Flow
O/S = Over Seat
U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		

7 Coil Construction



Grommet

Series 27
Intrinsically Safe Control

- ▶ Cannot Ignite Flammable Materials
- ▶ Solid State Reliability
- ▶ Internal Surge Suppression
- ▶ SPDT Contacts
- ▶ Can Be Used for Single Level or Differential Service

UL and CSA Approved

Series 27 is UL approved for use in Class I, Groups A, B, C, D; Class II, Groups E, F, G; and Class III hazardous locations. SPDT output contacts. UL Pilot Duty rated.

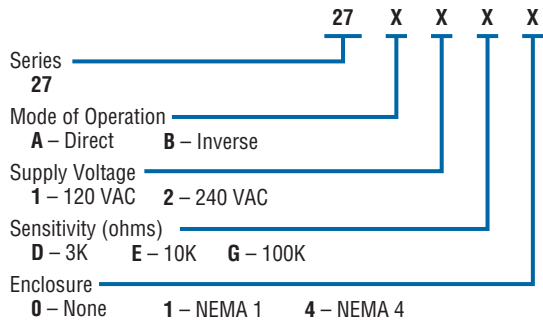
CSA Certified for Class 1, Groups A, B, C and D; Class II, Groups E, F and G; Class III

Specifications

Contact Design	1 N.O. & 1 N.C. (1 form C)
Contact Rating (24/120/240VAC)	8 amp Resistive
Mode of Operation	Direct/Inverse, factory set
Sensitivity	0-100K ohm, factory set
Primary Voltage	120 VAC, 240 VAC (+10%/-15%) 50/60Hz
Secondary Voltage	11 VAC, 2.3 mA
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals	U.L. 913 File # E44570; CSA #2174246
Connections	All screw type connections

How to Order

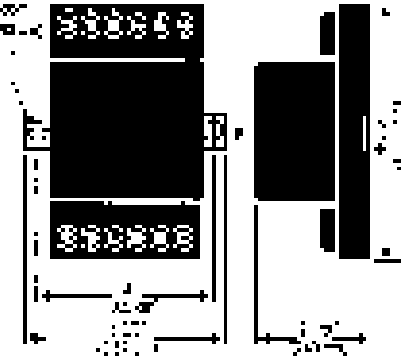
Use the **Bold** characters from the chart below to construct a product code.



Applications

- Hazardous Atmospheres
- Pumps
- Waste Treatment
- Alarms
- Sewage
- CP Industry

Dimensions



Large Size – Engineered Plastics

LS-800PVC Series – Our Most Economical Large Size Unit

- ▶ 1 to 7 Actuation Levels
- ▶ Lengths to 60 inches

Inexpensive, all-PVC LS-800PVC Series switches bring reliable level sensing to corrosive liquids. These durable, yet economical, switches use the same high-quality, dependable reed switches found in GEMS' LS-800 model.



1. Mounting Types

	Type 1 1/2" NPT	Type 3 2" NPT	Type 4 3", 150# Flange
Mounting and All Wetted Parts	PVC		
Operating Temperatures	0°F to 125°F (-17.8°C to 51.7°C)		
Pressure, PSI, Max.	15 @ 70°F (21°C)		
Max. Length (Lo)	60 inches (152.4cm)		
Mounting Position	Vertical ±30° Inclination		

2. Float Type

Float Material	PVC	Buna N
Float Dimensions		
Float Part Number	16306	142251
Min. Liquid Specific Gravity	0.85	0.80

LS-800PVC Series – Continued

3. Number of Actuation Levels and 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 type of wiring selected. See below.

Group I Wiring: 1 to 7 Actuation Levels

Group II Wiring: 1 to 4 Actuation Levels

Group III Wiring: 1 to 3 Actuation Levels

Group IV Wiring: 1 to 2 Actuation Levels

Switch (N.O. or N.C.):

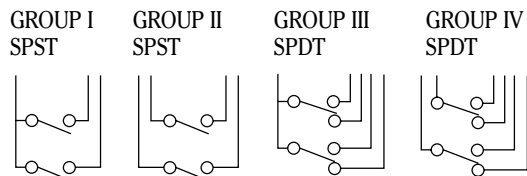
SPST: 20 VA or 100 VA

SPDT: 20 VA

Lead Wires: #22 AWG, 24" L., PVC

Typical Wiring Diagrams

For clarity, only two actuation levels are shown in each group diagram.

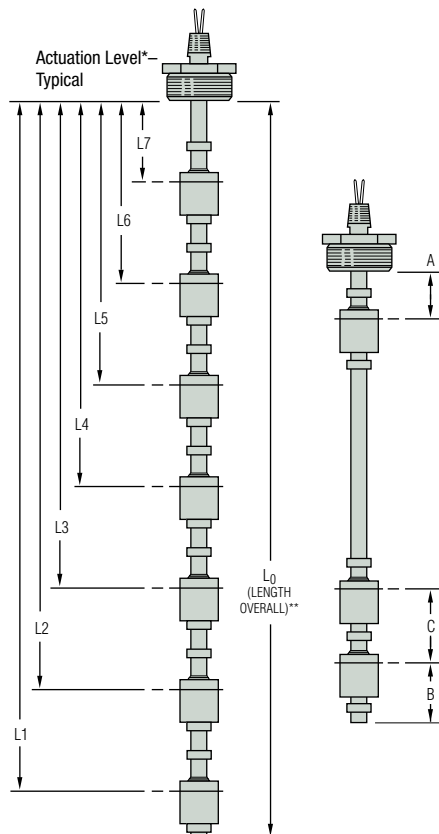


Wiring Color Code

SPST Switches				SPDT Switches 20 VA				
Wiring	Group I	Group II		Group III		Group IV		
Com. Wire	Black	None		Black		None		
	NO/NC	SW. Com.	NO/NC	NO	NC	SW. Com.	NO	NC
L1	Red	Red	Red	Red	Wh/Red	Red	Wh/Red	Wh/Blk/Red
L2	Yellow	Yellow	Yellow	Yellow	Wh/Yel	Yellow	Wh/Yel	Wh/Blk/Yel
L3	Blue	Blue	Blue	Blue	Wh/Blue			
L4	Brown	Brown	Brown					
L5	Orange							
L6	Gray							
L7	White							

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

4. Actuation Level Dimensions



Switch actuation levels are determined following the guidelines below.

A = 1-1/2" (38.1 mm) Minimum distance to highest actuation level.

B = 2" (50.8 mm) Minimum distance from end of unit to lowest actuation level.

C = 3" (76.2 mm) Minimum distance between actuation levels.

Notes:

1. Actuation levels are calibrated on descending fluid level, with water as the calibrating fluid, unless otherwise specified.
2. A and B dimensions based on a top mounted unit.
3. Float stops are permanently cemented in place.
4. Tolerance on actuation levels is $\pm 1/8"$ (3.2 mm).
5. Dimensions based on a liquid specific gravity 1.0.




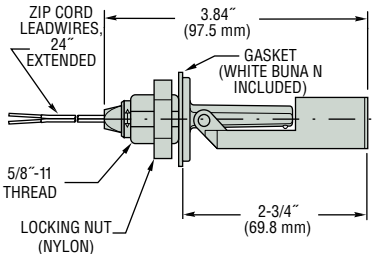
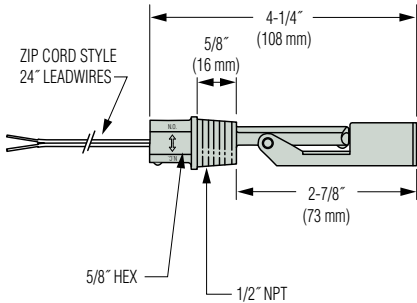
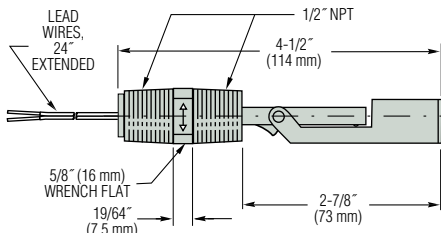
* Actuation level distances and L_0 (overall unit length) are measured from inner surfaces of mounting plug or flange.

** Length Overall (L_0) = L_1 + Dimension B. See Mounting Types for Maximum Length values.

Small Size – Engineered Plastics

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

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

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

Common Specifications

Switch Rating*: SPST, 20VA

Lead Wire Gauge: No. 22 AWG

Mounting Attitude: Horizontal.

RoHS: In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

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

Approvals

Material	CE	UL Recognized File No. E45168	cUL Recognized	CSA Listed File No. 30200
Nylon	X	X	X	X
Polypropylene	X	X	X	X
Noryl®	X	X	X	
Versaplast™	X	X	X	

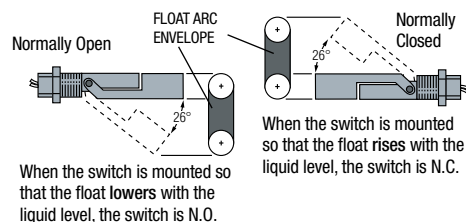
Media Compatibility

Media	LS-7 Compatible Types
Oil, Fuel, Hydrocarbons	Nylon
Broad Range of Chemicals and Water	Polypropylene
Limited Chemicals and Water	Noryl®
Oil, Antifreeze, High Temperatures, Corrosive Fluids, Various Chemicals	Versaplast™

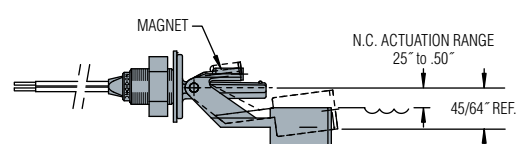
Switch Operation

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

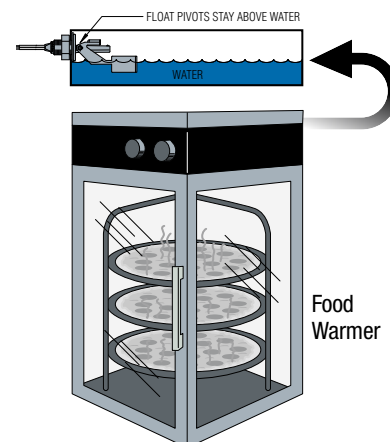
Types 3, 5, 7, 10 and 13






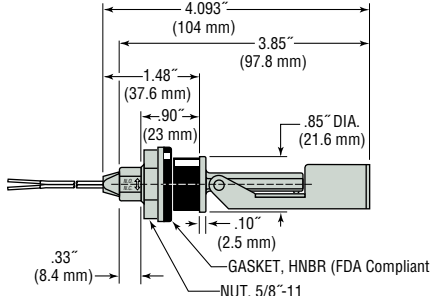
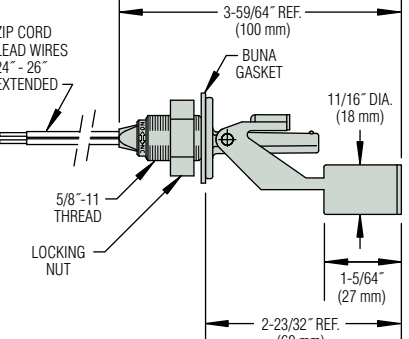
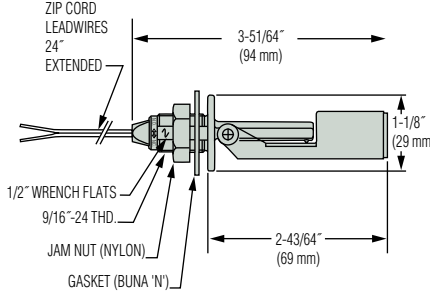
Type 12 – N.C. "Drop Float" Design



The LS-7 Type 12 is ideal for use on food warmers, hot water heaters, steam cookers, small boilers or wherever water evaporation occurs. The switch is used effectively for either high fluid level alarms or water make up systems.



- Nylon is ideal for oils and fuels.
- Polypropylene is ideal for potable water and broad chemicals.
- Versaplast™ is ideal for corrosive fluids, hot water, antifreeze, chemicals and oils.

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

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

Mounting Type	Materials*			Min. Liquid Sp. Gr.	Operating Temperature	Operating Pressure, Max.	Float Arc Envelope	Part Number
	Stem and Mounting	Float	Lead Wire Jacket					
3	Nylon	TPE†		.65	-40°F to +250°F (-40°C to +121.1°C)	100 psi @ 70°F (6.8 bar @ 20°C)	2.20	165570 ⚡
	Polypropylene			.55	-40°F to +225°F (-40°C to +107.2°C)			164520 ⚡
	Versaplast™			.80	-40°F to +250°F (-40°C to +121.1°C)			182600
5	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F (6.8 bar @ 20°C)	1.25	131100 ⚡
	Nylon			.65	-40°F to +250°F (-40°C to +121.1°C)			140620 ⚡
	Versaplast™	Teflon®		.80	-40°F to +300°F (-40°C to +148.9°C)			177100 ⚡
5 - BSP	Versaplast™	TPE†		.80	-40°F to +250°F (-40°C to +121.1°C)	100 psi @ 70°F (6.8 bar @ 20°C)	1.25	189422
7	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F (6.8 bar @ 20°C)	1.50	160450 ⚡
	Nylon			.65	-40°F to +250°F (-40°C to +121.1°C)			160460 ⚡
10	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	50 psi @ 70°F (3.4 bar @ 20°C)	2.08	165800 ⚡
	Nylon			.65	-40°F to +250°F (-40°C to +121.1°C)			165900
12	Noryl®	TPE†		.80	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F (6.8 bar @ 20°C)	.70	191080 ⚡
13	Polypropylene	TPE†		.55	-40°F to +225°F (-40°C to +107.2°C)	100 psi @ 70°F (6.8 bar @ 20°C)	2.20	197050

* Polysulfone and Rytan® R-4 are available upon request.

† Thermoplastic Elastomer Zip Cord, 22 AWG.

Note: NSF 169 certified products available. Contact factory.

See alloy versions on next page.

⚡ – Stock Items.

Small Size - Alloys

LS-7 Series

Compact Alloy and Alloy/Plastics Side Mounts

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

Common Specifications



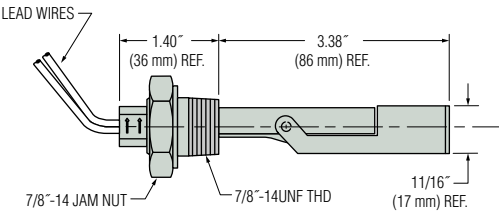
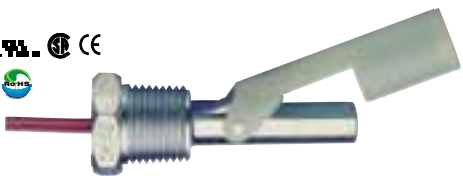

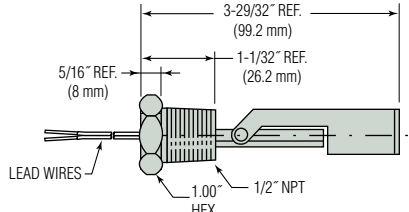


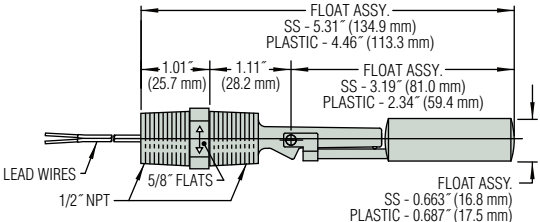


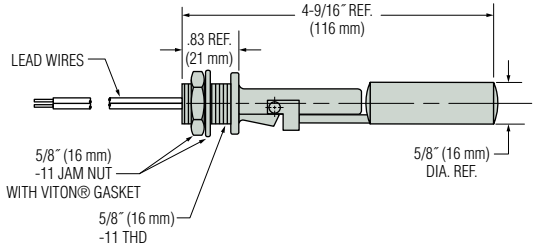
Switch Rating*: SPST, 20VA

Lead Wire: 22 AWG, 24"-27" Extended

Mounting Attitude: Horizontal.

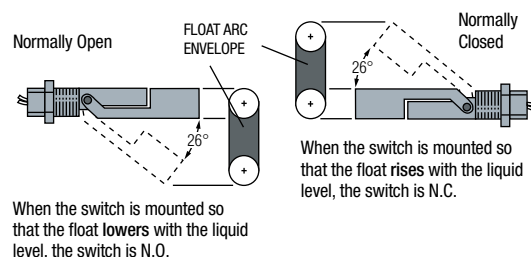
RoHS: In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

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

<p>Type 6 External Mounting</p>	 <p>CE </p> <p>Zinc alloy body with polypropylene or nylon float. SAE Mounting.</p>	
<p>Type 8 External Mounting</p>	 <p> CE</p> <p>Zinc alloy body with nylon or polypropylene float.</p>	
<p>Type 9 External Mounting</p>	 <p> CE</p> <p>316 Stainless Steel body with 316 SS, nylon or polypropylene float.</p>	
<p>Type 11 Internal Mounting</p>	 <p> CE</p> <p>316 Stainless Steel body with 316 S.S. float.</p>	

Switch Operation

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



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

Mounting Type	Materials			Min. Liquid Sp. Gr.	Operating Temperature	Operating Pressure, Max.	Float Arc Envelope	Part Number
	Stem and Mounting	Float	Lead Wire Jacket					
6	Zinc Alloy*	Nylon	TPE†	.65	-40°F to +250°F (-40°C to +121°C)	100 psi @ 70°F	1.36	155660 ⚡
		Polypropylene		.75	-40°F to +225°F (-40°C to +107°C)	100 psi @ 70°F	1.36	179870
8	Zinc Alloy*	316 S.S.	TPE†	.80	-40°F to +250°F (-40°C to +121°C)	300 psi @ 70°F	1.43	249315
		Nylon		.65	-40°F to +250°F (-40°C to +121°C)	100 psi @ 70°F	1.40	160950 ⚡
		Polypropylene		.55	-40°F to +225°F (-40°C to +107°C)	100 psi @ 70°F	1.40	162795 ⚡
	316 Stainless Steel	316 S.S.	TPE†	.80	-40°F to +250°F (-40°C to +121°C)	300 psi @ 70°F	1.43	249315
		Nylon		.65	-40°F to +250°F (-40°C to +121°C)	100 psi @ 70°F	1.40	247390
		Polypropylene		.55	-40°F to +225°F (-40°C to +107°C)	100 psi @ 70°F	1.40	247380
9	316 Stainless Steel	316 S.S.	TPE†	.80	-40°F to +250°F (-40°C to +121°C)	300 psi @ 70°F	1.43	164870 ⚡
		Nylon		.65	-40°F to +250°F (-40°C to +121°C)	100 psi @ 70°F	1.40	164850 ⚡
		Polypropylene		.55	-40°F to +225°F (-40°C to +107°C)	100 psi @ 70°F	1.40	164860 ⚡
11	316 Stainless Steel		Teflon®	.80	-40°F to +250°F (-40°C to +121°C)	300 psi @ 70°F	1.65	179445

†Thermoplastic Elastomer Zip Cord.

⚡ – Stock Items.

*Zinc Alloy Material Note:

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

RLI-G Guided Wave Radar Level Sensors

Level Sensors for Liquids

- ▶ Measuring Range up to 24m (80 feet)
- ▶ Accuracy: $\pm 5\text{mm}$ (0.2 inch)
- ▶ Measurement is Independent of Temperature, Pressure and Density Variations
- ▶ Rod, Cable and Coaxial Probes
- ▶ Minimum Dielectric Constant (ϵ_r) ≥ 1.4
- ▶ Removable Graphic Display
- ▶ 4-20 mA + HART Output
- ▶ Temperature Range: -22°F to $+194^\circ\text{F}$ (-30°C to $+90^\circ\text{C}$)
- ▶ Pressure, Max.: 580 psig (40 bar)
- ▶ IP67 Protection

The RLI-G Guided Wave Radar level transmitter is designed for continuous level measuring of conductive or non-conductive liquids, pulps and slurries. RLI-G level sensors operate on the well-known TDR (Time Domain Reflectometry) principle. Micropulses are sent along a probe guide at the speed of light. As soon as the impulse reaches the surface of the media, it is reflected back to the electronic module. Level distance is directly proportional to the flight time of the impulse. The reflected signal is dependent on the dielectric constant (ϵ_r) of the media, the feasibility of the measurement is $\epsilon_r \geq 1.4$. Our TDR technology is unaffected by the properties of the media as well as that of the space above it. Measurement is also unaffected by the change in the physical properties of the materials such as temperature or pressure.

Specifications

Measured Values	Distance, level, volume (volume is calculated)
Measuring Range	Depends on the probe type and dielectric constant (ϵ_r) of the measured media
Probe Types	Mono cable, twin cable, mono rod, twin rod, coaxial pipe and segmented rod
Accuracy	
Linearity Error¹	$\pm 5\text{mm}$ (0.2 inch), if probe length $\geq 10\text{ m}$ (32 feet): $\pm 0.05\%$ of the probe length
Resolution	$\pm 3\text{ }\mu\text{A}$
Minimal ϵ_r of the Media	1.4 (some probe types require higher values)
Power Supply	18 V - 35 V DC
Output	
Digital Communication	4-20 mA + HART
Display	GMD-100 graphic display unit
Media Temperature	-22°F to $+194^\circ\text{F}$ (-30°C to $+90^\circ\text{C}$)
Media Pressure, Max.	
Coaxial Probes	232 psig (16 bar/ 1.6 MPa)
Cable and Rod Probes	580 psig (40 bar/ 4 MPa)
Ingress Protection	IP67
Electrical Connection	2x 1/2" NPT and 2x M20 x1.5 Internal Threads
Electrical Protection	Class III
Housing Material	Paint coated aluminium
Sealing	FPM, contact Gems for other options
Weight (Housing Unit)	4.4 lb (2 kg)
Ambient Temperature	-22°F to $+140^\circ\text{F}$ (-30°C to $+60^\circ\text{C}$), with display: -4°F to $+140^\circ\text{F}$ (-20°C to $+60^\circ\text{C}$)

Note:

1. Under reference conditions and stabilized temperature.



Applications

Mono cable / Mono rod / Mono segmented rod

- All high-viscosity liquids
- Clean and contaminated liquids
- For stilling wells (calibration required)
- Conductive foams
- High temperature applications
- Bypass and stilling well applications

Twin cable

- Works with water, solvents, oils or fuels
- Medias with low dielectric constant ($\epsilon_r > 1.8$)
- Narrow tanks or restricted spaces
- Where minimum dead-zone is needed
- Mounting close to tank wall

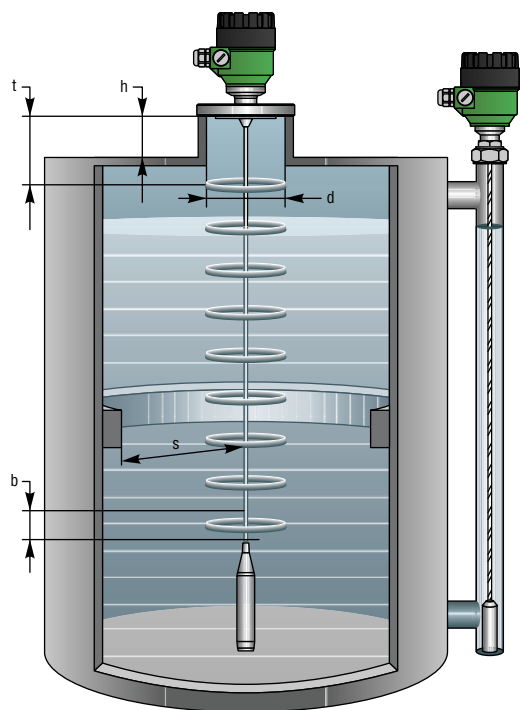
Twin rod

- Coated tanks
- Contaminated liquids
- Where minimum dead-zone is needed
- Narrow tanks or restricted spaces
- Slurries, Pulp

Coaxial pipe

- Small vessels or tanks with max. 6m (20 feet) height
- Solvents, LPG, LNG
- Clean liquids with low dielectric constant
- Agitated or flowing liquids
- Contact possible with metallic object or tank wall
- Where no dead-zone allowed

Installation & Ordering Guidance



Critical Dimensions

s = Minimum distance from the internal disturbing objects. Objects that are parallel to probe do not disturb the measurement.

Probe Type	S Dim
Mono	> 300mm (12 inch)
Twin	> 100mm (4 inch)
Coaxial	0

$$h \leq d$$

t = Upper dead-zone

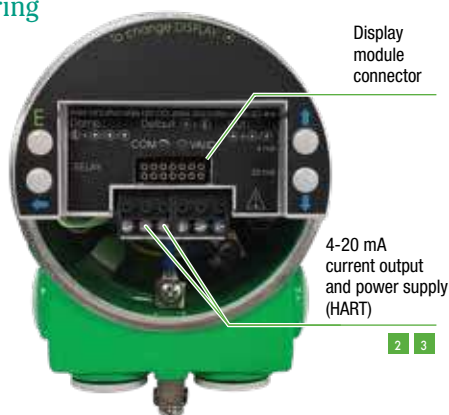
b = Lower dead-zone

Dead-zone

The unmeasurable upper and lower part of the tank, the lower dead-zone is extended with the length of the counterweight (cable versions only)

Probe Type	$\epsilon_r = 80$		$\epsilon_r = 2.4$	
	Upper (t)	Lower (b)	Upper (t)	Lower (b)
4mm Cable	300mm (12 inch)	20mm (0.75 inch)	400mm (16 inch)	100mm (4 inch)
8mm Cable				
8mm Rod				
14mm Rod / Segmented Rod	150mm (6 inch)	20mm (0.75 inch)	300mm (12 inch)	100mm (4 inch)
4mm Twin Cable				
8mm Twin Rod	0mm (0 inch)	10mm (0.4 inch)	0mm (0 inch)	100mm (4 inch)
Coaxial				

Wiring



Note: Consult Instruction Bulletin for proper wiring procedure.

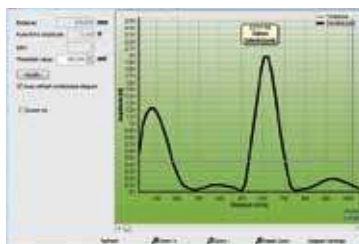
Setup and Programming

GMD-100 display unit



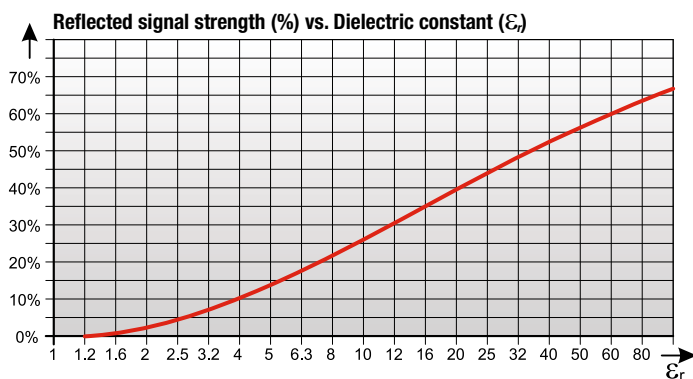
With the help of the GMD-100 plug-in display a simplified programming can be accomplished which covers most of the applications. The basic parameters of measurement and output can be set using the text-based menu system of the GMD-100. The large LCD display shows the measured values in numerical and bar graph form.

GemsView software



The GemsView configuration software can be downloaded free of charge. All user-modifiable parameters of the RLI-G can be set and all values can be queried through GemsView. Other features are: continuous "echo-map" reading, trend monitoring, data logging, data saving.

The measurability of the media and the reflected signal strength depends on the relative dielectric constant of the media.



Informative ϵ_r values			
Butane	1.4	Grain	3 - 5
Cement	1.5 - 10	Edible oil	3.9
LPG	1.6 - 1.9	Limestone	6.1 - 9.1
Kerosene	1.8 - 2.1	Acetone	21
Crude oil	2.1	Ethanol	24
Diesel oil		Methanol	33.1
Benzene	2.3	Glycol	37
Asphalt	2.6	Nitrobenzene	40
Clinker	2.7	Water	80
Resin	2.4 - 3.6	Sulphuric acid*	

* (T = 20°C)

Technical Data

Probe Type	4mm Cable	8mm Cable	4mm Twin Cable	Coaxial ⁵	14mm Rod / Segmented Rod	8mm Rod	8mm Twin Rod
Dimensions (mm)							
Measuring Distance, Max.	24m (80 feet)			6m (20 feet)		3m (10 feet)	
Media ϵ_r, Min.	2.1		1.8	1.4	2.1	2.1	1.8
Measuring Distance, Min. ($\epsilon_r = 80 / \epsilon_r = 2.4$)	0.3m / 0.4m (1 foot / 1.3 feet)		0.15m / 0.3m (0.5 feet / 1 feet)	0m (0 feet)	0.3m / 0.4m (1 foot / 1.3 feet)	0.3m / 0.4m (1 foot / 1.3 feet)	0.15m / 0.3m (0.5 feet / 1 feet)
Sensing space around the probe¹	Ø 600mm (2 feet)		Ø 200mm (0.65 feet)	0 mm (0 feet)	Ø 600mm (2 feet)	Ø 600mm (2 feet)	Ø 200mm (0.65 feet)
Probe material	316 SS		316 SS	316 SS (Ti)	316 SS (Ti)	316 SS (Ti)	316 SS (Ti)
Probe Ø, nominal	4mm (0.15 inch)	8mm (0.3 inch)	4mm (0.15 inch)	28mm (1.1 inch)	14mm (0.55 inch)	8mm (0.3 inch)	8mm (0.3 inch)
Separator material²	—		PFA, welded on the cable	PTFE	—	—	PTFE-GF25
Available Process Connections^{3,4}	1" BSP, 1" NPT, 1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI		1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI	1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI	1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI	1" BSP, 1" NPT, 3" 150# ANSI, 4" 150# ANSI	1-1/2" BSP, 1-1/2" NPT, 3" 150# ANSI, 4" 150# ANSI

Notes:

- For reduction of required sensing space, contact Gems Sensors about stilling well options.
- There is no separator below 1.5m (5 feet) length
- Except the coax types, probes can be removed from the head unit by the user.
- ANSI Flange connection will have head assembly threaded into flange based on probe selection.
- Coaxial types are segmented for lengths greater than 1.0m length

How to Order (not all combinations available)

Application Environmental Conditions: This information is essential to the accuracy and proper operation of your Gems configurable sensors. Please have this information readily available when you contact a Gems representative for ordering.

1. Liquid Media: _____

2. Pressure: Minimum _____ psig Maximum _____ psig

3. Temperature: Minimum _____ °F Maximum _____ °F

4. Media Dielectric: _____

5. Tank: Material _____ Depth _____

6. Application Location: ☐ Indoors ☐ Outdoors

Part Number Specification: Use the **bold** characters from the chart below to construct a product code.

RLI-G - B - XX - X - X₁-X₂ - 4

Series _____

Type _____
B - Sensor + Display

Probe / Process Connection _____

8mm Rod
R - 1" BSP
P - 1" NPT
AC - 3" 150# ANSI¹
AD - 4" 150# ANSI¹

14mm Segmented Rod
S - 1-1/2" BSP
Z - 1-1/2" NPT
AC - 3" 150# ANSI¹
AD - 4" 150# ANSI¹

8mm Twin Rod
D - 1-1/2" BSP
E - 1-1/2" NPT
AE - 3" 150# ANSI
AF - 4" 150# ANSI

Coaxial²
For Lengths ≤1.0m
C - 1-1/2" BSP
H - 1-1/2" NPT
AA - 3" 150# ANSI
AB - 4" 150# ANSI

4mm Cable
K - 1" BSP
L - 1" NPT
V - 1-1/2" BSP
W - 1-1/2" NPT
AG - 3" 150# ANSI
AH - 4" 150# ANSI

8mm Cable
N - 1-1/2" BSP
J - 1-1/2" NPT
AJ - 3" 150# ANSI
AK - 4" 150# ANSI

4mm Twin Cable
T - 1-1/2" BSP
U - 1-1/2" NPT
AL - 3" 150# ANSI
AM - 4" 150# ANSI

Housing _____
4 - Aluminum

Output _____
4 - 4-20mA + HART

Probe Length¹
X₁=Meters; X₂=Tenths of Meters. Select two Code values to complete the Part Number.

Coaxial, Rod, Segmented Rod, and Twin Rod Probes:

X ₁		X ₂	
Length	Code	Length	Code
0m	0	0m	0
1m	1	0.1m	1
2m	2	0.2m	2
3m	3	0.3m	3
4m	4	0.4m	4
5m	5	0.5m	5
6m	6	0.6m	6
		0.7m	7
		0.8m	8
		0.9m	9

Mono and Twin Cable Probes:

X ₁		X ₂	
Length	Code	Length	Code
0m	0	0m	0
10m	1	1m	1
20m	2	2m	2
		3m	3
		4m	4
		5m	5
		6m	6
		7m	7
		8m	8
		9m	9

Accessories

Accessories	Order Code
Plug-in graphic display module	GMD-100
GemsView configuration software for remote programming with PC	FREE download!
HART-USB modem for remote programming with PC ¹	DPC-55

Note:

1. HART-USB programming assembly comes with an integrated 24V 250 Ohm resistor.

Ordering Notes:

1. Rod and Segmented Rod Probes Using Codes AC or AD:

- 8mm Rods may not exceed 3m.
 - 14mm Segmented Rods may not exceed 6m.
 - Both 8mm and 14mm Rod Types share Process Connection Codes **AC** and **AD** (ANSI flanges).
 - Unless otherwise specified at time of order, Lengths ≤3m will be supplied with 8mm Rods. Lengths >3m will be supplied with 14mm Segmented Rods.
 - If you prefer to have 14mm Segmented Rods used for Length <3m, please alert your Sales Representative, or include a note with your order.
- Coaxial types greater than 1m length are segmented. For lengths ≤1m, product is 1-piece construction.
 - For Coated Probe option, contact Gems Sensors.
 - For Stilling Well options, contact Gems Sensors.

KV/KW Series – 1.25" (31.75 mm) and 1.5" (38.1 mm) Solenoids

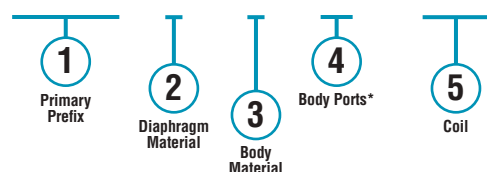
- ▶ 2-Way Normally Closed and 3-Way Directional Control
- ▶ MOPD: 15 PSI to 20 PSI
- ▶ C_v Range: 0.092 to 0.156
- ▶ PTFE Bodies and Diaphragms

Our largest orifice sizes for the highest flow rates, with a reduced component height. They feature all-PTFE wetted parts for extreme chemical compatibility.

How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

KV205 - T - 1 S1 - C203



* Combination of Body Port Configuration and Port Thread; Manifold Mount (BM) does **not** use the Thread Size designator

Example:

KV205-T-1 S1-C203-H

2-Way N.C. PTFE solenoid valve, with a PTFE body, 1/4"-28 UNF flat bottom threaded side ports and mounting holes, operating at 12 VDC.

Part Prefix Table ①

	Orifice (inch)	MOPD* (psig)	C_v	Internal Volume (μl)	① Primary Prefix
2-WAY	0.092	20	0.055	108	KV205
N.C.	0.156	15	0.11	239	KW207
3-WAY Directional Controls	0.156	15 (NC/O)	0.14	462	KW347

* Maximum Operational Pressure Differential

② Diaphragm Material

T = PTFE Polytetrafluoroethylene

③ Body Material

1 = PTFE Polytetrafluoroethylene

④ Body Port Configuration

S = Threaded side port

Port Thread (Used in conjunction with Threaded Port Configurations)

1 = 1/4"-28 UNF flat bottom¹ (Standard for KV)

2 = 10-32¹

3 = 5/16"-24

4 = 1/8" NPT (Standard for KW)

5 = M6 X 1.0¹

⑤ Coil

C203 = 12 VDC

C204 = 24 VDC

C109 = 115 VAC

C116 = 220 VAC

* Standard selection; will be used unless otherwise specified. Standard selections are not referenced in final part number.

Note

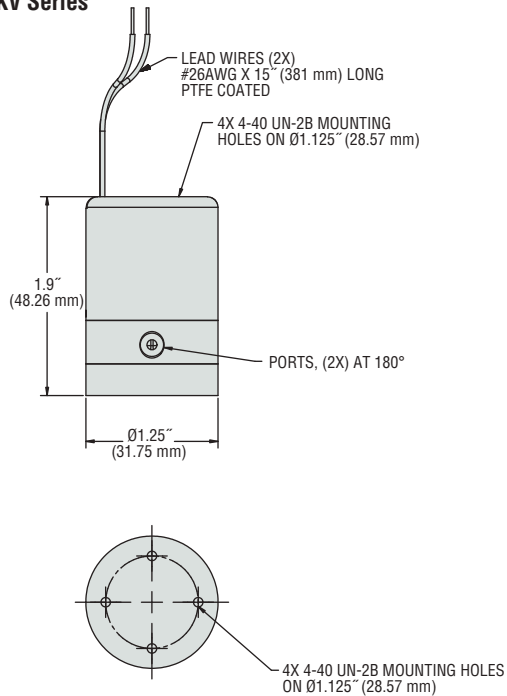
1. Not available with KW Series.



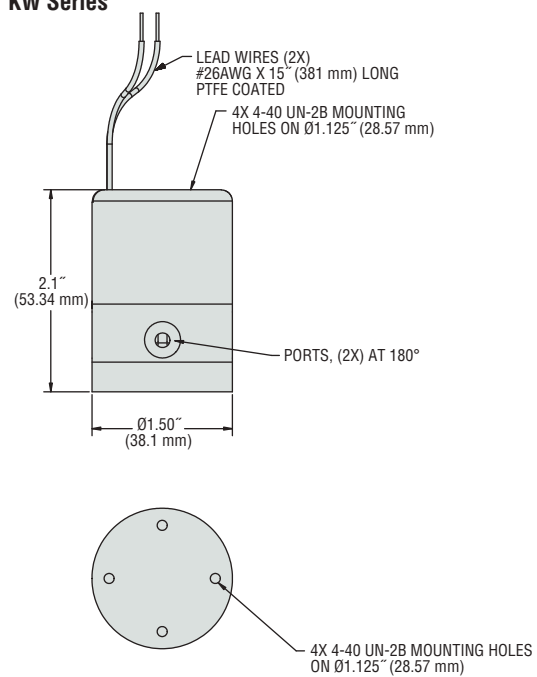
Dimensions – Side Port Body

2-Way, Normally Closed (N.C.)

KV Series

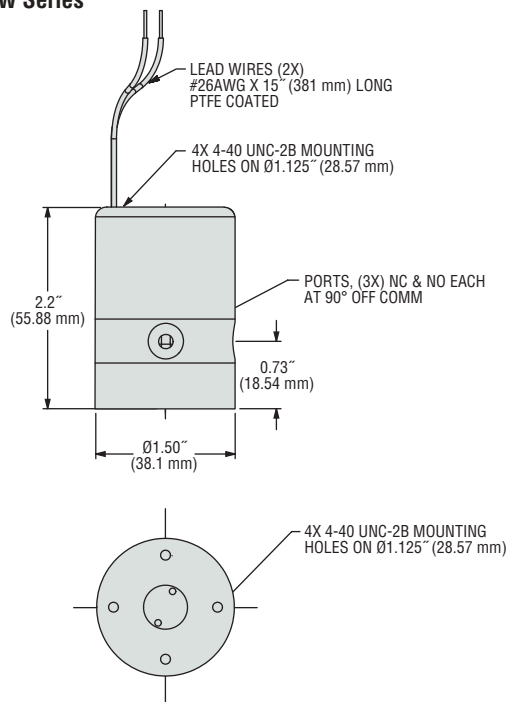


KW Series



3-Way, Normally Closed (N.C.), Multi-Purpose, Directional Control

KW Series



Economical Digital Process and Strain Gauge Panel Meters

- ▶ Easily Scaled in any Engineering Units from -19999 to 99999
- ▶ Large 18 mm (.71") high Red or Green Display
- ▶ Front Panel MIN, MAX and Alarm Reset Functions
- ▶ High or Low Alarms
- ▶ Process Meters for Amplified Transducers
- ▶ Strain Gauge Meters for Millivolt Transducers

The DM28 meter line is easily programmed to read out in any engineering units (psi, bar, Kg/cm²) and can be retro fitted in the field with plug in boards. Units can be scaled by applying known loads to the sensors or purely by software keystrokes without requiring any electronic instrumentation. Scaling the meter using up to 10 points can compensate for non-linear signals and profiling curved tanks in level applications. The display color (red or green), latching or non-latching alarms and the optional analog outputs are all programmable. The meter also features a help character that indicates max, min and normal operation, it also gives additional help when programming. The DM28 meter line is available in 5 different models, the specifications below are for the process and strain gauge meter lines only.

Specifications

Accuracy	.01% Process, .03% Strain
Resolution	14 bits
Display	5 digits, red or green LED
Display Height	18 mm (.71")
Operating Temperature	0° to 55°C (32° to 130°F)
Relative Humidity	20% to 95% non-condensing
Span Temp. Coefficient	25 ppm/°C
Storage Temperature	-20° to 80°C (-4° to 176°F)
Approvals	CE
Display Filter	100 ms to 100 seconds programmable
Output #1	5 Amp @ 120 Vac SPDT & NPN collector 30 Vdc @ 100 mA max.
Output #2	NPN collector (SPDT relay optional)
Remote Features	Optional Tare or Security lockout
Analog Output	Scalable 4-20 mA or 0-10 V (8 bit)
Meter Supply	90-264 Vac @ 50/60 Hz, 4 Watts (optional 20-50 Vdc/Vac)
Sensor Supply	24 Vdc @ 30 mA process meter 5 or 10 Vdc @ 60 mA strain meter
Physical	
Front Bezel	96 mm x 48 mm x 10 mm
Depth Behind Panel	100 mm
Panel Cut-out	1/8 DIN 92 mm x 45mm (3.622" x 1.772")
Front Panel Rating	IP65 (Nema 4X)
Terminals	Screw type
Weight	250 g (.56 lbs)

How To Order

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

SELECT:	DM28	2	0	0	0	0
1. Meter Input (*for additional information contact sales)						
2 DC Process Meter input: 4-20mA, 0-20mA, 10-50mA (24 Vdc excitation)						
6 Strain Meter input: 100mV (5 or 10 Vdc excitation)						
2. Relay Output						
0 One SPDT, one NPN						
1 Two SPDT						
3. Analog Output						
0 Standard none						
3 Programmable analog output						
4. External Digital Input						
0 Standard none						
6 Digital input for tare or security lockout						
5. Meter Power Supply						
0 Standard 90-264 Vac						
2 20-50 Vac or Vdc						



WIF-1250 Water in Fuel Sensor

- ▶ Designed for OHV and Generator Set applications
- ▶ Compact size, easy to install
- ▶ Operates in plastic or metal tanks
- ▶ Reliable and affordable OEM solution
- ▶ Solid-State – no moving parts

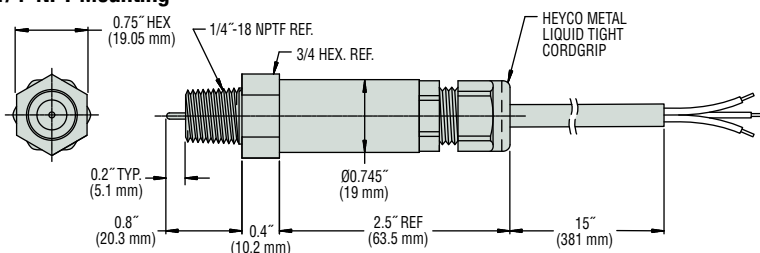
The WIF-1250 sensor is an innovative, no-moving-parts solution specifically designed to detect the presence of water in fuel. The sensor is an ideal solution for OEM's of off-highway vehicles, locomotive and generator sets. It is also ideal for use with fuel filters. Based on reliable conductivity technology, WIF-1250 sensors are built from robust nickel plated steel for compatibility with temperatures up to 257°F (125°C), and are suited for the most challenging environments or applications. A 5-second delay circuit prevents "slosh" actuation. The sensor is easily mounted in any position.

Specifications

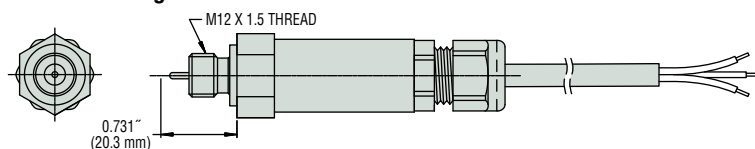
Housing Materials	Nickel plated steel, electrolytic nickel plated & fused glass conductivity pin insulator
Sensing Element Length	0.2" (5.1 mm)
Operating Pressure	750 PSI (51.7 bar) @ 70°F (21°C)
Operating Temperature	-40°F to 257°F (-40°C to 125°C)
Sensitivity	10,000 Ohms (fluid resistance)
Slosh Dampening	5 seconds
Supply Voltage	8 to 32 V DC
Current Consumption	<20 mA
Output	Open collector, sinking output
Output Load Capability	250 mA max.
Electrical Connection	20 AWG 3-Conductor Cable, 15" (381 mm)
Approvals	CE

Dimensions

1/4" NPT Mounting



M12x1.5 Mounting



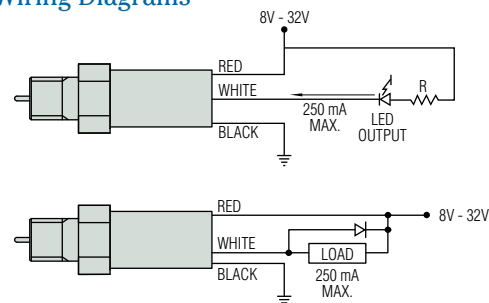
CE

Typical Applications

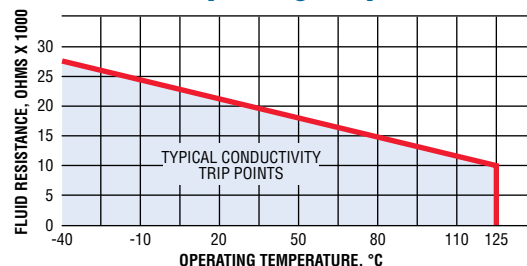
To detect water in:

- Fuel filters
- Diesel fuel storage tanks

Wiring Diagrams

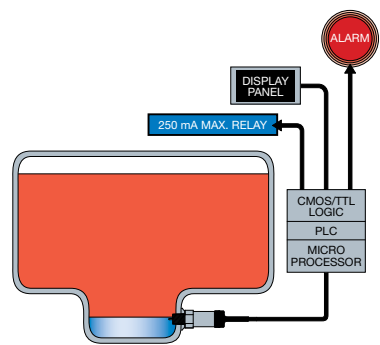


Resistance vs. Operating Temperature

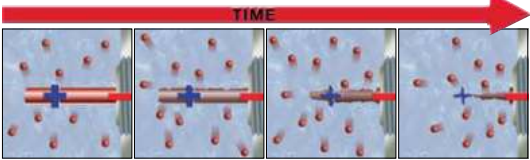


Operating Principle

WIF-1250 liquid level sensors are solid-state devices designed to detect the presence or absence of water in fuel. Each sensor contains integral, high-temperature-rated electronics that generate an alternating voltage to a probe tip. The presence of water 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.

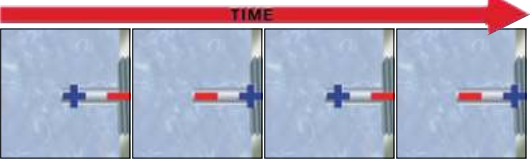


Conventional Conductivity Probe



When a single potential (DC Voltage) is applied to a probe submerged in conductive liquid, metal from that probe will be lost over time via electrolysis.

Gems WIF-1250 Probe



Gems applies extra circuitry to produce an alternating potential (alternating +/- DC square wave). Metal lost in one state is retrieved in the alternating state, resulting in virtually zero probe material loss.

How to Order

Select Part Number based on Mounting Thread and Switch Logic.

Probe Condition at Current Sink	Part Numbers	
	1/4" NPT	M12x1.5
Wet	238737	238856
Dry	238773	238855

PS82 – Economical Miniature Vacuum Switches

► 5" to 28" Hg (169 to 948 mbar)

These miniature vacuum switches, based on our proven PS41 series, are designed for demanding applications where space and/or price are strong concerns.

Specifications

Switch	SPST; SPDT
Repeatability	See Table 1
Wetted Parts	
Diaphragm Material	Nitrile standard (optional EPDM, Viton® and Neoprene)
Fitting	Brass (optional 316 Stainless Steel)
Spring	316 Stainless Steel
Electrical Termination	DIN 43650A IP65; Male Conduit with Flying Leads IP65; Flying Leads IP00; IP option IP66
Proof Pressure	0 psia to 350 psig (-1 bar to 24 bar)
Burst Pressure	700 psi (48 bar)
Approvals	CE
Weight, Approximate	Brass: 0.4 lbs. (0.18 kg)

Recommended Operating Temperature Limits

Diaphragm Material	Options Selected		
	No option, -10A, -SP or -RD	-RD or -RD and -G	-SP or -10A
Nitrile	15°F to 185°F (-9°C to +85°C)	15°F to 250°F (-9°C to +121°C)	15°F to 212°F (-9°C to +100°C)
Viton®	0°F to 185°F (-18°C to +85°C)	0°F to 250°F (-18°C to +121°C)	0°F to 212°F (-18°C to +100°C)
EPDM	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)	-10°F to +212°F (-23°C to +100°C)
Neoprene	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)	-10°F to +212°F (-23°C to +100°C)

Note: Switches may function below the cold temperature limit but the set points and deadband will increase. Consult factory for details.

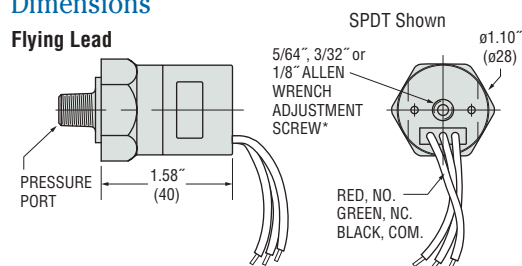
Electrical Switch Ratings

Options Selected	AC	DC
No option or -RD	5 amps @ 125/250 Volts	5 amps resistive, 3 amps inductive @ 28 Volts
-G only or -RD with -G	1 amp @ 125 Volts	1 amp resistive, 0.5 amp inductive @ 28 Volts
-10A only or -SP without -G	10.1 amps @ 125/250 Volts	—
-SP with -G	2 amps @ 125/250 Volts	—



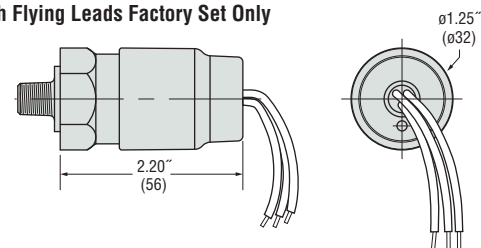
Dimensions

Flying Lead

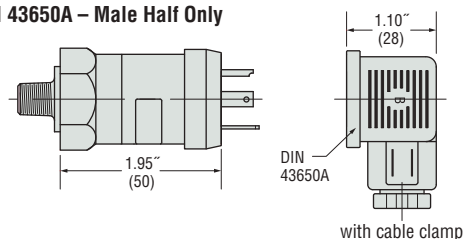


* Adjustment screw is located under protective screw.

Ingress Protection Option (IP66) with Flying Leads Factory Set Only



DIN 43650A – Male Half Only



How To Order

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

PS82 **-10** **-4MNB** **-C** **-H** **-XX** **-XXXX**

1
2
3
4
5
6

① Pressure Range Code

Insert Pressure Range Code from Table 1, below.

② Pressure Fitting¹

Brass

- 2MNB = 1/8" NPTM
- 4MNB = 1/4" NPTM
- 2MGB = 1/8" BSPM (G type)
- 4MGB = 1/4" BSPM (G type)
- 4MSB = 7/16"-20 SAE Male
- 6MSB = 9/16"-18 SAE Male

316 Stainless Steel

- 2MNS = 1/8" NPTM
- 4MNS = 1/4" NPTM
- 4MGS = 1/4" BSPM (G type)

③ Circuit

- A = SPST/N.O.
- B = SPST/N.C.
- C = SPDT

④ Electrical Termination

- FLXX = Flying Leads²
- FLSXX = Flying Leads w/PVC Shrink Tubing²
- ELXX = 1/2" NPT Male Conduit w/Flying Leads³
- CABXX = 18 AWG PVC Cable⁴
 - H = DIN 43650A Male Half Only⁵
 - HR = Right Angle DIN 43650A Male Half Only⁵
 - HC = DIN 43650A 9mm Cable Clamp⁵
 - HCR = Right Angle DIN 43650A 9mm Cable Clamp⁵
 - HN = DIN 43650A with 1/2" Female NPT Conduit⁵
 - HNR = Right Angle DIN 43650A with 1/2" Female NPT Conduit⁵
 - HM = Micro (9.4mm Spacing) DIN Style Male Half Only⁵
 - SP = Spade Terminals⁶

⑤ Options

- 10A = 10A @ 125/250 VAC Max. Rating⁷
- V = Viton® Diaphragm
- N = Neoprene Diaphragm
- E = EPDM Diaphragm
- G = Gold Contacts
(for loads less than 12 mA @ 12 VDC)
- RD = Reduced Differential
(25% reduction typical)
- IP = Ingress Protection⁸
- OF = Oil Free Cleaned
- WF = Weather Pack Connector, Female
- WM = Weather Pack Connector, Male
- DE = Deutsch Connector, Male, DT04 Series

⑥ Fixed Set Point (optional)

- A. Specify set point -FS
(in Inches Hg or mBAR, see example)⁹
- B. Set Point Actuation
R on Rising Vacuum
F on Falling Vacuum
Example: -FS300MBARF for 300 mBAR Falling
or -FS10INHGR for 10" Hg Rising

Notes:

1. Other fittings available. Consult factory.
2. 18" is standard. Specify lead length in inches (max. 48"). e.g. -FL18 or -FLS30.
3. 18" is standard. Specify lead length in inches (max. 48"). e.g. -EL18 or -EL30.
4. 36" is minimum. Specify cable length in inches. e.g. -CAB36 or -CAB120.
5. DIN connectors require -C SPDT circuit.
6. Requires -10A, -G options (50% increase in deadband typical).
7. Options -10A, -G or -RD cannot be combined.
8. Ingress Protection is available only with -FL, -FLS, -ELS or -CAB Electrical Termination choices. Ingress Protection requires Fixed Set Point -FS.
9. Set Point must be within Pressure Range selected in Step 1.

Table 1 — Vacuum Range Codes

The deadband values tabulated are for the standard microswitch. With either the -SP of -10A option, the deadband values are typically 50% greater than those listed. With the -RD option, the values will be typically 25% less than those listed. In certain applications deadband can be tailored and controlled to customer specifications. Consult factory for details.

Vacuum Range Code	Vacuum Range	Accuracy	Average Deadband*
10	5-15" Hg (169-508 mbar)	±0.71" Hg (24 mbar) +2% of setting	3.05" Hg (103 mbar) +7% of setting
20	12-28" Hg (406-948mbar)	±1.63" Hg (55 mbar) +2% of setting	6.1" Hg (207 mbar) +8% of setting

* -IP and -EL options are approximate gauge switches. Altitude and temperature changes will result in set point shifts.

PS75 – Rugged Cylindrical Pressure Switch

- ▶ Side Mounted DIN Connection
- ▶ Top Mounted Electrical Connection
- ▶ 5 to 6000 psi (0.35 to 414 bar)
- ▶ Wear Disc Design for Longer Life

Gems PS75 Series have all metal surfaces for overload stops and deliver reliable operation under extremely high pressure surges. They are designed with a wear disc and cushioning ring for increased life. The switches use a piston/diaphragm design, which combine the high proof pressure of piston technology with the sensitivity of a diaphragm design. They can be field or factory adjusted.

Specifications

Switch	SPST; SPDT
Repeatability	See Table 1
Wetted Parts	
Diaphragm	Nitrile (optional Viton®, Neoprene or EPDM)
Fitting	Zinc-Plated Steel (optional 316 Stainless Steel)
Housing	Brass or Zinc-Plated Steel (optional 316 Stainless Steel)
Electrical Termination	DIN 43650A IP65; Conduit with Flying Leads IP65; Flying Leads IP65
Proof Pressure	7500 psi (517 bar) except range 10: 500 psi (35 bar)
Burst Pressure	9000 psi (621 bar)
Approvals	CE, UL Approved units available
Weight, Approximate	Steel: 0.6 lbs. (0.27 kg)

Recommended Operating Temperature Limits

Diaphragm Material	Circuit Codes	
	-A, -B, -C	-A, -B, -C with -RD option
Nitrile (Std)	15°F to 185°F (-9°C to +85°C)	15°F to 250°F (-9°C to +121°C)
Viton®	0°F to 185°F (-18°C to +85°C)	0°F to 250°F (-18°C to +121°C)
EPDM	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)
Neoprene	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)

Note: Switches may function below the cold temperature limit but the set points and deadband will increase. Consult factory for details.

Electrical Switch Ratings

Circuit Code	AC	DC
-A, -B, -C¹	5 amps @ 125/250 Volts	5 amps resistive, 3 amps inductive @ 28 Volts
-A, -B, -C²	1 amp @ 125 Volts	1 amp resistive, 0.5 amp inductive @ 28 Volts

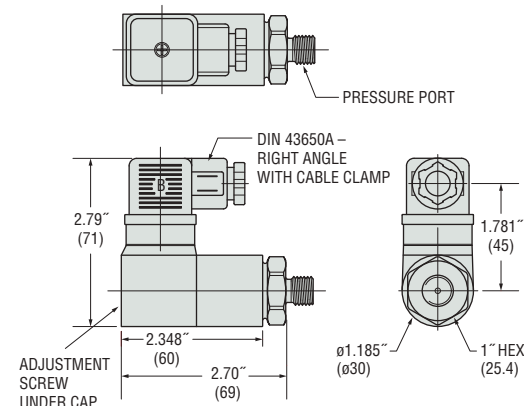
Notes:

1. Without Gold Contacts Option (-G).
2. With Gold Contacts Option (-G).

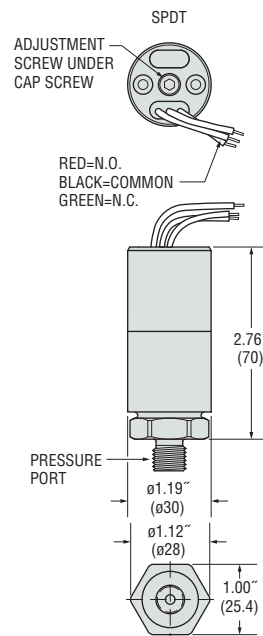


Dimensions

Right Angle DIN 43650A with Cable Clamp

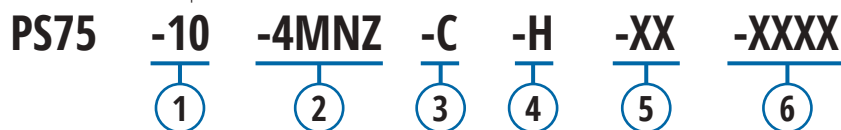


Flying Lead



How To Order

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



1 Pressure Range Code

Insert Pressure Range Code from Table 1, below.

2 Pressure Fitting¹

12L14 Zinc-Plated Steel

- 2MNZ = 1/8" NPTM
- 4MNZ = 1/4" NPTM
- 4FNZ = 1/4" NPTF
- 4MGZ = 1/4" BSPM (G type)
- 4FGZ = 1/4" BSPF (G type)
- 4MSZ = 7/16" -20 SAE Male
- 6MSZ = 9/16" -18 SAE Male

316 Stainless Steel

- 4MNS = 1/4" NPTM
- 4MGS = 1/4" BSPM (G type)
- 4FGS = 1/4" BSPF (G type)
- 4FNS = 1/4" NPTF
- 6MSS = 9/16" -18 SAE Male

3 Circuit

- A = SPST/N.O.
- B = SPST/N.C.
- C = SPDT

4 Electrical Termination

- FLXX = Flying Leads²
- FLSXX = Flying Leads w/PVC Shrink Tubing²
- ELXX = 1/2" NPT Male Conduit w/Flying Leads³
- H = DIN 43650A Male Half Only⁴
- HR = Right Angle DIN 43650A Male Half Only⁴
- HC = DIN 43650A 9mm Cable Clamp⁴
- HCR = Right Angle DIN 43650A 9mm Cable Clamp⁴
- HN = DIN 43650A with 1/2" Female NPT Conduit⁴
- HNR = Right Angle DIN 43650A with 1/2" Female NPT Conduit⁴

5 Options

- V = Viton[®] Diaphragm
- N = Neoprene Diaphragm
- E = EPDM Diaphragm
- G = Gold Contacts
(for loads less than 12 mA @ 12 VDC)
- RD = Reduced Differential (25% reduction typical)
- OF = Oil Free Cleaned⁵
- R = Restrictor (low damping coefficient) Brass
- SR = Spiral Restrictor (high damping coefficient)
300 Series Stainless Steel⁶
- WF = Weather Pack Connector, Female
- WM = Weather Pack Connector, Male
- DE = Deutsch Connector, Male, DT04 Series

6 Fixed Set Point (optional)

- A. Specify set point -FS (in PSI or BAR, see example)⁷
- B. Set Point Actuation
- R on Rising Pressure
- F on Falling Pressure
- Example: -FS1BARF for 1 BAR Falling
- or -FS20PSIR for 20 PSI Rising

Notes:

1. Manifold mounts available. Consult factory.
2. 18" is standard. Specify lead length in inches (max. 48"). e.g. -FL18 or -FL30.
3. 18" is standard. Specify lead length in inches (max. 48"). e.g. -EL18 or -EL30.
4. DIN connectors require -C SPDT circuit.
5. Requires stainless steel pressure fitting.
6. -SR will result in wider deadbands and slower response times.
7. Set Point must be within Pressure Range selected in Step 1.

Table 1 — Pressure Range Codes

For Circuit Codes -A, -B and -C

Pressure Range Code	Pressure Range	Accuracy*	Average Deadband**
10	5-25 psi (0.35-1.7 bar)	±1.0 psi (0.07 bar) +2% of setting	3 psi (0.21 bar) +5% of setting
20	15-75 psi (1.0-5.2 bar)	±2.5 psi (0.17 bar) +2% of setting	5 psig (0.34 bar) +10% of setting
30	50-150 psi (3.5-10.3 bar)	±6 psi (0.41 bar) +2% of setting	15 psig (1.03 bar) +13% of setting
40	150-650 psi (10.3-44.8 bar)	±15 psi (1.03 bar) +2% of setting	25 psi (1.72 bar) +14% of setting
50	500-1750 psi (34.5-121 bar)	±25 psi (1.72 bar) +2% of setting	55 psi (3.79 bar) +15% of setting
60	1000-3500 psi (69-241 bar)	±45 psi (3.10 bar) +3% of setting	100 psi (6.89 bar) +16% of setting
70	2500-6000 psi (172-414 bar)	±80 psi (5.51 bar) +4% of setting	200 psi (13.8 bar) +17% of setting

* Accuracy and set point of units may change due to the effects of temperature.

** In certain applications deadband can be tailored and controlled to customer specifications. Consult factory for details.

2200 Series / 2600 Series

General Purpose Industrial Pressure Transducers

- ▶ Gauge, Vacuum, and Compound Pressure Models Available
- ▶ Submersible, General Purpose and Wash Down Enclosures
- ▶ High Stability Achieved by CVD Sensing Element
- ▶ Voltage and Current Output Models

The 2200 series features stability and accuracy in a variety of enclosure options. The 2600 series extends the packaging options via an all welded stainless steel back end for demanding submersible and industrial applications. The 2200 and the 2600 feature proven CVD sensing technology, an ASIC (amplified units), and modular packaging to provide a sensor line that can easily accommodate standard configurations while not sacrificing high performance.

Specifications

Input	
Pressure Range	Vacuum to 6000 psi (400 bar)
Proof Pressure	2 × Full Scale (FS) (1.5 × FS for 400 bar, ≥ 5000 psi)
Burst Pressure	>35 × FS ≤ 100 psi (6 bar); >20 × FS ≥ 1000 psi (60 bar); > 5 × FS ≤ 6000 psi (400 bar)
Fatigue Life	Designed for more than 100 million FS cycles
Performance	
Long Term Drift	0.2% FS/year (non-cumulative)
Accuracy	0.25% FS typical
Thermal Error	1.5% FS typical (optional 1% FS)
Compensated Temperatures	−5°F to +180°F (−20°C to +80°C)
Operating Temperatures	−40°F to +260°F (−40 °C to +125 °C) for elec. codes A, B, C, 1 −5°F to +180°F (−20 °C to +80 °C) for elec. codes 2, D, G, 3 −5°F to +125°F (−20 °C to +50 °C) for elec. codes F, M, P >100°C maximum 24 VDC supply
Zero Tolerance	1% of span
Span Tolerance	1% of span
Response Time	0.5 ms
Mechanical Configuration	
Pressure Port	See ordering chart
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See ordering chart
Enclosure	316 SS, 17-4 PH SS IP65 NEMA 4 for elec. codes A, B, C, D, G, 1, 2, 3 IP67 for elec. code "F" IP68 for elec. codes M, (max depth 200 meters H ₂ O) IP30 for elec. code "3" with flying leads
Vibration	70 g, peak to peak sinusoidal, 5–2000 Hz (Random Vibration: 20–2000 Hz @ 20 g Peak per MIL-STD-810E Method 514.4)
Acceleration	100g steady acceleration in any direction 0.032% FS/g for 15 psi (1 bar) range decreasing logarithmically to 0.0007% FS/g for 6000 psi (400 bar) range.
Shock	20 g, 11 ms, per MIL-STD.-810E Method 516.4 Procedure I
Approvals	CE, UR (22IC, 26IC, 22CS, 26CS)
Weight	Approx. 100 grams (additional cable; 75 g/m)

Series 2200



Series 2600



Individual Specifications

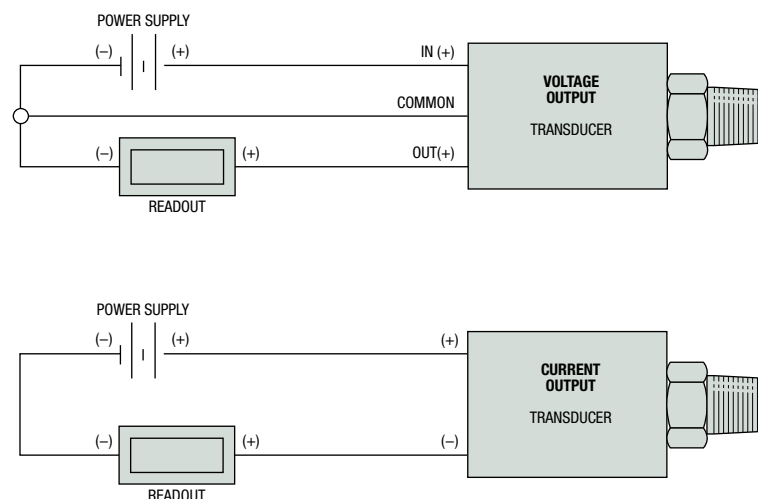
Voltage Output Units

Output	see ordering chart
Supply Voltage (Vs)	1.5 VDC above span to 35 VDC @ 6 mA
Supply Voltage Sensitivity	0.01% FS/Volt
Min. Load Resistance	(FS output / 2) kΩ
Current Consumption	approx 6 mA at 7.5 V output

Current Output Units

Output	4–20 mA (2 wire)
Supply Voltage (Vs)	24 VDC, (7–35 VDC)
Supply Voltage Sensitivity	0.01% FS/Volt
Max. Loop Resistance	$(V_s - 7) \times 50 \Omega$

Connection Code			Voltage Units				Current Units (4–20 mA)		
			IN+	COM	OUT+	EARTH	(+)	(–)	EARTH
A, B, G	“DIN”	PIN	1	2	3	4	1	2	4
C	“10-6 Bayonet”	PIN	A	C	B	E	A	B	E
D	“cable”		R	BK	W	DRAIN	R	BK	DRAIN
F	“IP 67 cable”		R	BK	W	DRAIN	R	BK	DRAIN
M	“Immersible”		R	W	Y	DRAIN	R	BL	DRAIN
1	“8-4 Bayonet”	PIN	A	C	B	D	A	B	D
2	“cable”		R	BK	W	DRAIN	R	BK	DRAIN
3	“conduit & cable”		R	BK	W	DRAIN	R	BK	DRAIN



Electromagnetic Capability

Meets the requirement for CE marking of EN50081-2 for emissions and EN50082-2 for susceptibility.

Test Data:

- EN61000-4-2 Electrostatic Discharge. 8 kV air discharge, 4 kV contact discharge. Unit survived.
- ENV50140 Radiated RF Susceptibility. 10 V/m, 80 MHz–1 GHz, 1 kHz mod. Maximum recorded output error was $< \pm 1\%$
- ENV50204 Radiated RF Susceptibility to Mobile Telephones. 10 V/m, 900 MHz. Maximum recorded output error was $< \pm 1\%$.
- EN61000-4-4 Fast Burst Transient. 2 kV, 5/50 ns, 5 kHz for 1 minute. Unit survived.
- ENV50141 Conducted RF Susceptibility. 10 Vms, 1 kHz mod, 150 kHz–80 MHz. Maximum recorded output error was $< \pm 1\%$


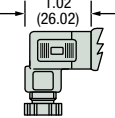
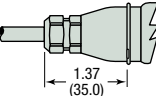
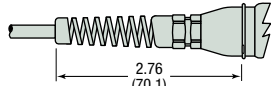
Cable Legend:

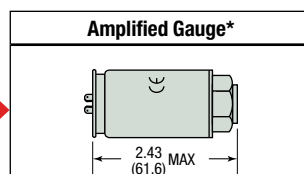
- R = Red
- BL = Blue
- BK = Black
- W = White
- Y = Yellow



Dimensions


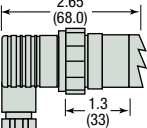

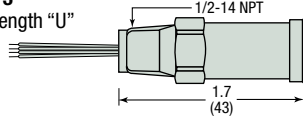
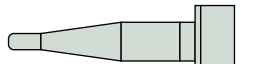
2200 Series

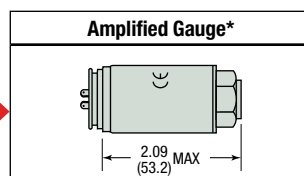
Mini 4-pin – No Connector	
Code B	
Mini 4-pin – With Connector	
Code A	 1.02 (26.02)
IP67 Cable (Waterproof)	
Code F	 1.37 (35.0)
IP65 or NEMA4 Cable	
Code D or 2	 2.76 (70.1)



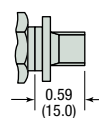
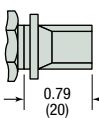
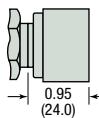
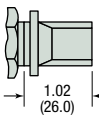
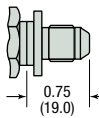
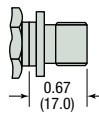

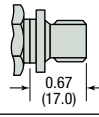
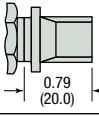

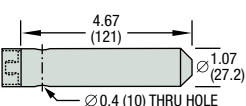
* Maximum diameter 1.07" (27.3 mm)

2600 Series

10-6 or 8-4 Mil-C Connector	
10-6: Code C 8-4: Code 1	 0.87 (22.0)
Large DIN 43650 Plug	
Code G	 2.65 (68.0) 1.3 (33)
Conduit Connector with Cable	
Code 3	 1/2-14 NPT 1.7 (43)
Conduit Connector with Flying Leads	
Code 3 with length "U"	 1/2-14 NPT 1.7 (43)
Moulded, Immersible Cable	
Code M	 0.9 (23)



* Maximum diameter 1.07" (27.3 mm)

1/8-27 NPT	
Code 08	 0.59 (15.0)
1/4-18 NPT	
No Snubber: Code 02 w/ Snubber: Code 0J	 0.79 (20)
1/4-18 NPT Internal	
Code 0E	 0.95 (24.0)
1/2-14 NPT	
Code 0H	 1.02 (26.0)
7/16-20 UNF-2A	
Code 04	 0.75 (19.0)
9/16-18 UNF-2A	
Code 1P	 0.67 (17.0)
ISO 228 - G 1/8 Internal	
Code 09	
ISO 228 - G 1/4 External	
Code 01	 0.67 (17.0)
ISO 7 - R 1/4 External	
Code 0A	 0.79 (20.0)
Nose Cone – Black Acetal	
Code 19	 0.79 (20.0)
Nose Cone Sink Weight	
Code 29	 4.67 (121) Ø 1.07 (27.2) Ø 0.4 (10) THRU HOLE

How to Order

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

	XXXX	X	G	XXX	XX	X	3	X	A	
Series										Performance Code
2200 - 2200 Series										Accuracy/Thermal
2600 - 2600 Series										A - 0.25%/1.5%
Output										Cable Length¹
B - 4–20 mA										U - No Cable Fitted ^{1,2}
C - 1–6 V										D - 3' (1 m)
D - 1–11 V										E - 9' (3 m)
F - 0.1–5.1 V										F - 16' (5 m)
G - 0.2–10.2 V										G - 32' (10 m)
H - 1–5 V										Apparatus Protection
J - 0.5–5.5 V										3 - Amplified Only RFI Protected CE Mark, UR
R - 0–5 V										Electrical Connection (See Notes)
S - 0–10 V										2200 Series
Pressure Datum										A - 4 PIN DIN (Micro) Mating Connector Supplied
G - Gauge										B - 4 PIN DIN (Micro) Mating Connector Not Supplied
Pressure Range³										2 - Cable Nema 4 USA
F07 - 0–7.5 psi				A10 - 0–1 bar						D - Cable European Color Code
F15 - 0–15 psi				A16 - 0–1.6 bar						F - Cable Gland Metal IP67
F30 - 0–30 psi				A25 - 0–2.5 bar						2600 Series
F60 - 0–60 psi				A40 - 0–4 bar						C - Fixed Plug Size 10-6 Mating Plug Not Supplied
G10 - 0–100 psi				A60 - 0–6 bar						G - Fixed Plug To DIN 43650 Mating Plug Supplied
G15 - 0–150 psi				B10 - 0–10 bar						M - Moulded Cable Immersible
G20 - 0–200 psi				B16 - 0–16 bar						1 - Fixed Plug Size 8-4 Mating Plug Not Supplied
G30 - 0–300 psi				B25 - 0–25 bar						3 - Conduit Connector 1/2-14 NPT Ext. 1 m Cable ²
G50 - 0–500 psi				B40 - 0–40 bar						
G60 - 0–600 psi				B60 - 0–60 bar						
H10 - 0–1,000 psi				C10 - 0–100 bar						
H15 - 0–1,500 psi				C16 - 0–160 bar						
H20 - 0–2,000 psi				C25 - 0–250 bar						
H30 - 0–3,000 psi				C40 - 0–400 bar						
H40 - 0–4,000 psi										
H50 - 0–5,000 psi										
H60 - 0–6,000 psi										
Vac = –15 psi				Vac = –1 bar						
1F5 - Vac–0 psi				1A0 - Vac–0 bar						
3F0 - Vac–15 psi				1A6 - Vac–0.6 bar						
6F0 - Vac–45 psi				2A5 - Vac–1.5 bar						
1G0 - Vac–85 psi				4A0 - Vac–3 bar						
2G0 - Vac–185 psi				6A0 - Vac–5 bar						
3G0 - Vac–285 psi				1B0 - Vac–9 bar						
				1B6 - Vac–15 bar						
				2B5 - Vac–24 bar						
				4B0 - Vac–39 bar						
Pressure Port										
North American Threads				European Threads						
08 - 1/8-27 NPT External				09 - G 1/8 Internal						
02 - 1/4-18 NPT External				01 - G 1/4 External						
0J - 1/4-18 NPT External w/ Snubber				0A - R 1/4 External						
0E - 1/4-18 NPT Internal				Submersible (2600 only)						
0H - 1/2-14 NPT External				19 - Plastic Nose Cone						
04 - 7/16-20 External (SAE #4, J514)				29 - Sink Weight Nose Cone						
1P - 9/16-18 External (SAE #6, J1926-2)										
IJ - 7/16-20 External (SAE #4, J1926-2)										

Notes:

- When electrical connection is cable please select a cable length from Table 1 below. When electrical connection is DIN or plug style "U" must be specified.
- Where electrical connection -3 and cable length -U occur in part number, the unit will be supplied with flying leads (4-1/2" IP30).
- Additional Pressure Ranges are available. Please consult factory.

Table 1 – Cable Length

(2600 Series) (2200 Series select "U" through "G")

Code	Length (M)	Code	Length (M)
U	No Cable Fitted	M	40
D	1	N	50
E	3	P	75
F	5	Q	100
G	10	R	125
H	15	S	150
J	20	4	170
K	25	5	200
L	30	6	225

Note: Maximum cable length on a 2200 is 10 meters.

DG Series – High Flow

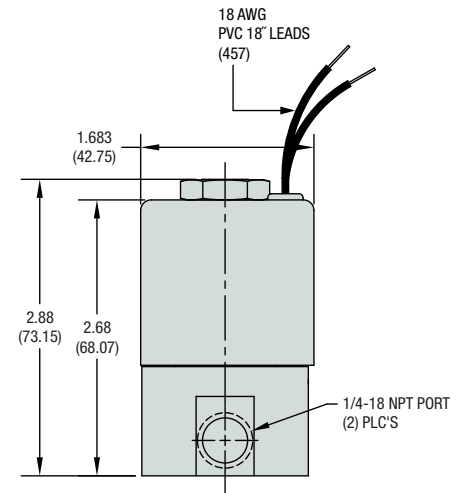
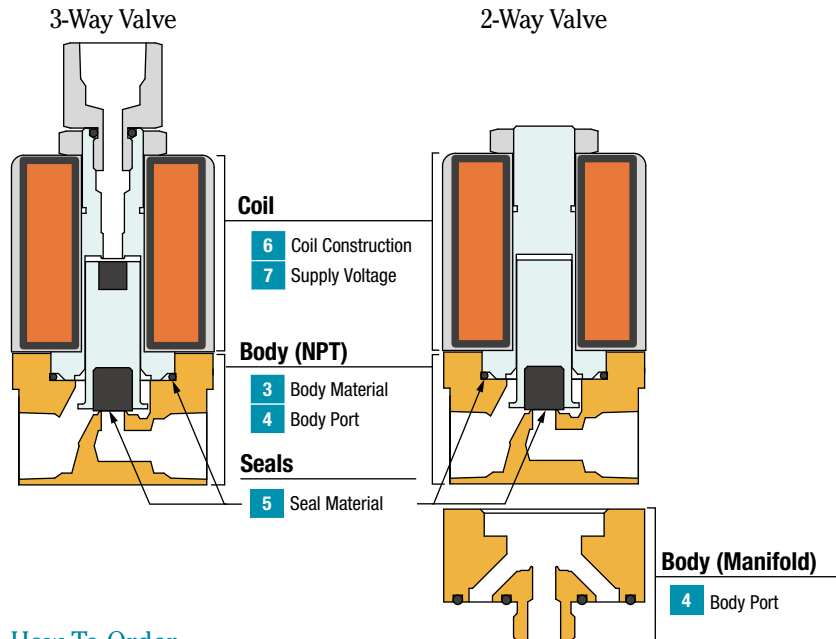
- ▶ MOPD: 900 PSI (62 Bar)
- ▶ C_v Range: 0.045 to 0.880 (K_v Range: 0.038 to 0.748)
- ▶ 10 Watts

For maximum flow in a miniature solenoid valve the DG Series delivers a wide range of C_v (K_v) values and maximum operating pressures. The DG Series is also available in multiple body materials, seal materials, coil constructions, voltages, and wattages. Proven to perform for millions of cycles without failure, the DG valve – as with the entire valve series – is ideal for manifold configurations, sub-assemblies, and complete fluidic systems. The DG Series is the largest in a progression – AG Series and BG Series – of the highly flexible, modular design, (general purpose) valves.

Typical Applications

- Agriculture
- Defense
- Sterilization Equipment
- Industrial Automation

Reference



Example Shown

Part Number: DG2024-01LB-B-G1-203
From How to Order example below.

How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

DG	20	24	-	01	LB	-	B	-	G1	-	203
Series	Function	MOPD	-	Body Material	Body Port	-	Seal Material	-	Coil Construction	-	Supply Voltage

Product Description from Example Shown Above:

DG2024-01LB-B-G1-203

DG2024 = DG Series with 2-Way Normally Closed Valve Function; 85 MOPD

-01LB = 303 Stainless Steel **Body Material**; 1/4" NPT Female **Body Port**

-B = Nitrile (Buna-N) **Seal Material**; (Plunger Seal and Internal O-Ring)

-G1 = Grommet Tape-Wrapped (Class B) **Coil Construction**

-203 = 12 VDC **Supply Voltage**

DG Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

DG			-			-		-			-	
Series	1	2		3	4		5		6			7

1 + 2 Valve Function & Maximum Operating Pressure Differential

Valve Function	Code	MOPD		C _v		K _v		Orifice			
		psig	bar	Body	Stop	Body	Stop	Body		Stop	
								inches	mm	inches	mm
2-WAY Normally Closed	2002	900	62	0.045	—	0.038	—	3/64	1.19	—	—
	2003	650	45	0.080	—	0.068	—	1/16	1.98	—	—
	2006	350	24	0.150	—	0.128	—	3/32	2.38	—	—
	2010	225	16	0.210	—	0.179	—	1/8	3.18	—	—
	2019	130	9.0	0.380	—	0.323	—	5/32	3.97	—	—
	2024	85	5.9	0.430	—	0.366	—	3/16	4.76	—	—
	2029	50	3.4	0.700	—	0.595	—	1/4	6.35	—	—
	2035	20	1.4	0.850	—	0.723	—	5/16	7.94	—	—
3-WAY Normally Closed	3114	175	12	0.080	0.080	0.068	0.068	1/16	1.59	1/16	1.59
	3117	150	10	0.110	0.110	0.094	0.094	5/64	1.98	5/64	1.98
	3120	125	8.6	0.150	0.150	0.128	0.128	3/32	2.38	3/32	2.38
	3124	85	5.9	0.210	0.210	0.179	0.179	1/8	3.18	1/8	3.18
	3130	45	3.1	0.380	0.380	0.323	0.323	5/32	3.97	5/32	3.97
	3133	30	2.1	0.430	0.380	0.366	0.323	3/16	4.76	5/32	3.97
	3137	10	0.7	0.700	0.380	0.595	0.323	1/4	6.35	5/32	3.97
3-WAY Normally Open	3211	200	14	0.080	0.080	0.068	0.068	1/16	1.59	1/16	1.59
	3214	175	12	0.110	0.110	0.094	0.094	5/64	1.98	5/64	1.98
	3217	150	10	0.150	0.150	0.128	0.128	3/32	2.38	3/32	2.38
	3222	100	6.9	0.210	0.210	0.179	0.179	1/8	3.18	1/8	3.18
	3229	50	3.4	0.380	0.380	0.323	0.323	5/32	3.97	5/32	3.97
	3232	35	2.4	0.430	0.380	0.366	0.323	3/16	4.76	5/32	3.97
	3236	15	1.0	0.700	0.380	0.595	0.323	1/4	6.35	5/32	3.97
3-WAY Multi Purpose	3316	160	11	0.080	0.080	0.068	0.068	1/16	1.59	1/16	1.59
	3319	130	9.0	0.110	0.110	0.094	0.094	5/64	1.98	5/64	1.98
	3321	110	7.6	0.150	0.150	0.128	0.128	3/32	2.38	3/32	2.38
	3326	75	5.2	0.210	0.210	0.179	0.179	1/8	3.18	1/8	3.18
	3331	40	2.8	0.380	0.380	0.323	0.323	5/32	3.97	5/32	3.97
	3334	25	1.7	0.430	0.380	0.366	0.323	3/16	4.76	5/32	3.97
	3337	10	0.7	0.700	0.380	0.595	0.323	1/4	6.35	5/32	3.97
3-WAY Directional Control	3410	225	16	0.080	0.080	0.068	0.068	1/16	1.59	1/16	1.59
	3413	185	13	0.110	0.110	0.094	0.094	5/64	1.98	5/64	1.98
	3417	150	10.3	0.150	0.150	0.128	0.128	3/32	2.38	3/32	2.38
	3421	110	7.6	0.210	0.210	0.179	0.179	1/8	3.18	1/8	3.18
	3428	60	4.1	0.380	0.380	0.323	0.323	5/32	3.97	5/32	3.97
	3431	40	2.8	0.430	0.380	0.366	0.323	3/16	4.76	5/32	4.76
	3435	20	1.4	0.700	0.380	0.595	0.323	1/4	6.35	5/32	3.97

3 Body Material

01 303 Stainless Steel
XX No Body
 (4 Body Port **OB** only)

5 Seal Material

B Nitrile
V Viton® (1/4" orifice max)

7 Supply Voltages

203 12 VDC
204 24 VDC

4 Body Port

LB 1/4" NPT Female
LD 3/8" NPT Female
MM Manifold Mount
 (1/2"-20 Stud;
 1/4" Orifice, Max.)
OB Omit Body (operator only)*
 (3 Body Material **XX** only)

6 Coil Construction

G1 Grommet Housing,
 Tape-Wrapped (Class B) Lead Wires
G5 Grommet Housing,
 Epoxy Encapsulated (Class B) Lead Wires
S1 Epoxy Encapsulated (Class B), 1/4" Spade Terminals

* Contact Gems for the operator orifice drawings

DG Series – Additional Component Details & Dimensions

1 Valve Function

Flow Schematics

Flow Key

Blocked Flow

Free Flow

O/S = Over Seat

U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		
3-Way Normally Closed		
3-Way Normally Open		
3-Way Multi Purpose		
3-Way Directional Control		

DG Series – Additional Component Details & Dimensions, cont.

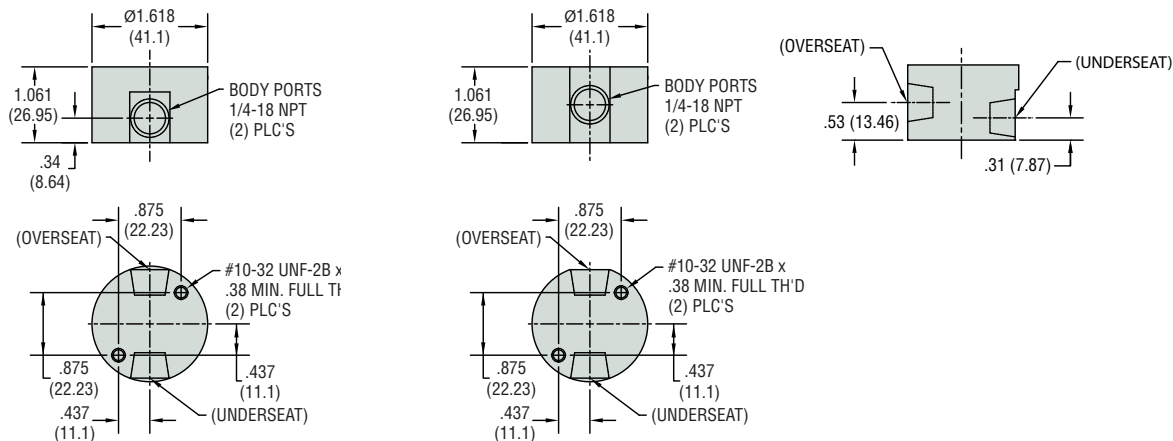
4 Body Port

Note: Contact Gems for the operator orifice drawings

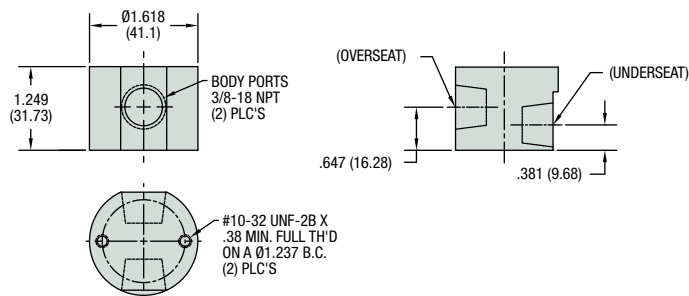
Ported Bodies

1/4" NPT Port (LB)

FOR 1/4", 5/16", 3/8" BODY ORIFICES



3/8" NPT Port (LD)



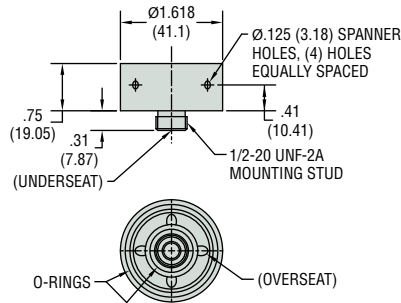
3/8-18 NPT PORTS (OPTION "LD")

DG Series – Additional Component Details & Dimensions, cont.

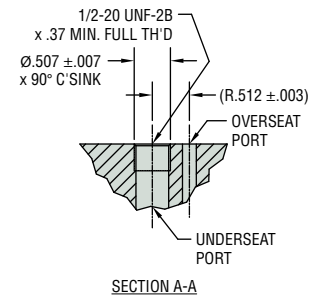
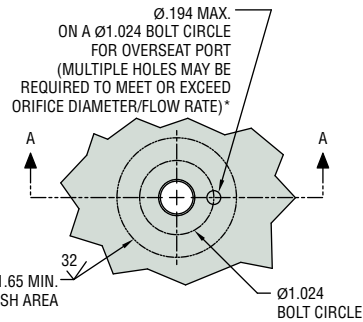
4 Body Port (continued)

Manifold Mounting Bodies

Manifold Mount 1/2"-20 Stud Body (MM)



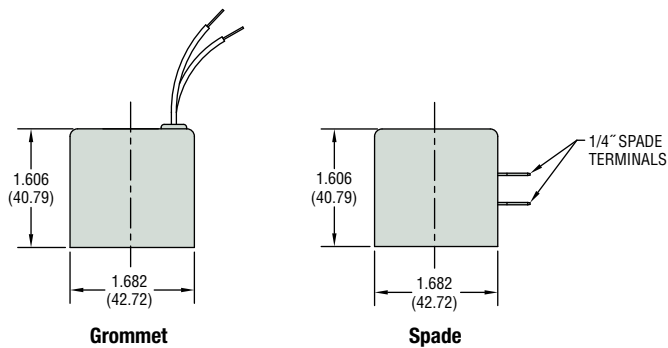
Manifold Preparation



* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Type	Overseat Port	Underseat Port
2-Way N.C.	IN	OUT
3-Way N.C.	CYL	IN
3-Way N.O.	CYL	EXH
3-Way M.P.	COM	N.C.
3-Way D.C.	IN	N.C.

6 Coil Construction



B Series – Modular

- ▶ MOPD: 400 PSI (28 Bar)
- ▶ C_v Range: 0.018 to 0.430 (K_v Range: 0.016 to 0.372)
- ▶ 7 Watts

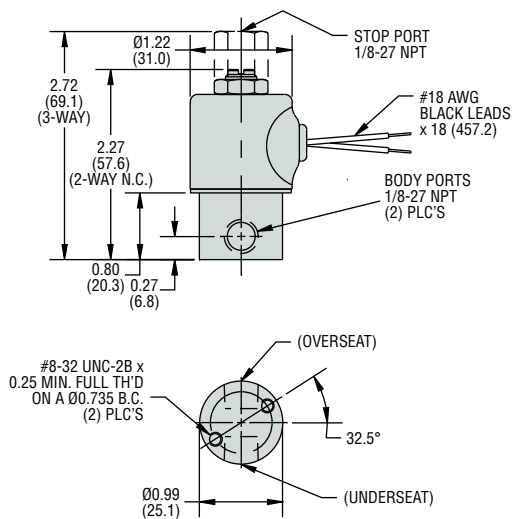
The B Series is a direct acting solenoid valve, available in 2- or 3-way functionality. Like all of our valves, the B Series has bubble tight plunger construction and is designed to last for millions of cycles in general purpose liquid, gas, and vacuum applications. The B Series is available in various orifice sizes, a variety of body materials, wattages, and coil constructions for the utmost adaptability to your application requirements. The B Series is an excellent choice for most general-purpose application requiring a C_v of 0.018 to 0.430 (K_v of 0.016 to 0.372).

Typical Applications

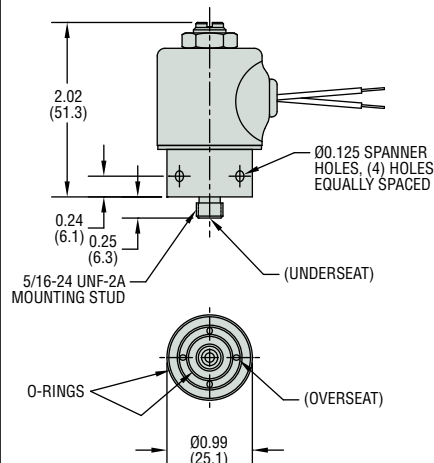
- Printing
- HVAC
- Semiconductor Equipment
- Medical Equipment

Dimensions

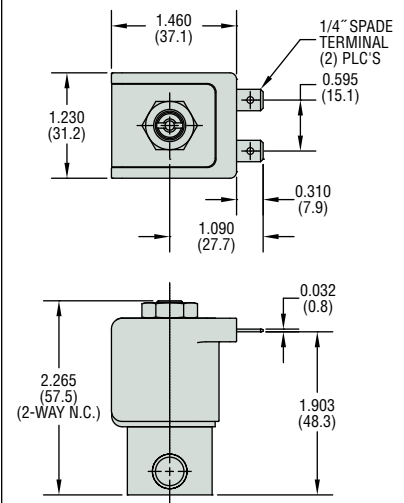
Threaded Port Body



Manifold Mount Body

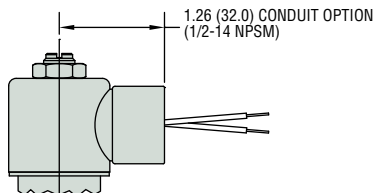


Molded Coil



Alternate 1/2" Conduit Housing

Available on all body configurations



See Manifold Mount Interface Details on pages J-22–J-23.



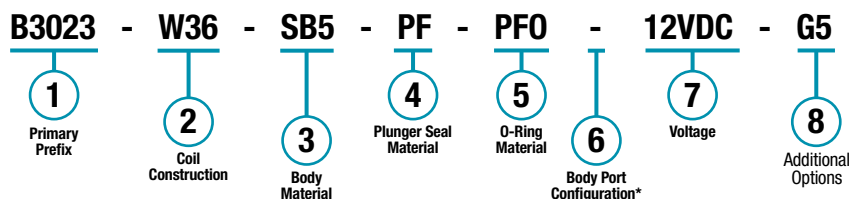
CE



Next Day Shipping
On Many Configurations

How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.



Example:

B3023-W36-SB5-PF-PFO-12VDC-G5

2-Way N.C. Free Vent (with 1.26 Conduit Option) solenoid valve, with 36" (91cm) tape-wrapped coil, lead-wired, non-standard length, 316 stainless steel body, perfluoroelastomer plunger seal, perfluoroelastomer o-ring, 1/8-27 NPT female thread, operating at 12 VDC, and includes a one piece 316 stainless steel guide assembly option.














* Blank entry indicates a "Standard" selection (1/8-27 NPT female thread, in this case).



Take advantage of next day shipping by making your selections from those marked with the Lightning Bolt icon.

Part Prefix Table ①

	Orifice				MOPD		C _v		K _v		① Primary Prefix	
	Body		Stop		psig	bar	Body	Stop	Body	Stop	Grommet Housing	Conduit Housing
	inches	mm	inches	mm								
2-WAY N.C.	1/16	1.59	—	—	400	28	0.065	—	0.056	—	B2011	B2021
	5/64	1.98	—	—	300	21	0.090	—	0.078	—	B2012	B2022
	3/32	2.38	—	—	250	17	0.155	—	0.134	—	B2013	B2023
	7/64	2.78	—	—	200	14	0.200	—	0.173	—	B2014	B2024
	1/8	3.18	—	—	150	10	0.240	—	0.208	—	B2015	B2025
	5/32	3.97	—	—	100	6.9	0.300	—	0.259	—	B2016	B2026
	3/16	4.76	—	—	50	3.4	0.430	—	0.372	—	B2017	B2027
2-WAY N.O.	—	—	1/32	0.79	400	28	—	0.019	—	0.016	B2211	B2221
	—	—	3/64	1.19	300	21	—	0.040	—	0.035	B2212	B2222
	—	—	1/16	1.59	200	14	—	0.075	—	0.065	B2213	B2223
	—	—	5/64	1.98	150	10	—	0.090	—	0.078	B2214	B2224
3-WAY N.C. Free Vent	1/32	0.79	1/32	0.79	250	17	0.018	0.018	0.016	0.016	B3011	B3021
	3/64	1.19	3/64	1.19	175	12	0.040	0.040	0.035	0.035	B3012	B3022
	1/16	1.59	1/16	1.59	125	8.6	0.065	0.070	0.056	0.061	B3013	B3023
	5/64	1.98	5/64	1.98	100	6.9	0.090	0.090	0.078	0.078	B3014	B3024
	3/32	2.38	5/64	1.98	75	5.2	0.155	0.090	0.134	0.078	B3015	B3025
	1/8	3.18	5/64	1.98	50	3.4	0.240	0.090	0.208	0.078	B3016	B3026
	5/32	3.97	5/64	1.98	15	1.0	0.300	0.090	0.259	0.078	B3017	B3027
3-WAY N.C. Line Connection	1/32	0.79	1/32	0.79	250	17	0.018	0.018	0.016	0.016	B3111	B3121
	3/64	1.19	3/64	1.19	175	12	0.040	0.040	0.035	0.035	B3112	B3122
	1/16	1.59	1/16	1.59	125	8.6	0.065	0.070	0.056	0.061	B3113	B3123
	5/64	1.98	5/64	1.98	100	6.9	0.090	0.090	0.078	0.078	B3114	B3124
	3/32	2.38	5/64	1.98	75	5.2	0.155	0.090	0.134	0.078	B3115	B3125
	1/8	3.18	5/64	1.98	50	3.4	0.240	0.090	0.208	0.078	B3116	B3126
	5/32	3.97	5/64	1.98	15	1.0	0.300	0.090	0.259	0.078	B3117	B3127
3-WAY N.O.	1/32	0.79	1/32	0.79	200	14	0.018	0.018	0.016	0.016	B3211	B3221
	3/64	1.19	3/64	1.19	150	10	0.040	0.040	0.035	0.035	B3212	B3222
	1/16	1.59	1/16	1.59	125	8.6	0.065	0.070	0.056	0.061	B3213	B3223
	5/64	1.98	5/64	1.98	100	6.9	0.090	0.090	0.078	0.078	B3214	B3224
	3/32	2.38	5/64	1.98	75	5.2	0.155	0.090	0.134	0.078	B3215	B3225
	1/8	3.18	5/64	1.98	50	3.4	0.240	0.090	0.208	0.078	B3216	B3226
	5/32	3.97	5/64	1.98	15	1.0	0.300	0.090	0.259	0.078	B3217	B3227
3-WAY Multi Purpose	1/32	0.79	1/32	0.79	175	12	0.018	0.018	0.016	0.016	B3311	B3321
	3/64	1.19	3/64	1.19	125	8.6	0.040	0.040	0.035	0.035	B3312	B3322
	1/16	1.59	1/16	1.59	100	6.9	0.065	0.070	0.056	0.061	B3313	B3323
	5/64	1.98	5/64	1.98	75	5.2	0.090	0.090	0.078	0.078	B3314	B3324
	3/32	2.38	5/64	1.98	50	3.4	0.155	0.090	0.134	0.078	B3315	B3325
	1/8	3.18	5/64	1.98	25	1.7	0.240	0.090	0.208	0.078	B3316	B3326
	5/32	3.97	5/64	1.98	15	1.0	0.300	0.090	0.259	0.078	B3317	B3327
3-WAY Directional Control	1/32	0.79	1/32	0.79	275	19	0.018	0.018	0.016	0.016	B3411	B3421
	3/64	1.19	3/64	1.19	200	14	0.040	0.040	0.035	0.035	B3412	B3422
	1/16	1.59	1/16	1.59	150	10	0.065	0.070	0.056	0.061	B3413	B3423
	5/64	1.98	5/64	1.98	100	6.9	0.090	0.090	0.078	0.078	B3414	B3424
	3/32	2.38	5/64	1.98	75	5.2	0.155	0.090	0.134	0.078	B3415	B3425
	1/8	3.18	5/64	1.98	50	3.4	0.240	0.090	0.208	0.078	B3416	B3426
	5/32	3.97	5/64	1.98	25	1.7	0.300	0.090	0.259	0.078	B3417	B3427

2 Coil Construction**(blank)** = Tape-wrapped, Class B (130°C), with 18" (45.7cm) lead wires* **W**___ = Tape-wrapped coil, lead wires, non-standard length
(specify length in inches)**10** = Externally rectified coil (AC voltages lead wires only) **1** = Encapsulated coil, Class B (130°C), lead wires**3** = Encapsulated coil, Class H (180°C), lead wires**4** = Encapsulated coil, Class B (130°C), 3/16" (4.76mm) spade terminals
(1/4" (6.35mm) spade terminal optional)**11** = Tape-wrapped coil, Class H (180°C), lead wires**HC2** = Encapsulated coil, Class B (130°C), 9.4mm DIN
(EN175301-803 Style C Industrial 2+1 poles)**3 Body Material****(blank)** = 303 Stainless Steel* **BB** = Brass**SB** = 304 Stainless Steel**SB5** = 316 Stainless Steel**SBF** = 430F Stainless Steel**4 Plunger Seal Material****(blank)** = Nitrile* **E** = EPDM **GV** = Gasoline Viton® (2-way N.C. only)**N** = Neoprene **NS** = Nitrile (NSF/FDA material) **PF** = Perfluoroelastomer **R** = Rulon® (2-way N.C. only)**T** = PTFE**V** = Viton® **5 O-Ring Material****(blank)** = Nitrile* **EO** = EPDM **NO** = Neoprene **NSO** = Nitrile (NSF/FDA material) **PFO** = Perfluoroelastomer **TO** = PTFE**VO** = Viton® **6 Body Port Configuration****(blank)** = 1/8-27 NPT female thread* **LB** = 1/4-18 NPT female thread**BD** = #10-32 female straight thread
– max. orifice = 1/8" (3.18mm)**LT** = 1/8-28 BSPT female thread**LU** = 1/4-19 BSPT female thread (2-way N.C. only)**MM** = Manifold mount (1/4-28 UNF-2A mounting stud)†††**MM3** = Manifold mount (5/16-24 UNF-2A mounting stud)†††**OB** = Omit body (operator style)**MB** = Bottom metering (2-way N.C. only)**BI** = Bottom over-seat port, female thread
– max. orifice = 1/8" (3.18mm)**BIM** = Bottom over-seat port, 1/8-27 NPT male thread
– max. orifice = 5/64" (1.98mm), brass body only**BO** = Bottom under-seat port, female thread**BOM** = Bottom under-seat port, 1/8-27 NPT male thread
– max. orifice = 1/8" (3.18mm), brass body only**RL** = 90° porting - left hand**RR** = 90° porting - right hand**BS** = Stop port, #10-32 female straight thread**7 Voltage†† (see note below)****C203** = 12 VDC **C204** = 24 VDC **C301** = 120/50/60R (add Coil Option -10) **C303** = 240/50/60R (add Coil Option -10) ___ **VDC** = DC (specify DC voltage)___ **VAC** = AC (specify AC voltage; includes copper shading ring)**8 Additional Options****Y** = Yoke (2-way N.C. only)**WM** = Mounting bracket**TP** = PTFE coated plunger**QO** = Quiet operation (2-way N.C. only)**S** = Silver shading ring**OC** = Cleaned for oxygen use**VAC** = Vacuum application – 0 to 29.5" Hg (0 to 1000mBar)**G1** = One-piece 303 Stainless Steel guide assembly
(standard on 2-way normally open and all 3-way valves)**G5** = One piece 316 Stainless Steel guide assembly**SH** = 1" Diameter housing, grommet**SC** = 1" Diameter housing, conduit

* Standard selection; will be used unless otherwise specified. Standard selections are not referenced in final part number.

† Internal rectified available. Consult factory.

†† Can be AC rectified without shading ring. Use coil construction Code 10.

††† Teflon® o-ring not suitable for manifold mount.

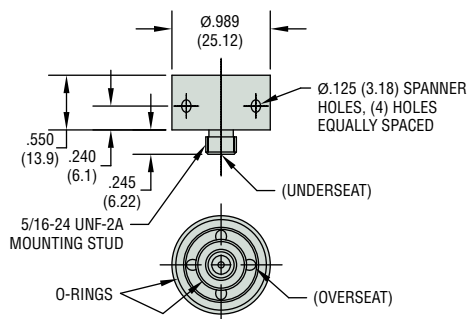


Take advantage of next day shipping by making your selections from those marked with the Lightning Bolt icon.

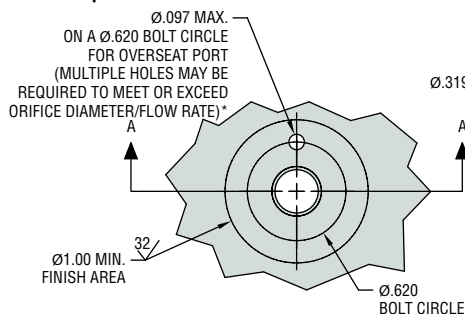
B Series – Manifold Mount Interface Details

Manifold Mounting Bodies

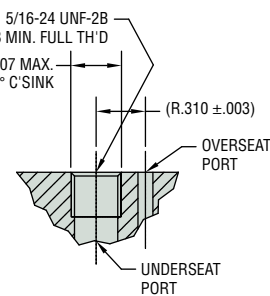
Manifold Mount 5/16"-24 Stud Body (MM3)



Manifold Preparation

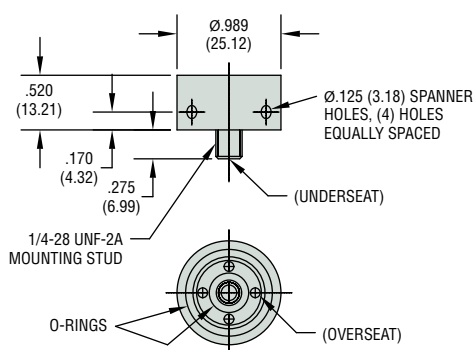


* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

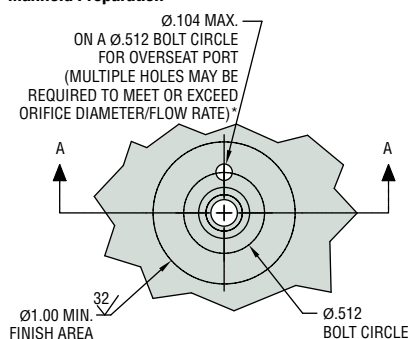


SECTION A-A

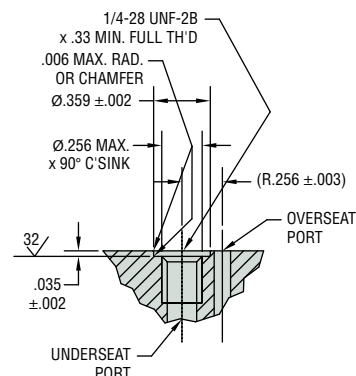
Manifold Mount 1/4"-28 Stud Body (MM)



Manifold Preparation



* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.



SECTION A-A

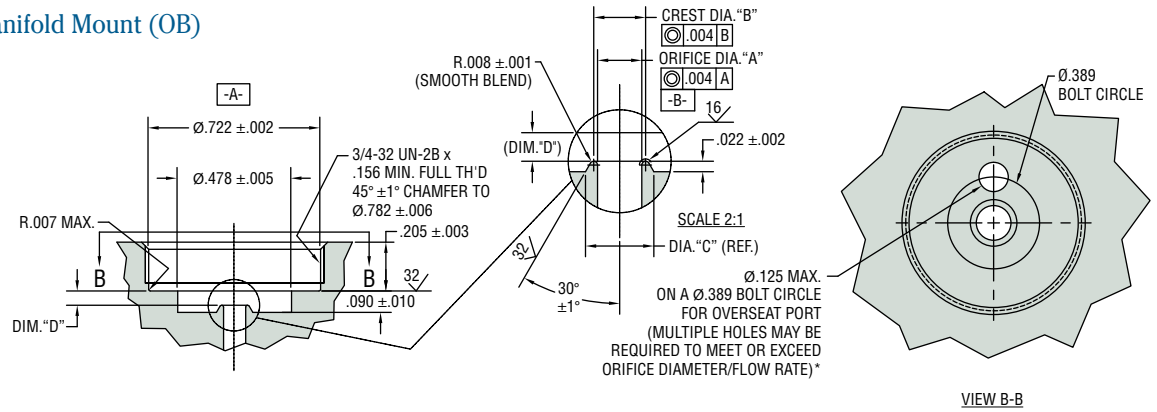
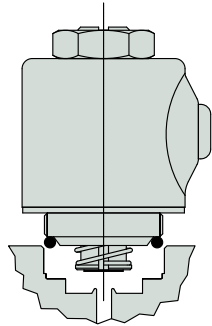
Standard and Vacuum Port values for all manifold drawings on this page.

Valve Type	Standard		Vacuum	
	Overseat Port	Underseat Port	Overseat Port	Underseat Port
2-Way N.C.	IN	OUT	VAC	IN
2-Way N.O.	IN	—	IN	—
3-Way N.C.	CYL	IN	IN	VAC
3-Way N.O.	CYL	EXH	CYL	EXH
3-Way M.P.	COM	N.C.	COM	N.C.
3-Way D.C.	IN	N.C.	VAC	N.C.

B Series – Operator (OB) Interface Details

Omit Body Manifold Mount (OB)

N.C. & 3-Way



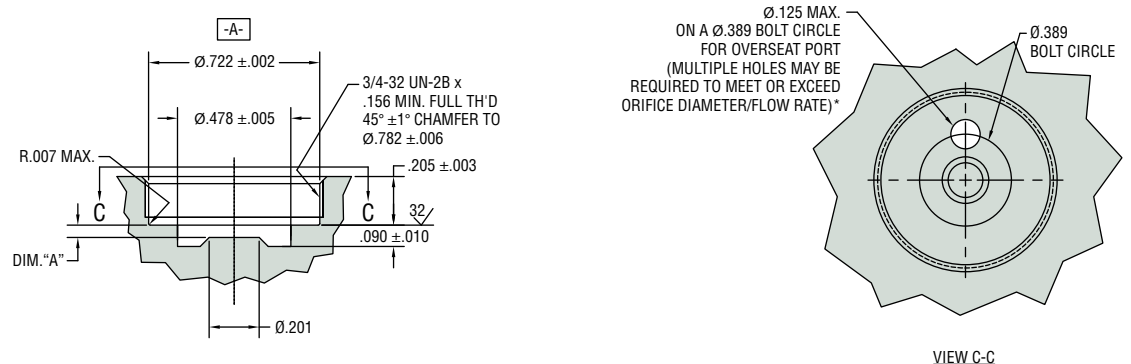
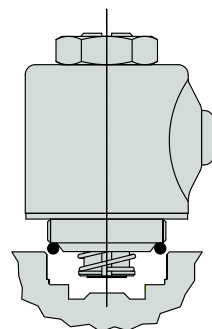
Note: All diameters to be concentric to datum -A- within .003 T.I.R.

Dimensions

* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Function	Valve Prefix (Code 1)	Orifice Dia. "A" ±.001	Crest Dia. "B" ±.002	Base Dia. "C" Ref.	Orifice Depth Dim. "D" ±.001
2-Way N.C.	2011	.062 (1.57)	.078 (1.98)	.1126 (2.860)	.052 (1.32)
	2012	.078 (1.98)	.094 (2.39)	.1286 (3.266)	.056 (1.42)
	2013	.093 (2.36)	.109 (2.77)	.1436 (3.647)	.060 (1.52)
	2014	.109 (2.77)	.125 (3.18)	.1596 (4.054)	.064 (1.63)
	2015	.120 (3.05)	.136 (3.45)	.1706 (4.333)	.067 (1.70)
	2016	.148 (3.76)	.164 (4.17)	.1986 (5.044)	.074 (1.88)
	2017	.176 (4.47)	.192 (4.88)	.2266 (5.756)	.081 (2.06)
3-Way (All)	3X11	.040 (1.02)	.052 (1.32)	.0843 (2.141)	.047 (1.19)
	3X12	.046 (1.19)	.062 (1.57)	.0966 (2.454)	.048 (1.22)
	3X13	.062 (1.57)	.078 (1.98)	.1126 (2.860)	.052 (1.32)
	3X14	.078 (1.98)	.094 (2.39)	.1286 (3.266)	.056 (1.42)
	3X15	.093 (2.36)	.109 (2.77)	.1436 (3.647)	.060 (1.52)
	3X16	.120 (3.05)	.136 (3.45)	.1706 (4.333)	.067 (1.70)
	3X17	.148 (3.76)	.164 (4.17)	.1986 (5.044)	.074 (1.88)

N.O.



Note: All diameters to be concentric to datum -A- within .003 T.I.R.

Dimensions

* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Function	Valve Prefix (Code 1)	Orifice Depth Dia. "A" ±.001	Stop Orifice Ref.
2-Way N.O.	2211	.047 (1.19)	1/32
	2212	.048 (1.22)	3/64
	2213	.052 (1.32)	1/16
	2214	.056 (1.42)	5/64

Small Size – Alloys

XM/XT-800 Series – Compact Analog Sensors

- ▶ Stainless or Brass Construction
- ▶ 1/4" Resolution
- ▶ Lengths to 144 inches (366 cm)
- ▶ OEM Configurations Available

These compact transmitters feature the rugged durability of stainless steel or brass construction. The XM-800 series provides analog output, and can be combined with GEMS Digital Meter Receiver Stations and compact Level Cubes described in this catalog. Our versatile XT-800 Series adds a choice of signal conditioning for use with GEMS digital bargraph receivers or other digital display and control equipment.

Approvals

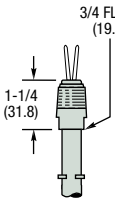
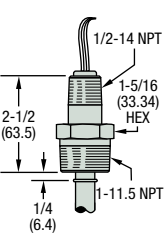
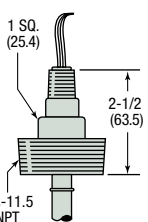
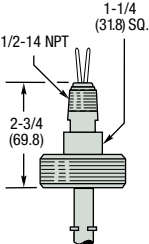
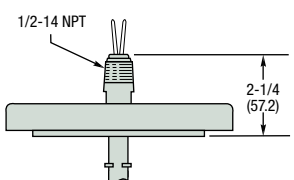
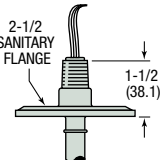
XM-800 and XT-800 Series transmitters may carry the following commercial approvals:

 UL-Recognized.

XM-800 Series transmitters only:

 CSA Certified

1. Mounting Types

	Type 1 1/2-14 NPT	Type 10 1-11.5 NPT	Type 2 1 1/4	Type 3 2-11.5 NPT	Type 4 3" 150# Flange	Type 6 2 1/2" Sanitary Flange
						
Stem Material	Brass or 316 Stainless Steel				316 Stainless Steel	
Mounting Material	Brass or 316 Stainless Steel				Carbon Steel or 316 SS	316 Stainless Steel
Float Stop Material	Brass Units: Beryllium Copper Grip Rings; Stainless Steel Units: S.S. Armco PH-15-7MO Grip Rings					
Operating Temperature* With J. Box Mounted or XM Signal Conditioners	Oil: -40 °F to +230 °F (-40 °C to +110 °C), Water: up to +180 °F (82.2 °C) — Buna-N Float -40 °F to +230 °F (-40 °C to +110 °C) — Stainless Steel Float					
With Stem Mounted Signal Conditioners	+5 °F to +160 °F (-15 °C to +70 °C)					
Operating Pressure	Dependent on Float Type; See Next Page					
Maximum Overall Length	72" (183 cm) Tubing; 144" (366 cm) Pipe (Types 3 & 4 only)					

* Consult factory for higher temperature ranges.

ORDER IT!

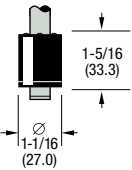
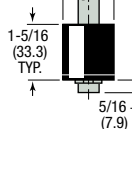
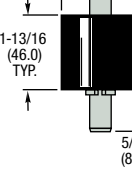
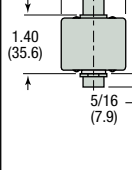
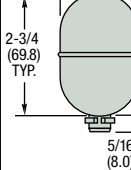
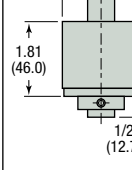
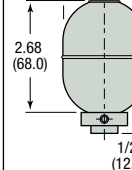
Ordering is Easy! See Page C-11.
Easy online ordering too!

Lengths
to 12 ft!



2. Float Types

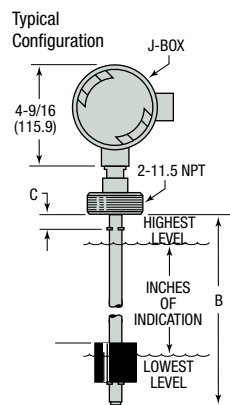
Based on the overall length required by your tank, select from two main subsets of floats below; further refine selection based on material and performance parameters.

	For Overall Lengths To 72"					For Lengths Greater Than 72" (144" Max.)	
Float Material	Buna N			Stainless Steel		Buna N	Stainless Steel
Float Dimensions							
Compatible Mountings	1, 2, 3, 4, 6, 10	1, 2, 3, 4, 6	1, 3, 4	1, 3, 4, 6	1, 3, 4	3, 4	3, 4
Part Number	253644	164255 ²	43359	156490	43590	69654	52084
Min. Liquid Spec. Gravity	0.55			0.70	0.75	0.55	0.75
Maximum Operating Pressure ¹	150 psi (10 bar)			80 psi (6 bar)	300 psi (21 bar)	150 psi (10 bar)	300 psi (21 bar)
Maximum Operating Temperature	Water: 180 °F (82 °C) Oil: 230 °F (110 °C)			230 °F (110 °C) ³		Water: 180 °F (82 °C) Oil: 230 °F (110 °C)	230 °F (110 °C) ³

Notes:

- ② Ambient Temperature
- Recommended for Type 2 mounting only.
- Consult factory for higher temperature range.

3. To Determine Dimensions



B: Overall Length = Inches of Indication + C + X (See Table at Right)

C: Distance From Bottom of Mounting to Float Stop (Customer Specified):

- 1/4" (6.4 mm) Minimum
- 1-1/4" (31.8 mm) Minimum on Type 1, XT Series only

Calculating Length

To find Overall Length when Inches or Indication is known:

- Inches of Indication + C* + X = Overall Length

To find Maximum Inches of Indication when Overall Length is known:

- Overall Length – C* – X = Maximum Inches of Indication

* C dimension is determined by customer.

Float Factor – X

Float Part Number	X
253644	2.125" (54.0 mm)
164255	2.0" (50.8 mm)
43359	2.5" (63.5 mm)
156490	2.062" (52.4 mm)
43590	3.437" (87.3 mm)
69654	2.687" (68.3 mm)
52084	3.625" (92.1 mm)

4. Input/Output

For XM-800 Series, no special output designation is necessary. For XT-800 Series, specify the desired signal conditioning by Part Number.

Additional information about GEMS signal conditioning modules is found on Page C-26.

Series	Input Voltage	Output Signal	Part Number	Electrical Termination	Compatible Mountings	
					Type 1	Types 2, 3, 4, 6 & 10
XM-800	10–30 VDC	Proportional Voltage	—	Lead Wires (3), 22 AWG, 24" (60.9 cm), PTFE Jacket	●	●
	8–24 VDC*	0–5 VDC	51965	Lead Wires, 22 AWG, 24" (60.9 cm), PTFE Jacket	●	●
XT-800	14–30 VDC*	0–12 VDC	51970		●	●
	8–24 VDC*	0–5 VDC	52536	Junction Box		●
	15–30 VDC*	0–12 VDC	52537			●
	10–40 VDC	4–20 mA	52555			●
		4–20 mA	112300 ⚡	Panel Mount with Plug-in Base	●	●
	7–24 VDC*	4–20 mA	239896	Lead Wires (2), 22 AWG, 24" (60.9 cm), PTFE Jacket	●	●

* Stem mounted

⚡ Stock item

ULS-1 Single Point Level Switches

- ▶ Compact 1/4" and 1/2" NPT versions
- ▶ All-Stainless Steel wetted materials
- ▶ IP65 ingress protection

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

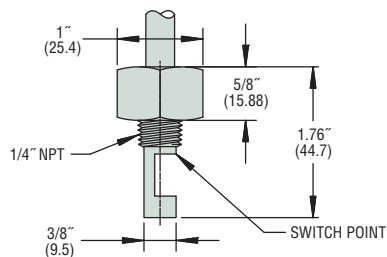
Relay output provides a reliable switch interface with remote devices such as a PLC, SCADA or alarm.

Specifications

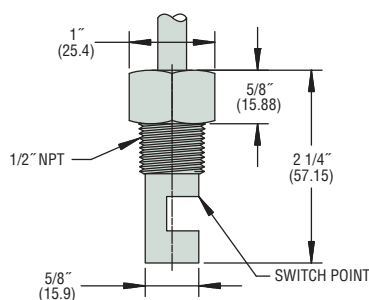
Wetted Material	316L Stainless Steel
Repeatability	2 mm (or better)
Protection	Transient Reverse Polarity
Leakage Current	<50µA
Delay	0.5 seconds
Input Power	5 VDC to 30 VDC
Output	See Ordering Table

Dimensions

1/4" NPT Mounting



1/2" NPT Mounting



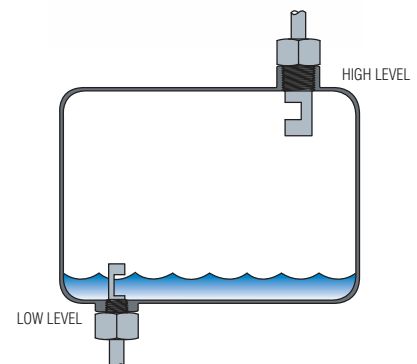
How To Order

Select a Part Number based on Mounting Size and Output.

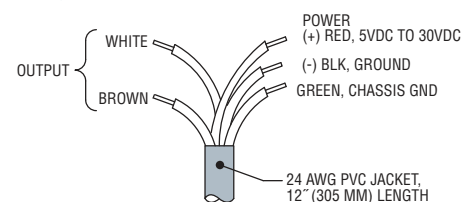
Mounting Size	Electronic Output	Part Number
1/4" NPT	Wet Sink	220901
	Wet Source	220902
	1A SPST Relay, Normally Closed	220903
1/2" NPT	Wet Sink	221485
	Wet Source	221486
	1A SPST Relay, Normally Closed	221487

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

- Standard units suitable for use up to 80°C.
- High temperature versions also available - up to 100°C.

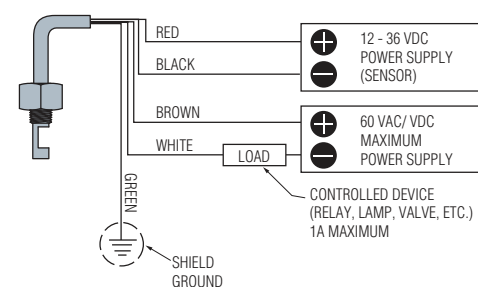


Wiring



Wiring Direct to a Load

N.C. Operation (Relay Signal Output)



Ultrasonic Switches Monitor the Toughest Applications

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

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

Ultrasonic Switch

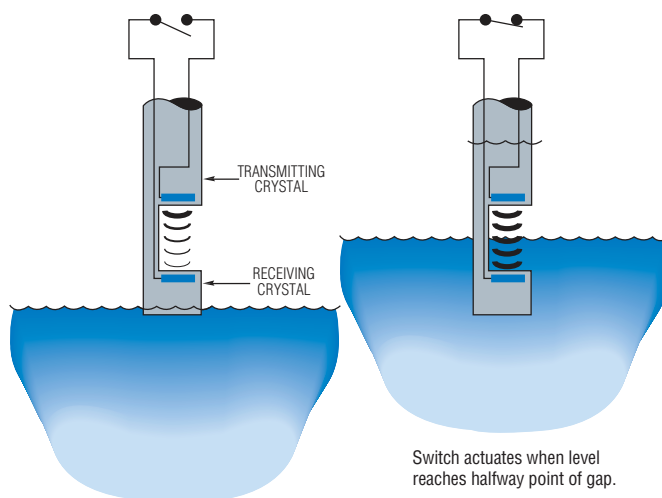
Selection Guide

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



General Operating Principle

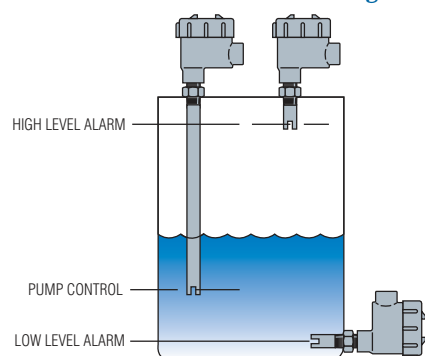
ULS Series switches operate using ultrasonic sound wave propagation. Ultrasonic sound waves are greatly attenuated when transmitted through air. Conversely, when liquid is present, transmission of the sound waves is greatly enhanced. The electronic control unit generates electrical signals that are converted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



Typical Installation

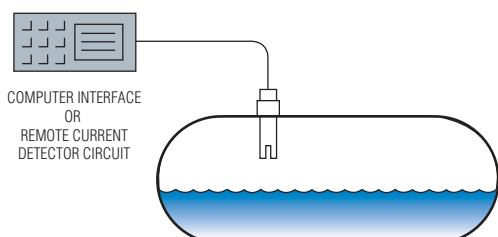
1. Drill a suitable hole in the vessel or pipe wall and tap for 3/4" NPT. In thin walled vessel or material not suitable for threading, weld or braze a bushing to accept the sensor.
2. Screw the sensor in the threaded section and make sure that there is a good seal. Use a pipe compound or sealing tape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

Vertical or Horizontal Mounting



Advantages of GEMS ULS-10 2-Wire Output Switches

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



Secondary Containment Tanks and Piping Systems

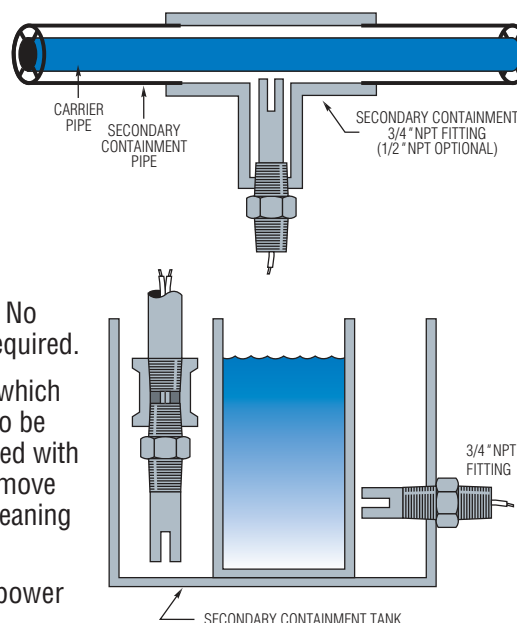
Maintenance

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

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

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

To reinstall, follow installation procedures.



Contents

Page Start

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

FS-925 Series – General Purpose

- **Flow Rate Settings:** Liquids: 0.1 GPM to 1.5 GPM
Air/Gases: See Flow Settings at right

FS-926 Series – Low Flow

- **Port Size:** 1/4-18 NPT
- **Primary Construction Material:** Brass or Stainless Steel
- **Setting Type:** Fixed
- **Flow Rate Settings:** Liquids: 50-300 cc/min.
Air/Gases: See Flow Settings at right

These two series of precision-calibrated switches provides reliable and consistent performance; repeatability is within 1%. FS-925 and FS-926 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.

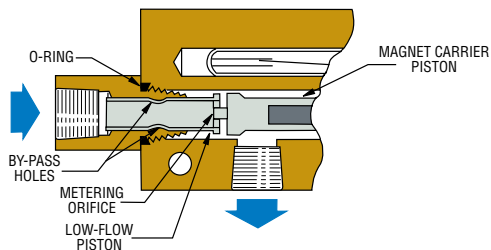
Specifications

Wetted Materials

Housing	Brass or 316 Stainless Steel
Piston	
In Brass Housing	Polysulfone for water; Brass for oil or air
Stainless Steel Housing	316 Stainless Steel
Low Flow Piston (FS-926)	Same as Housing
Spring	316 Stainless Steel
O-Ring	Viton®
Other Wetted Parts	Epoxy
Pressure Rating	
Operating, Maximum	1000 psig (69 bar)
Proof	2500 psig (172 bar)
Burst	5000 psig (345 bar)
Operating Temperature	
With Brass or S.S. Piston	-20°F to +300°F (-29°C to +148.9°C)
With Polysulfone Piston	-20°F to +225°F (-29°C to +107.2°C)
Repeatability	1% Maximum Deviation
Set Point Accuracy	±10%
Set Point Differential	15% Maximum
Switch*	SPDT, 20 VA
Inlet/Outlet Ports	1/4-18 NPT
Electrical Termination	No. 18 AWG, 24" L., Polymeric Lead Wires

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

Double Piston Detects Minute Flow – FS-926



An additional, lap-fitted piston is used in Gems FS-926 Series to accurately detect low-flow rates. Calibration is determined by one or more metering holes in the end of the low-flow piston, which regulate bypass flow, and therefore the actuation setting.

When metered bypass flow is exceeded, the resultant pressure differential displaces the low-flow piston, moving the magnet carrier piston to actuate the reed switch. Two large bypass holes in the piston skirt are exposed after actuation to maintain low pressure drop.



FS-925/926 Series



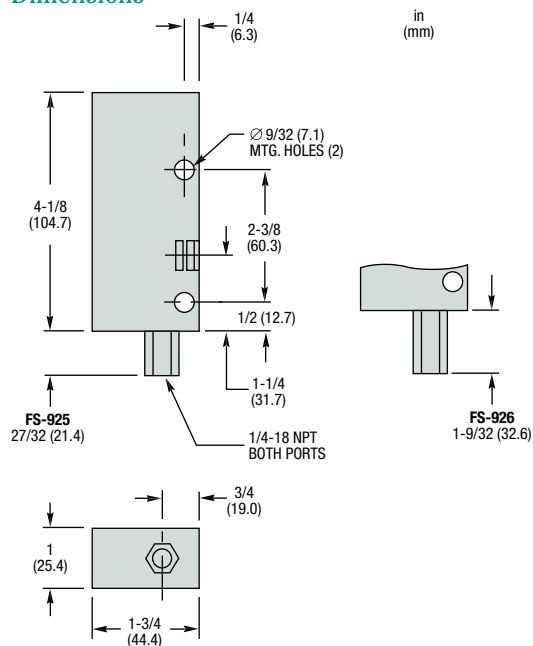
U.L. Recognized:
File No. E31926

CSA Listed:
File No. LR30200

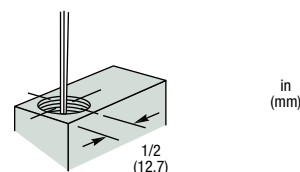


Both the FS-925 and FS-926 use a spring-loaded piston to detect positive flow with great precision. They act upon direct fluid flow and will not show "false-positive" flow indication as can happen with sensors using indirect sensing methods such as pressure measurement. The FS-926 incorporates an additional lap-fitted piston for very low flows; see below.

Dimensions



Electrical Connection, 1/2-14 NPT Conduit



Flow Settings, Air (Typical)

Dependent on operating line pressure. Examples of set point ranges at a given line pressure are shown below.

Line Pressure*	Actuation Point			
	FS-925		FS-926	
	Min.	Max.	Min.	Max.
5 psig	0.5 SCFM	10 SCFM	2 SCFH	15 SCFH
100 psig	1.5 SCFM	25 SCFM	7 SCFH	50 SCFH

* Minimum 5 psig line pressure required.

Gas Calibration

Water flow units should not be used for air/gas applications: Gas flow units have a special dash-pot piston for reliable operation. Gas calibration is dependent upon line pressure, switch orientation, and the specific type of gas. The calibrated flow set point is subject to change with fluctuations in line pressure.

How To Order – Standard Models – Water Calibration

Specify Part Number based on desired housing material and flow setting.

Liquids other than water: Special calibration is available from GEMS for media other than water. Please consult factory with your requirements, including housing material (brass or stainless steel), flow media, operating pressure, flow set point and liquid viscosity (SSU). A lot charge will be applied for special calibrations.

Gas flow: Consult factory for available calibrations. Specify: Housing material (brass or stainless steel), gas type, mounting orientation, operating pressure and actuation setting (SCFM or SCFH) and normal flow rate. A lot charge will be applied for special calibrations.

FS-925 Series – General Purpose

Flow Settings GPM, $\pm 10\%$	Part Numbers	
	Brass	316 S.S.
0.10	26914 ⚡	26926 ⚡
0.25	26915 ⚡	26927 ⚡
0.50	26916 ⚡	26928
0.75	26917 ⚡	26929
1.00	26918 ⚡	26930
1.50	26919	26931

FS-926 Series – Low Flow

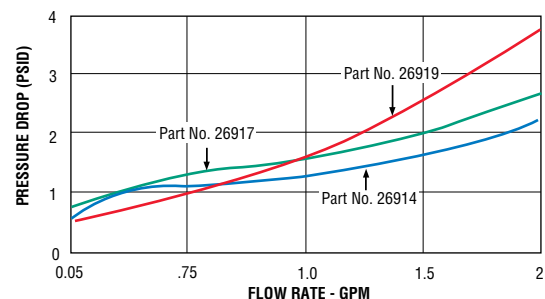
Flow Setting		Part Numbers	
cc/Min. $\pm 10\%$	Equiv. GPM	Brass Material	316 S.S. Material
50	0.013	26938	26951 ⚡
100	0.025	26939	26952
150	0.045	26941 ⚡	26953
200	0.055	26942	26954
250	0.065	26943	26955
300	0.075	26944	26956

Notes:

- Flow settings are calibrated using water @ +70°F on increasing flow, with units in a vertical position (lead wires up). Consult factory regarding special flow setting calibration.
 - Temperature changes will slightly affect the standard water or gas flow settings listed. Oil flow settings will vary with viscosity.
 - Use of 50 micron filtration is recommended.
- ⚡ Stock Items

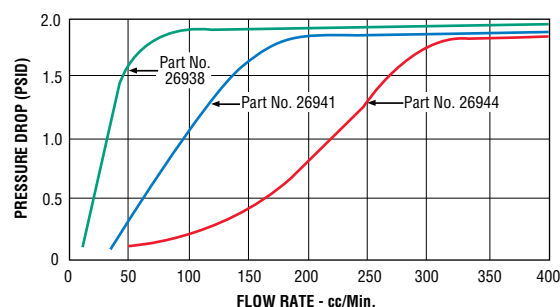
Pressure Drop - Typical

FS-925 Series



Tests conducted with units in vertical position (lead wires up) with water at +70°F (21°C).

FS-926 Series



Tests conducted with units in vertical position (lead wires up) with water at +70°F (21°C).

FS-925 and FS-926 switches are U.L. Approved for Class I, Division 2, Groups A, B, C, D hazardous locations.

U.L. Approved: File No. E183854

Standard Wiring Color Code

Wire Color	Terminal
Orange	N.O.
Black	Common
Red	N.C.

830 Series – Wet/Wet Differential Pressure Transducer

- ▶ Liquid Media on Both Ports
- ▶ Bleed Screws for Accurate Results
- ▶ Optional Manifold for Easy Installation

The 830 Series is designed for wet-to-wet differential pressure measurements of liquids or gases. They feature fast-response capacitance sensors that respond approximately 20x faster than conventional fluid-filled transducers! Sensors are coupled to signal conditioned electronic circuitry for highly accurate, linear analog output proportional to pressure. Both unidirectional and bidirectional models are available for line pressures up to 350 psi (24 bar). These units feature bleed ports that allow for total elimination of air in the line and pressure cavities.

Common Specifications

Input	
Pressure Range	0 to 100 psid (0 to 6.9 bar)
Proof Pressure	see ordering chart
Burst Pressure	see ordering chart
Common Line Pressure	350 psi (24 bar)
Fatigue Life	>1 Million Cycles
Performance	
Supply Voltage (Vs)	9-30 VDC (13-30 VDC for 10 VDC output)
Long Term Drift	0.5% FS/year
Accuracy	0.25% FS
Thermal Error Zero	0.02% FS/°F (0.036% FS/°C)
Thermal Error Span	0.02% FS/°F (0.036% FS/°C)
Compensated Temperatures	30°F to 150°F (-1°C to +65°C)
Operating Temperatures	0°F to 175°F (-18°C to +80°C)
Storage Temperatures	-65°F to +250°F (-54°C to +121°C)
Zero Tolerance	0.5% FS
Span Tolerance	0.5% FS
Mechanical Configuration	
Pressure Port	see ordering chart
Wetted Parts	17-4 PH Stainless Steel, 300 Series SS, Viton and Silicone
Electrical Connection	7/8" Knock Out for 1/2" Conduit, Screw Terminal Strip
Enclosure	Stainless Steel, Aluminum
Vibration	5g Peak Sinusoidal, 5 to 500 Hz
Acceleration	10g
Shock	50g
Approvals	CE
Weight	15 oz

Individual Specifications

Voltage Output Units	
Output	0-5 VDC or 0-10 VDC (3 wire)
Min. Load Resistance	5000K ohms
Current Output Units	
Output	4-20 mA (2 wire)
Max. Loop Resistance	(Vs-9) x 50 ohms



CE

3-Valve Manifold Assembly



Gems optional 3-valve manifold assembly eases installation and maintenance.

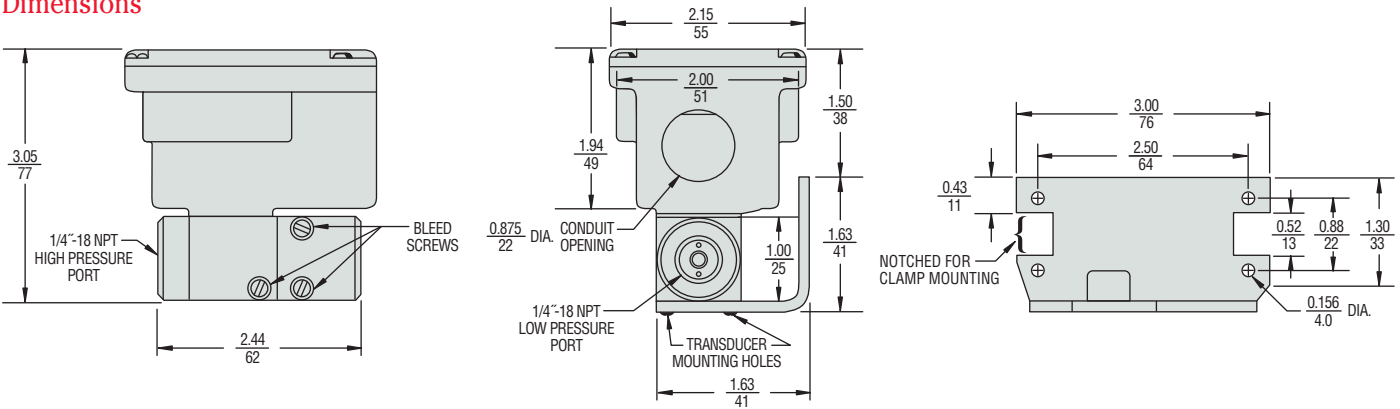
Applications

- Energy Management Systems
- Process Control Systems
- Liquid & Gas Flow Measurement
- Filter Monitoring
- Liquid Level Measurement

How They Operate

A unique isolation system transmits the motion of the differential pressure sensing diaphragm from the high line pressure environment to the dry enclosure where it moves one of a pair of capacitance plates proportionally to the diaphragm movement. Electronic circuitry linearizes output vs. pressure and compensates for thermal effects of the sensor.

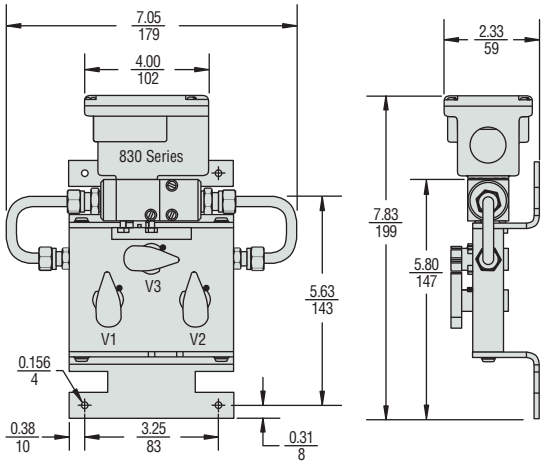
Dimensions



3-Valve Manifold

Gems optional 3-valve manifold assembly eases installation and maintenance. Machined of brass, it eliminates internal pipe connections and the associated chance of internal leaks. When manifold and 830 Series transducer are ordered together, they are assembled at the factory and shipped ready for mounting. Specify the **3V** Pressure Port code when ordering.

Wetted Parts	360 Brass, Copper 122, Acetal plug valves, and Nitrile O-rings
Valve Type	90-degree on/off
Process Connections	1/4" NPTF
Dimensions	7.05" x 6.25" x 2.16" D (179 mm x 159 mm x 55mm)
Weight	2.5 lbs



How to Order

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

SELECT

1. Series **8301** - 830 Series

2. Pressure Range Code

Unidirectional psid Ranges	Proof Pressure – psi		
	High Side	Low Side	Burst
001PD - 0-1	20	2.5	200
002PD - 0-2	40	5.0	200
005PD - 0-5	100	12.5	600
010PD - 0-10	100	25.0	1000
025PD - 0-25	350	62.5	1000
030PD - 0-30	350	62.5	1000
050PD - 0-50	350	125.0	1000
100PD - 0-100	350	250.0	1000

Bidirectional psid Ranges	Proof Pressure – psi		
	High Side	Low Side	Burst
0R5PB - ±0.5	20	1.25	200
001PB - ±1	40	2.50	200
2R5PB - ±2.5	100	6.25	600
005PB - ±5	100	12.50	1000
010PB - ±10	200	25.00	1000
025PB - ±25	350	62.50	1000
050PB - ±50	350	125.00	1000

3. Pressure Port **2F** - 1/4" NPTF
3V - 3-Valve Manifold Assembly Installed

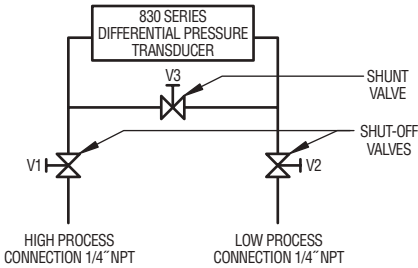
4. Output **11** - 4-20 mA
2D - 0-5 Vdc
2E - 0-10 Vdc

5. Bleed Screw Seals **B** - Viton/Silicon Standard
A - Buna-N Optional

6. Optional **C** - Calibration Certificate

8301 025PD 2F 11 B X

Valve Schematic



2200 Series / 2600 Series

General Purpose Industrial Pressure Transducers

- ▶ Gauge, Vacuum, and Compound Pressure Models Available
- ▶ Submersible, General Purpose and Wash Down Enclosures
- ▶ High Stability Achieved by CVD Sensing Element
- ▶ Voltage and Current Output Models

The 2200 series features stability and accuracy in a variety of enclosure options. The 2600 series extends the packaging options via an all welded stainless steel back end for demanding submersible and industrial applications. The 2200 and the 2600 feature proven CVD sensing technology, an ASIC (amplified units), and modular packaging to provide a sensor line that can easily accommodate standard configurations while not sacrificing high performance.

Specifications

Input	
Pressure Range	Vacuum to 6000 psi (400 bar)
Proof Pressure	2 × Full Scale (FS) (1.5 × FS for 400 bar, ≥ 5000 psi)
Burst Pressure	>35 × FS ≤ 100 psi (6 bar); >20 × FS ≥ 1000 psi (60 bar); > 5 × FS ≤ 6000 psi (400 bar)
Fatigue Life	Designed for more than 100 million FS cycles
Performance	
Long Term Drift	0.2% FS/year (non-cumulative)
Accuracy	0.25% FS typical
Thermal Error	1.5% FS typical (optional 1% FS)
Compensated Temperatures	−5°F to +180°F (−20°C to +80°C)
Operating Temperatures	−40°F to +260°F (−40 °C to +125 °C) for elec. codes A, B, C, 1 −5°F to +180°F (−20 °C to +80 °C) for elec. codes 2, D, G, 3 −5°F to +125°F (−20 °C to +50 °C) for elec. codes F, M, P >100°C maximum 24 VDC supply
Zero Tolerance	1% of span
Span Tolerance	1% of span
Response Time	0.5 ms
Mechanical Configuration	
Pressure Port	See ordering chart
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See ordering chart
Enclosure	316 SS, 17-4 PH SS IP65 NEMA 4 for elec. codes A, B, C, D, G, 1, 2, 3 IP67 for elec. code "F" IP68 for elec. codes M, (max depth 200 meters H ₂ O) IP30 for elec. code "3" with flying leads
Vibration	70 g, peak to peak sinusoidal, 5–2000 Hz (Random Vibration: 20–2000 Hz @ 20 g Peak per MIL-STD-810E Method 514.4)
Acceleration	100g steady acceleration in any direction 0.032% FS/g for 15 psi (1 bar) range decreasing logarithmically to 0.0007% FS/g for 6000 psi (400 bar) range.
Shock	20 g, 11 ms, per MIL-STD.-810E Method 516.4 Procedure I
Approvals	CE, UR (22IC, 26IC, 22CS, 26CS)
Weight	Approx. 100 grams (additional cable; 75 g/m)

Series 2200



Series 2600



Individual Specifications

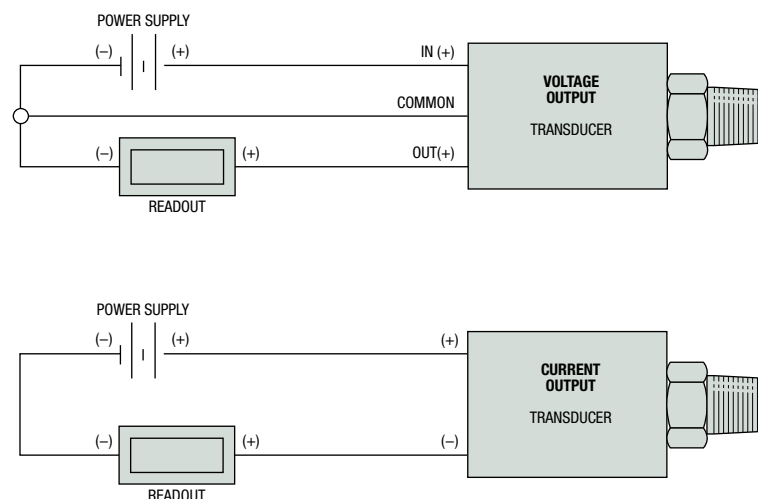
Voltage Output Units

Output	see ordering chart
Supply Voltage (Vs)	1.5 VDC above span to 35 VDC @ 6 mA
Supply Voltage Sensitivity	0.01% FS/Volt
Min. Load Resistance	(FS output / 2) kΩ
Current Consumption	approx 6 mA at 7.5 V output

Current Output Units

Output	4–20 mA (2 wire)
Supply Voltage (Vs)	24 VDC, (7–35 VDC)
Supply Voltage Sensitivity	0.01% FS/Volt
Max. Loop Resistance	$(V_s - 7) \times 50 \Omega$

Connection Code			Voltage Units				Current Units (4–20 mA)		
			IN+	COM	OUT+	EARTH	(+)	(–)	EARTH
A, B, G	“DIN”	PIN	1	2	3	4	1	2	4
C	“10-6 Bayonet”	PIN	A	C	B	E	A	B	E
D	“cable”		R	BK	W	DRAIN	R	BK	DRAIN
F	“IP 67 cable”		R	BK	W	DRAIN	R	BK	DRAIN
M	“Immersible”		R	W	Y	DRAIN	R	BL	DRAIN
1	“8-4 Bayonet”	PIN	A	C	B	D	A	B	D
2	“cable”		R	BK	W	DRAIN	R	BK	DRAIN
3	“conduit & cable”		R	BK	W	DRAIN	R	BK	DRAIN



Electromagnetic Capability

Meets the requirement for CE marking of EN50081-2 for emissions and EN50082-2 for susceptibility.

Test Data:

- EN61000-4-2 Electrostatic Discharge. 8 kV air discharge, 4 kV contact discharge. Unit survived.
- ENV50140 Radiated RF Susceptibility. 10 V/m, 80 MHz–1 GHz, 1 kHz mod. Maximum recorded output error was $< \pm 1\%$
- ENV50204 Radiated RF Susceptibility to Mobile Telephones. 10 V/m, 900 MHz. Maximum recorded output error was $< \pm 1\%$.
- EN61000-4-4 Fast Burst Transient. 2 kV, 5/50 ns, 5 kHz for 1 minute. Unit survived.
- ENV50141 Conducted RF Susceptibility. 10 Vms, 1 kHz mod, 150 kHz–80 MHz. Maximum recorded output error was $< \pm 1\%$


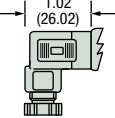
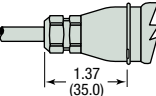
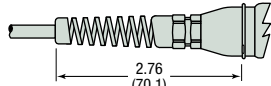
Cable Legend:

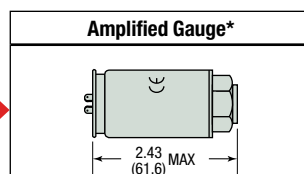
- R = Red
- BL = Blue
- BK = Black
- W = White
- Y = Yellow



Dimensions


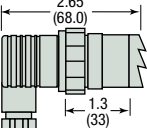

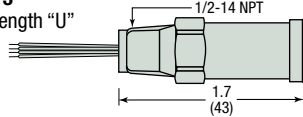
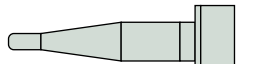
2200 Series

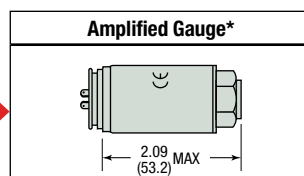
Mini 4-pin – No Connector	
Code B	
Mini 4-pin – With Connector	
Code A	 1.02 (26.02)
IP67 Cable (Waterproof)	
Code F	 1.37 (35.0)
IP65 or NEMA4 Cable	
Code D or 2	 2.76 (70.1)



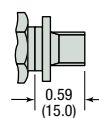
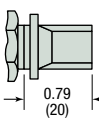
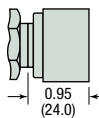
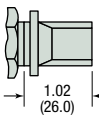
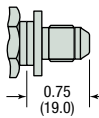
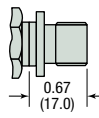

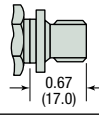
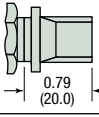

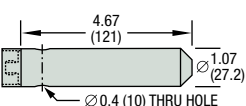
* Maximum diameter 1.07" (27.3 mm)

2600 Series

10-6 or 8-4 Mil-C Connector	
10-6: Code C 8-4: Code 1	 0.87 (22.0)
Large DIN 43650 Plug	
Code G	 2.65 (68.0) 1.3 (33)
Conduit Connector with Cable	
Code 3	 1/2-14 NPT 1.7 (43)
Conduit Connector with Flying Leads	
Code 3 with length "U"	 1/2-14 NPT 1.7 (43)
Moulded, Immersible Cable	
Code M	 0.9 (23)



* Maximum diameter 1.07" (27.3 mm)

1/8-27 NPT	
Code 08	 0.59 (15.0)
1/4-18 NPT	
No Snubber: Code 02 w/ Snubber: Code 0J	 0.79 (20)
1/4-18 NPT Internal	
Code 0E	 0.95 (24.0)
1/2-14 NPT	
Code 0H	 1.02 (26.0)
7/16-20 UNF-2A	
Code 04	 0.75 (19.0)
9/16-18 UNF-2A	
Code 1P	 0.67 (17.0)
ISO 228 - G 1/8 Internal	
Code 09	
ISO 228 - G 1/4 External	
Code 01	 0.67 (17.0)
ISO 7 - R 1/4 External	
Code 0A	 0.79 (20.0)
Nose Cone – Black Acetal	
Code 19	 0.79 (20.0)
Nose Cone Sink Weight	
Code 29	 4.67 (121) 1.07 (27.2) Ø 0.4 (10) THRU HOLE

How to Order

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

	XXXX	X	G	XXX	XX	X	3	X	A	
Series										Performance Code
2200 - 2200 Series										Accuracy/Thermal
2600 - 2600 Series										A - 0.25%/1.5%
Output										Cable Length¹
B - 4–20 mA										U - No Cable Fitted ^{1,2}
C - 1–6 V										D - 3' (1 m)
D - 1–11 V										E - 9' (3 m)
F - 0.1–5.1 V										F - 16' (5 m)
G - 0.2–10.2 V										G - 32' (10 m)
H - 1–5 V										Apparatus Protection
J - 0.5–5.5 V										3 - Amplified Only RFI Protected CE Mark, UR
R - 0–5 V										Electrical Connection (See Notes)
S - 0–10 V										2200 Series
Pressure Datum										A - 4 PIN DIN (Micro) Mating Connector Supplied
G - Gauge										B - 4 PIN DIN (Micro) Mating Connector Not Supplied
Pressure Range³										2 - Cable Nema 4 USA
F07 - 0–7.5 psi										D - Cable European Color Code
F15 - 0–15 psi										F - Cable Gland Metal IP67
F30 - 0–30 psi										2600 Series
F60 - 0–60 psi										C - Fixed Plug Size 10-6 Mating Plug Not Supplied
G10 - 0–100 psi										G - Fixed Plug To DIN 43650 Mating Plug Supplied
G15 - 0–150 psi										M - Moulded Cable Immersible
G20 - 0–200 psi										1 - Fixed Plug Size 8-4 Mating Plug Not Supplied
G30 - 0–300 psi										3 - Conduit Connector 1/2-14 NPT Ext. 1 m Cable ²
G50 - 0–500 psi										
G60 - 0–600 psi										
H10 - 0–1,000 psi										
H15 - 0–1,500 psi										
H20 - 0–2,000 psi										
H30 - 0–3,000 psi										
H40 - 0–4,000 psi										
H50 - 0–5,000 psi										
H60 - 0–6,000 psi										
Vac = –15 psi										
1F5 - Vac–0 psi										
3F0 - Vac–15 psi										
6F0 - Vac–45 psi										
1G0 - Vac–85 psi										
2G0 - Vac–185 psi										
3G0 - Vac–285 psi										
Pressure Port										
North American Threads										
08 - 1/8-27 NPT External										
02 - 1/4-18 NPT External										
0J - 1/4-18 NPT External w/ Snubber										
0E - 1/4-18 NPT Internal										
0H - 1/2-14 NPT External										
04 - 7/16-20 External (SAE #4, J514)										
1P - 9/16-18 External (SAE #6, J1926-2)										
IJ - 7/16-20 External (SAE #4, J1926-2)										
European Threads										
09 - G 1/8 Internal										
01 - G 1/4 External										
0A - R 1/4 External										
Submersible (2600 only)										
19 - Plastic Nose Cone										
29 - Sink Weight Nose Cone										

Notes:

- When electrical connection is cable please select a cable length from Table 1 below. When electrical connection is DIN or plug style "U" must be specified.
- Where electrical connection -3 and cable length -U occur in part number, the unit will be supplied with flying leads (4-1/2" IP30).
- Additional Pressure Ranges are available. Please consult factory.

Table 1 – Cable Length

(2600 Series) (2200 Series select "U" through "G")

Code	Length (M)	Code	Length (M)
U	No Cable Fitted	M	40
D	1	N	50
E	3	P	75
F	5	Q	100
G	10	R	125
H	15	S	150
J	20	4	170
K	25	5	200
L	30	6	225

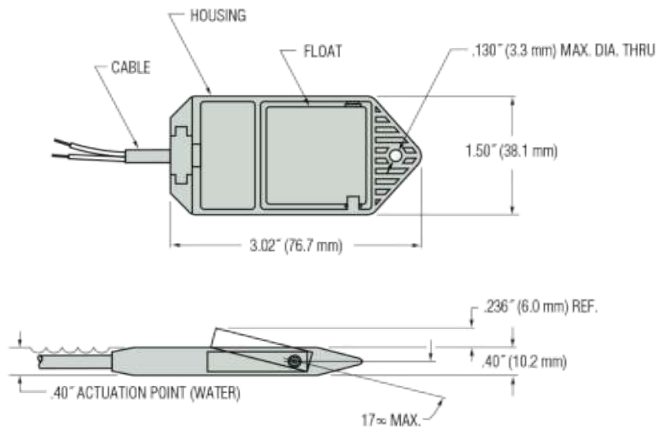
Note: Maximum cable length on a 2200 is 10 meters.

LS-10 Series – Slim Profile for Interstitial Liquid Sensing

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

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

Dimensions



Specifications

Wetted Materials:

Housing: Valox®

Float: Foamed Polyethylene with Solid Polyethylene Pin

Tape: UHB Double-Sided 3M Tape

Cable: PVC

Pressure: Atmospheric

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

Accuracy: ±1/8 inch

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

Cable: Two (2) Conductor PVC Jacketed 25 ft. Extended

Approvals: UL Recognized

How to Order – Select Part Number based on mounting option

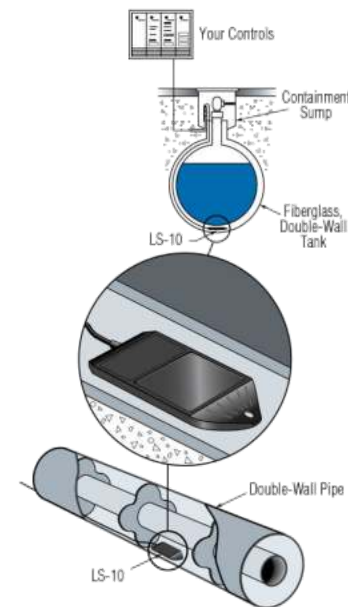
Series Number	Mounting Option	Part Number
LS-10	25' PVC Jacketed Cable	156000 ⚡

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



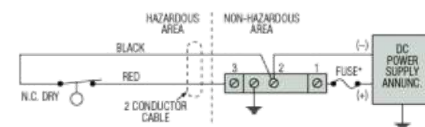
Typical Applications

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

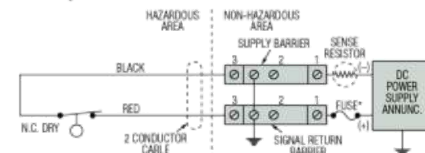


Typical Wiring Diagrams

Non-Isolated System—Single Zener Barrier

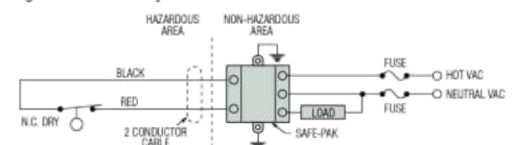


Isolated System - Dual Zener Barrier



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

Single Safe-Pak® Relay



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

Series 19MR

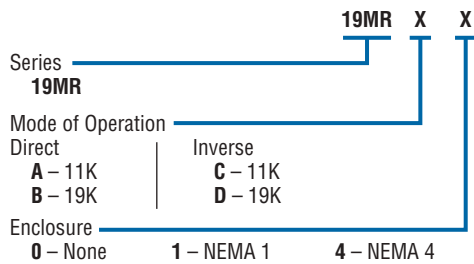
Direct Motor Load of 30 Amps @ 240 VAC

Series 19MR controls are the ideal choice where pump up or pump down service is necessary. This control eliminates the need for contactors because it can directly handle motors up to 1 HP at 120 VAC, or motors up to 2 HP at 240 VAC.

Enclosures	Optional
Output Contact Rating	30 amp @ 240 VAC
Powered Output Contact	SPST 30 A at supply voltage (120 or 240 VAC)
Horsepower Range	1 hp for 120 VAC; 2 hp for 240 VAC
Terminals	3/16" spade lug on probe connections 1/4" spade lug on power connections
Primary Voltage	120 VAC or 240 VAC (+10%/-15%), 50/60 Hz
Secondary Voltage	11.0 VAC, 1.5 mA
Temperature	-40°F to +150°F (-40°C to +65°C)

How to Order

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

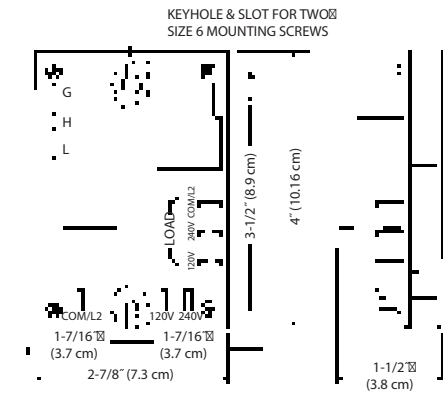


Series 19MR

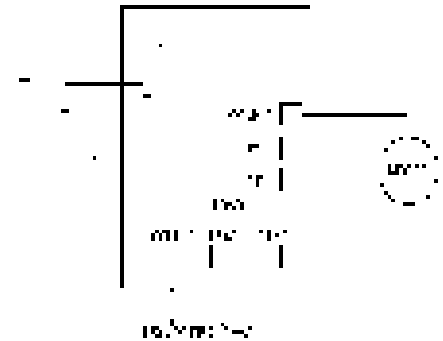
Applications

- Carbonators
- Appliances
- Sumps
- Low-Water Cutoff
- Direct Motor Load

Dimensions



Wiring



Caution: 19MR contacts are powered contacts. When power is applied to the 19MR controller, power may be present on relay output connections. Output voltage will be same as input voltage.

Series 26NM Modules Low-Water Cutoff – Plug-In Modules

- ▶ Non-Powered Contacts
 - ▶ Modular Plug-In Design
 - ▶ Low Voltage Sensor
 - ▶ 11-Pin Socket
 - ▶ U.L. "Limit Control"
 - ▶ Optional Manual Reset Button Feature.
 - ▶ Solid State Reliability
 - ▶ LED Monitoring
 - ▶ Time Delays Available
 - ▶ Meets CSD1 Requirements
 - ▶ Optional Test Feature
- If Level Drops, Control is Deactivated Until Liquid Level Returns to Normal and Pushbutton is Depressed
- ▶ Optional Power Outage Feature Ignores Nuisance Outages and Resets When Power is Restored

Series 26NM – General Purpose Control

Series 26NM is designed for low-water cutoff protection. This control meets CSD1 requirements for boiler low water cutoff. Series 26NM features non-powered contacts. If powered contacts are required, use Series 26M.

Specifications

Contact Design	1 SPST (1 form A), N.O. (non-powered)
Contact Rating (24/120/240VAC)	10 amp Resistive 1/3 hp
Mode of Operation	Direct
Sensitivity	0 - 26K ohm, factory set
Primary Voltage	24 VAC, 120 VAC, 240 VAC ¹
Secondary Voltage	12 VAC
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals¹	U.L. 353 File # MP1430
Terminal Style	Screw connector
Options	Time Delays, Power Outage, Manual Reset, Test Feature See page E-11 for descriptions

Notes:

1. 240 VAC and 208/240 VAC units do not carry U.L. Limit Control recognition.

How to Order

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

1. Series	26NM	X	X	X	X	X	XX	XX
2. Sensitivity	A – 4.7K B – 10K C – 26K	D – 50K E – 100K						
3. Supply Voltage	1 – 120 VAC 3 – 24 VAC	2 – 240 VAC 8 – 208/240 VAC						
4. Socket Style	A – 11 Pin Octal B – DIN Mount M – None, Module Only							
5. Enclosure	0 – None 1 – NEMA 1 4 – NEMA 4							
6. Option Package	See page E-11, Chart B for code letter.							
7. Time Delay (decreasing level) Option	03-90 seconds Blank 3 seconds							
8. Time Delay (increasing level) Option	00-90 seconds Blank 0 seconds							

Socket Details and Option Availability are located on web site.



Series 26NM

Applications

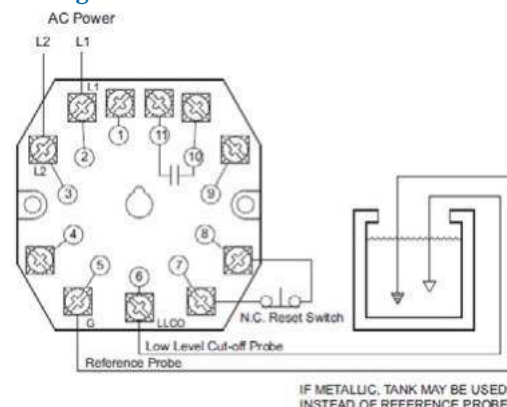
- Low-Water Cutoff
- Point Level
- Alarms

Dimensions



Note: Controls also available with DIN mount socket.

Wiring



Caution: Contacts are non-powered. If powered contacts are required, request information on Series 26M.

PS11 – Ultra-Long Life OEM Pressure Switches

- ▶ 0.75 to 15 psi (52 to 1034 mbar)
- ▶ Factory Set or Adjustable Set Points

For low pressure applications, the longevity of our PS11 Series is hard to beat. Their snap-action microswitch resets automatically and meets or exceeds industry standards. The brass housing offers chemical resistance at an affordable price.

Specifications

Switch*	5 Amp @ 24 VDC and 250 VAC 1.0 Amp resistive 0.5 Amp inductive @ 24 VDC (-G option)
Repeatability	See Table 1
Wetted Parts	
Diaphragm	Nitrile (optional Viton®, EPDM or Kapton®)
Fitting	Brass
Housing	Brass
O-Ring	Nitrile (optional Viton® or EPDM)
Ingress Protection**	DIN 43650A IP00; Terminals IP00; Flying Leads IP00
Proof Pressure	0 psia to 150 psi (-1 bar to 10.3 bar)
Burst Pressure	300 psi (20.7 bar)
Approvals	CE, UL Approved units available
Weight, Approximate	0.31 lbs. (0.14 kg)

* Gold contacts (option G) may be required for less than 12 VDC and 20 mA.

** Plastic housing is vented to atmosphere. Consult factory for non-vented version, IP-rated version.

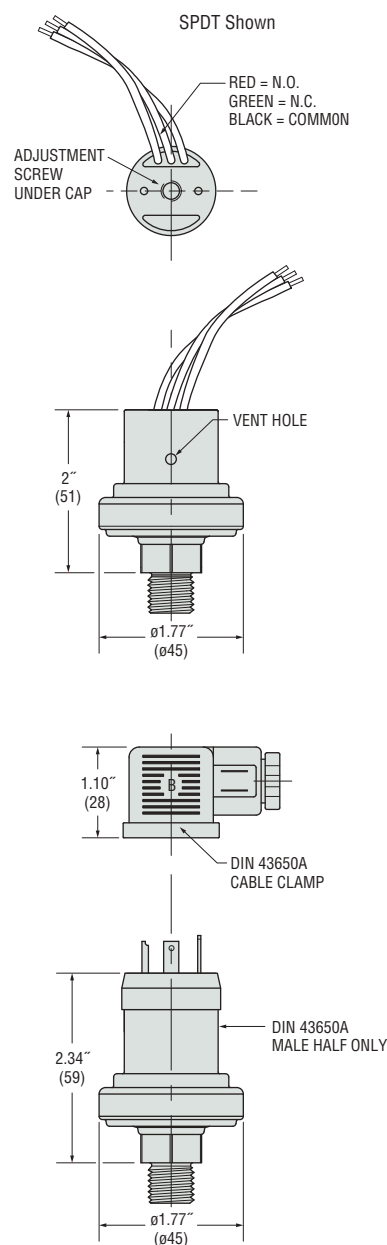
Recommended Operating Temperature Limits

Diaphragm Material	Range
Nitrile	15°F to 250°F (-9°C to +121°C)
Viton®	0°F to 250°F (-18°C to +121°C)
EPDM	-20°F to +250°F (-29°C to +121°C)
Kapton®	-40°F to +250°F (-40°C to +121°C)

Note: Switches may function below the cold temperature limit but the set point and deadband will increase. Consult factory for details.



Dimensions



How To Order

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

PS11 **-10** **-4MNB** **-C** **-HC** **-XX** **-XXXX**

1
2
3
4
5
6

1 Pressure Range Code

Insert Pressure Range Code from Table 1, below.

2 Pressure Fitting¹

- 2MNB = 1/8" NPTM Brass
- 4MNB = 1/4" NPTM Brass
- 4MGB = 1/4" BSPM Brass (G type)
- 4MSB = 7/16"-20 SAE Male, Brass

3 Circuit

- A = SPST/N.O.
- B = SPST/N.C.
- C = SPDT

4 Electrical Termination²

- FLXX = Flying Leads³
- ELXX = 1/2" Male NPT Conduit w/Flying Leads³
- H = DIN 43650A Male Half Only
- HC = DIN 43650A 9mm Cable Clamp
- HN = DIN 43650A 1/2" NPT Female Conduit

5 Options

- V = Viton® Diaphragm
- E = EPDM Diaphragm
- K = Kapton® Diaphragm
- G = Gold Contacts
(for loads less than 12 mA @ 12 VDC)
- OF = Oil Free Cleaned
- WF = Weather Pack Connector, Female
- WM = Weather Pack Connector, Male
- DE = Deutsch Connector, Male, DT04 Series

6 Fixed Set Point (optional)

- A. Specify set point -FS (in PSI or mBAR, see example)⁴
- B. Set Point Actuation
- R** on Rising Pressure
- F** on Falling Pressure
- Example: -FS200MBARF for 200 mBAR Falling
- or -FS3PSIR for 3 PSI Rising

Notes:

1. Other fittings available. Consult factory.
2. DIN units are available with -C SPDT circuit only.
3. 18" is standard. Specify lead length in inches (max. 48"). e.g. -FL18 or -EL30.
4. Set Point must be within Pressure Range selected in Step 1.

Table 1 — Pressure Range Codes

Pressure Range Code	Pressure Range	Accuracy*	Average Deadband**
10	0.75-4 psig (51-276 mbar)	±0.15 psi (10 mbar) +4% of setting	0.2 psi (14 mbar) +9% of setting
20	3.5-15 psig (241-1034 mbar)	±0.25 psi (17 mbar) +5% of setting	0.4 psig (26 mbar) +11% of setting




* Accuracy and set point of units may change due to the effects of temperature.

** In certain applications deadband can be tailored and controlled to customer specifications. Consult factory for details.

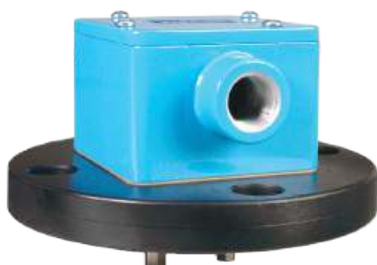

Designed for OEM

- ▶ Compact
- ▶ One-Piece Probe/Body Construction
- ▶ Quick Install & Connect
- ▶ Order Sized to Your Spec

These Warrick fitting are designed for OEM use. They are shipped ready for quick installation. Integrated probes eliminate pre-assembly tasks, and avoid potential vibration-induced loosening when installed with power tools. Choose from single- or multi-electrode probe series. Gems supplies these series with probes pre-cut to lengths you specify.

Series	3J	3H	3L
			
Probe Quantity	1, 2 or 3	1	1
Mounting Size	1" NPT	3/8" NPT or 5/8" NF/NFE	1/8" NPT
Materials			
Body	Case iron or red brass	316 stainless steel	316 stainless steel
Terminal Housing	Diecast aluminum, epoxy coated (optional)	—	—
Probe	316 stainless steel	316 stainless steel	316 stainless steel
Insulation	Teflon®	Teflon®	Teflon®
Probe Diameter	3/16"	1/4"	3/16"
Pressure/Temperature	0 psig @ 500°F	250 psig @ 406°F	150 psig @ 365°F
Approvals	—	U.L. File #MP2489, Vol. 1 Sec. 1; CSA	U.L. File #MP2489
Use the Bold characters from the chart below to construct a product code.	<p>Series 3J</p> <p>Number of Probes 1 – One 2 – Two 3 – Three</p> <p>Body Material¹ B – Cast Iron C – Red Brass</p> <p>Housing 0 – None 1 – Optional Housing</p> <p>Length of Probes² A – All probes 10-1/4" C – For lengths less than 10-1/4" indicate length as inches in decimal form</p>	<p>Series 3H</p> <p>Thread 1 – 3/8" – 18 NPT 2 – 5/8" – 18 UNF 3 – 5/8" – 24 UNEF</p> <p>Sleeve¹ B – Teflon® 3/4" Long</p> <p>Length (Feet)² 1 – One 2 – Two 3 – Three</p>	<p>Series 3L</p> <p>Connection Size 1 – 1/8" NPT</p> <p>Insulator Length D – Teflon® 1-1/4"</p> <p>Length in Inches^{1, 2} 02 – Two 06 – Six 10 – Ten 03 – Three 07 – Seven 11 – Eleven 04 – Four 08 – Eight 12 – Twelve 05 – Five 09 – Nine</p>
Notes	<p>1. Probes are stainless steel.</p> <p>2. 10-1/4" maximum</p>	<p>1. Longer Teflon® sleeves are available. Contact factory or your representative</p> <p>2. Custom probe and insulation lengths are available. Contact your representative.</p>	<p>1. 12" maximum</p> <p>2. Indicate fractional inches in decimal form (01.75 = 1-3/4")</p>

Top Mounting Fixtures – General Purpose




Series	3F	3G																									
																											
Mounting Connection	Flange — 4.5" to 7.5" Dia.	NPT, Flange, Bracket (Plate)																									
Probe Quantity	1 thru 7	1 thru 7																									
Description	Designed for general purpose service, Series 3F flanged, pressure-tight fittings can handle up to 7 probes. They mate with standard pipe flanges coupled to the top of the vessel. Available in a variety of materials.	Series 3G fittings are designed for general purpose use, and are made of PVC to withstand corrosive conditions. The flanged assemblies are sized to accommodate up to 7 probes and to mate with standard flanges on the tops of vessels.																									
Materials																											
Terminal Housing	Die-cast aluminum, epoxy coated	Polycarbonate																									
Body	Forged steel, red brass, 316 S.S., 1018 C.S, PVC	PVC																									
Probe Insulation	Teflon®	Teflon®																									
Pressure/Temperature	125 psig @ 323°F (cast iron) 225 psig @ 150°F (brass) 230 psig @ 100°F (316 S.S.) 275 psig @ 100°F (1018 C.S.) PVC – not rated	0 psig @ 150°F (PVC)																									
Approvals	CSA	—																									
Dimensions	<table><tr><th>No. of Probes</th><th>Nominal Pipe Flange Size</th><th>Diameter of Flange</th><th>Conduit Boss Thread Size</th><th>Terminal Housing Size (W" x D" x H")</th></tr><tr><td>1</td><td>1</td><td>4-1/2"</td><td>1/2" NPT</td><td>2-1/4 x 2-1/4 x 2-1/4</td></tr><tr><td>2-3</td><td>2</td><td>6"</td><td>1/2" NPT</td><td>3-1/4 x 3-1/4 x 2-3/8</td></tr><tr><td>4</td><td>2-1/2</td><td>7"</td><td>1/2" NPT</td><td>3-1/4 x 3-1/4 x 2-3/8</td></tr><tr><td>5-7</td><td>3</td><td>7-1/2"</td><td>3/4" NPT</td><td>4 x 4 x 2-1/2</td></tr></table>	No. of Probes	Nominal Pipe Flange Size	Diameter of Flange	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")	1	1	4-1/2"	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	2-3	2	6"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	4	2-1/2	7"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	5-7	3	7-1/2"	3/4" NPT	4 x 4 x 2-1/2	
No. of Probes	Nominal Pipe Flange Size	Diameter of Flange	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")																							
1	1	4-1/2"	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4																							
2-3	2	6"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8																							
4	2-1/2	7"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8																							
5-7	3	7-1/2"	3/4" NPT	4 x 4 x 2-1/2																							
How to Order	<p>Use the Bold characters from the chart at right to construct a product code.</p> <p>Electrode Probes are ordered separately.</p> <p>Series 3F X X</p> <p>Number of Probes 1 thru 7</p> <p>Body Material A – Forged Steel (Raised Face) B – Red Brass (Flat Face) C – 316 S.S. (Raised Face) D – 1018 C.S. (Raised Face) E – PVC (Flat Face)</p>	<p>Series 3G X X X</p> <p>Number of Probes 1 thru 7</p> <p>Base Size and Style A – 2" Flange (6" O.D.)³ E – 2" NPT³ B – 3" Flange (7-1/2" O.D.) H – 3" NPT C – 3-1/4" x 6" x 3/4" PVC Plate</p> <p>Probe Type 1 – 316 S.S. Inserts for Use with 1/4" Rod Extensions⁴ 2 – Tapered Probe Assembly⁵ 3 – Wire-Suspended Probes⁶</p>																									
Compatible Electrode Probes (order separately)	3R, 3W ¹ , 3Y ²	3R, 3T, 3W ¹ , 3Y ²																									

Notes:

- Requires 3Z1B Adapter and 3Z1A Wire.
- Requires 3Z1B Adapter.
- Maximum 4 probes.

- Order 3R rods separately. See page E-21.
- Order 3T rods separately. See page E-21.
- Order 3W/3Y probes separately. See page E-22.

Custom options available. Consult factory.

3E		3N		3B	
					
1" to 3" NPT		#10 Machine Screws from Underside		3/8" - 18NPT, 5/8" - 18UNF, 5/8" - 24UNEF	
1 thru 7		1 thru 3		1	
Series 3E fittings are cast metal, pressure-tight assemblies capable of handling 1-7 probes. Attachment to vessels is accomplished with external pipe threading. 3E Fittings require the use of 3R rigid or 3W wire suspended electrodes.		Series 3N fittings accommodate 1-3 probes operating at atmospheric pressure. The assembly mounts on a flat surface atop open tanks or closed vessels. 3N Fittings require the use of 3R rigid or 3W wire suspended electrodes.		Series 3B fittings are compact pressure tight assemblies that hold a single electrode probe for use in water and chemicals. These fittings incorporate a 1/4-20 female thread that must be combined with a Series 3R (rigid rod electrode) or Series 3W/3Y (wire suspended electrode) to make a complete assembly.	
Die-cast aluminum, epoxy coated		Die-cast aluminum, epoxy coated		—	
Cast iron, red brass, 316 stainless steel		PVC, red brass, 316 stainless steel		316 stainless steel	
Teflon®		Teflon®		Teflon®	
125 psig @ 353°F (cast iron) 250 psig @ 406°F (brass, 316 S.S.)		0 psig @ 150°F (PVC) 0 psig @ 500°F (brass, 316 S.S.)		250 psig @ 406°F 500 psig @ 75°F	
U.L. File #MP2489, Vol. 1 Sec. 1; CSA		CSA File #LR11644		U.L. File #MP2489, Vol. 1 Sec. 1; CSA	
	No. of Probes	Attachment to Vessel	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")	
3E	1	1" NPT	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	
	2-3	2" NPT	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	
	4	2-1/2" NPT	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	
	5-7	3" NPT	3/4" NPT	4 x 4 x 2-1/2	
3N	1-3	2-1/4" square flat pad, 1-1/2" dia. hole in top of vessel secured with #10 machine screws at the corners of a 1-1/2" square	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	
Series 3E Number of Probes 1 thru 7 Body Material A – Cast Iron B – Red Brass C – 316 Stainless Steel		Series 3N Number of Probes 1 thru 3 Body Material A – PVC B – Red Brass C – 316 Stainless Steel		Series 3B Thread 1 – 3/8" - 18 NPT 2 – 5/8" - 18 UNF 3 – 5/8" - 24 UNEF Metal Parts B – 316 Stainless Steel	
3R, 3W ¹		3R, 3W ¹		3R solid rod (up to 4') 3W ¹ or 3Y ² (greater than 4')	

Custom options available. Consult factory.

Non-Intrinsically Safe Relays Boost Your Sensor's Load Handling Ability

- ▶ SPST, N.O. Operation
- ▶ AC or DC models
- ▶ Amplify current handling capability of sensors for controlling high power loads
- ▶ Compact, polysulfone bodies are totally encapsulated
- ▶ Impervious to shock or vibration
- ▶ Solid-state reliability

GEMS solid-state switching units perform the functions of electro-mechanical relays, with the added reliability and advantages inherent in solid-state. Compact, totally encapsulated, and impervious to shock or vibration, these units mount anywhere... even directly on working machinery.

LOAD-PAKS: integrated, solid-state switches that amplify current handling capabilities of sensors for controlling high power loads. SPST, N.O. operation, AC and DC models.

SPDT-PAKS: enable one low-current sensor to control two independent loads up to 5 amps each. Switching is N.O. for one load and N.C. for the other.

FLIP-PAKS: provide low-current, "Start-stop" or "on-off" switching for industrial motor, liquid level and other control systems. Units hold operational state up to 1/2 second during momentary power loss to cut nuisance shutdowns; low voltage protection is inherent. 120 VAC and 240 VAC models handle loads to 5 amps.

Dimensions

LOAD-PAK, 5 Amp, A.C.	LOAD-PAK, 10 Amp, A.C. LOAD-PAK, 2 Amp, D.C. SPDT-PAK, FLIP-PAK

Electrical Information

DC LOAD-PAK: Switching is by means of B+ closure. . . the DC LOAD-PAK must be wired to the polarity shown. REVERSING POLARITY WILL DESTROY THIS UNIT.

SPDT-PAK: This unit is designed to operate with a load connected to each of the two outputs. These loads must be 10 watts, minimum, for correct SPDT switching. One load used alone must be connected to the N.O. terminal. With this load, which may be less than 10 watts, the unit will operate the same as an SPST unit.

Line Transients: While random line transients will not normally harm LOAD-PAKS, they may pass current to some loads for up to 1/2 cycle duration*. AC LOAD-PAKS and the DC LOAD-PAK include transient protection. . . the SPDT-PAK does not. If load transients are a problem, the external protective circuit, a properly-sized metal oxide varistor, may be used.

* Mechanical holding or latching contacts (contactors) may cause some loads to latch under transient conditions.

LOAD-PAK®,
5 AMP, AC



LOAD-PAK®,
10 AMP, AC



Intrinsically Safe

LOAD-PAK®,
2 AMP, DC

Certified intrinsically safe under MSHA Certification No. 1951 for use on permissible equipment, for Group D use only.



FLIP-PAK



SPDT-PAK



Switch or Sensor Wiring: Wires connecting external sensor switches to LOAD-PAKS should not be placed in raceways or conduits containing high voltage lines. Voltages induced from these lines trigger the low-power, solid-state triac, causing it to turn "on" momentarily.

How To Order

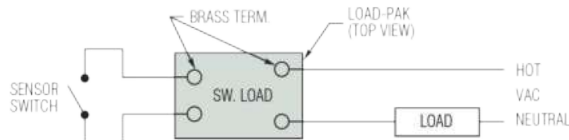
Specify Part Number based on the specifications tabulated below.

	LOAD-PAK 5 AMP, AC	LOAD-PAK 10 AMP, AC	LOAD-PAK 2 AMP, DC	SPDT-PAK 5 AMP, AC	FLIP-PAK 5 AMP, AC	
Part Number	20173 ⚡	26392 ⚡	25763 ⚡	22155	28196 ⚡	28244
Operating & Load Voltage Range	24 to 260 VAC		6 to 48 VDC	100 to 130 VAC	100 to 130 VAC	200 to 250 VAC
Voltage Loss	2 VAC		2 VDC	3 VAC	2 VAC	
Sensor Current, Max.	20 mA		35 mA	20 mA	20 mA	
Allowable Resistance in Sensor Circuit to Turn “ON” (Max.)	4 k at Nom. Volt.		0 to 4 k	4 k at Nom. Volt.	—	
Leakage Current Thru Load Term.	12 mA @ 240 VAC		2 mA	20 mA	12 mA @ 240 VAC	
Switching Mode	SPST, N.O.			SPST, N.O. & N.C.	SPST, N.O.	
Operating Temperature	0°F to 120°F (-17.8°C to 48.9°C)		32°F to 120°F (0°C to 48.9°C)	0°F to 120°F (-17.8°C to 48.9°C)		

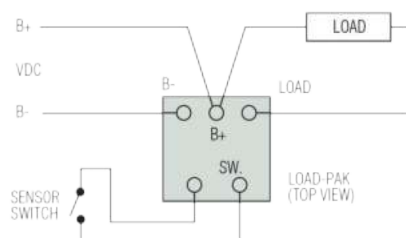
Note: All AC voltage and current specifications are RMS values unless otherwise stated.

⚡ – Stock Items

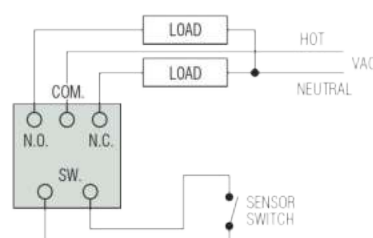
Typical Wiring



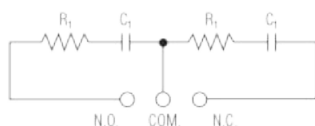
LOAD-PAK, Part Numbers 20173 and 26392 actuated by dry contact sensor to control load up to 10 amps, AC.



LOAD-PAK, Part Number 25763, actuated by dry contact sensor to control load up to 2 amps, DC.



SPDT-PAK, actuated by a single sensor to control two separate loads.



SPDT-PAK LOAD TERMINALS

TRANSIENT PROTECTION FOR THE SPDT-PAK, The circuit shown or a properly-sized metal oxide varistor may be used.

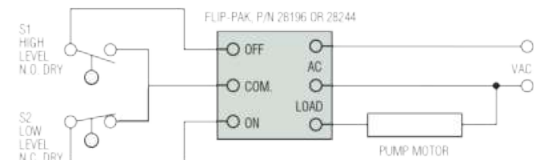
R = 100 OHM,
1/4 WATT
RESISTOR
C = .05 MICROFARAD,
500 V. CAPACITOR

Surge Current Ratings of LOAD-PAKS.

Non-repetitive.

LOAD-PAK Rating	Overload Time		
	.010 Sec.	1.0 Sec.	10 Sec.
	Overload, Amps		
5 Amps, AC	30	20	10
10 Amps, AC	50	30	15

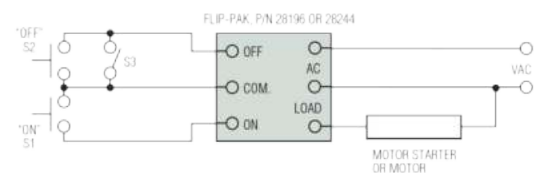
* Mechanical holding or latching contacts (contactors) may cause some loads to latch under transient conditions.



FLIP-PAK, providing pump up/down control.

Refill: Low level permits S2 to close, starting refill pump. Rising level allows S2 to open, and eventually closes S1 to actuate the FLIP-PAK "OFF" circuit and stop the pump motor. The FLIP-PAK "OFF" override assures pump shut-down even if S2 failed to open.

Pump-Down: With "ON" and "OFF" connections of S1 and S2 transposed at the FLIP-PAK, the pump is started by S1 and stopped by S2 at low level. The same "OFF" override prevails.



With two normally open, momentary contact push buttons (S1 and S2), the **FLIP-PAK** provides solid-state control of the motor starter or the motor itself... if load requirements are within FLIP-PAK ratings. S3 provides a safety shut-down. With S3 closed, the "ON" push button (S1) is rendered ineffective by the "OFF" override feature of the FLIP-PAK.

Small Size – Engineered Plastics

LS-300TFE Series – All-PTFE Wetted Parts for Ultra-Pure Fluids

- ▶ Low Particle Generation-One piece Molded Design
- ▶ Corrosion Resistant
- ▶ 1 to 4 Actuation Levels in a Single Unit
- ▶ Lengths to 24 Inches

Typical Applications

- Semiconductor Process Equipment
- Pure Chemical Delivery System
- Wafer Cleaning and Etching Systems
- Cabinet Leak Sensing

1. Mounting Types

Each mounting type can be configured with stem lengths (L_0) and float materials indicated in this bulletin.

Type 11, No Mounting	Type 22, 1" NPT	Type 24, 1/4" NPT	Type 25, 3/8" NPT

2. Electrical Connections

Type 1 Leadwire	Type 2 Cable	Type 3* Liquid-Tight Cable
Extended Leads	#22 AWG Teflon® Wire or #24 AWG PVC Jacketed Cable	

* Available on Mounting Type 22 only.

ORDER IT!

Ordering is Easy! See Page B-9.
Easy online ordering too!



3. Float Types

Float Material	PTFE	PVDF
Float Dimensions		
Operating Temperature	+32°F to +212°F (0°C to 100°C)	-40°F to +250°F (-40°C to 121°C)
Pressure, PSIG (bar), Max. at Ambient Temperature	25 (1.7)	50 (3.4)
Min. Liquid Specific Gravity	0.90	0.86

Note: A single float type is selected for use at all actuation points.

4. 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 4 Actuation Levels.

Group II Wiring: 1 or 2 Actuation Levels.

Switch (SPST, N.O. or N.C.): 10/20/50/100VA.

Notes:

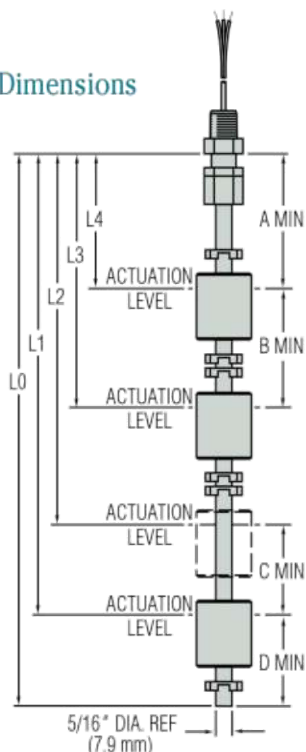
1. Other wiring options available. Consult factory.
2. Consult Factory for load information.

Electrical Connection	Group 1	Group 2
Lead Wire (*)		
Cable (*)		

* Pin correlation of plug connectors shown in parenthesis.

5. Actuation Level Dimensions

- * Actuation level distances and L_1 (overall unit length) are measured from inner surface of mounting. See mounting types on opposite page for L_1 reference point.
- ** Length Overall (L_0) = L_1 + Dimension D.
 $L_{0max.} = 24"$.



Switch actuation levels are determined following the guidelines below.

A = Minimum distance from highest actuation level to bottom of mounting.

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.

Float Material	Dimensions			
	A	B	C	D
PTFE	$\frac{1-3/4}{44.5^*}$	$\frac{2}{50.8}$	$\frac{1/8}{3.2}$	$\frac{1-5/8}{41.3}$
PVDF	$\frac{1-3/4}{44.5^*}$	$\frac{2}{50.8}$	$\frac{1/8}{3.2}$	$\frac{1-7/16}{36.5}$

$\frac{\text{inch}}{\text{mm}}$

* Mounting Type 22 (1" NPT) requires a minimum "A" dim. of 2-1/16" (52.4mm)

890 Series – 3A Sanitary Pressure Transducer

- ▶ For Clean-In-Place (CIP) and Sterilize-In-Place (SIP)
- ▶ 0.20% Full Scale Accuracy
- ▶ No Liquid Fill Diaphragms

The 890 Series meets 3A sanitary design standards and is fully sealed to withstand external high pressure washdowns. These units are packaged in rugged welded stainless steel housings and are exceptionally insensitive to vibration, shock and environmental extremes. A small size and tri-clover sanitary pressure fitting allow direct mounting in most CIP and SIP installations. Other features include IC-based circuitry, a 1/2" NPT conduit fitting and shielded cable with vent tube. Sealed screws provide access to zero and span adjustments.

Specifications

Input	
Pressure Range	Vacuum to 1000 psig
Proof Pressure	see ordering chart
Burst Pressure	see ordering chart
Fatigue Life	>1 million cycles
Performance	
Output	4-20 mA (2 Wire)
Supply Voltage (Vs)	18-38 VDC
Accuracy	0.20% FS
Thermal Error Zero	0.02% FS/°F (0.036%FS/°C)
Thermal Error Span	0.02% FS/°F (0.036%FS/°C)
Compensated Temperatures	20°F to 180°F (-7°C to +80°C)
Operating Temperatures	-40°F to +260°F (-40°C to +125°C)
Storage Temperatures	-65°F to +260°F (-54°C to +127°C)
Zero Tolerance	1% FS (±0.5 mA adjustable)
Span Tolerance	1% FS (±0.5 mA adjustable)
Maximum Loop Resistance	(Vs-18) x 50
Response Time	10 ms
Mounting Effects	0.15% FS (.25% FS for 1.5" Tri-Clover)
Mechanical Configuration	
Pressure Port	1.5" or 2" Tri-Clover Sanitary Fitting
Wetted Parts	316 Stainless Steel
Electrical Connection	1/2" NPT Conduit Fitting and Strain Relief with 15 ft. Cable
Enclosure	Stainless Steel
Vibration	10g Peak Sinusoidal, 50 to 1000 Hz
Acceleration	10g
Shock	50g
Approvals	Meets 3-A Sanitary Standards
Weight	8 oz



Applications

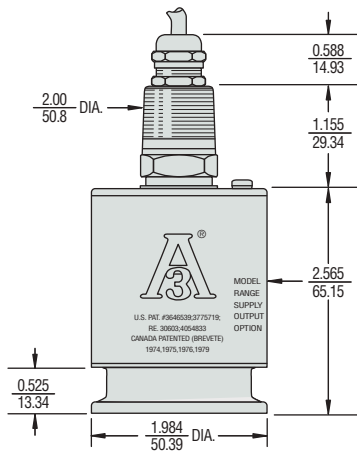
- Food Processing
- Dairy & Beverage Processing
- Pharmaceutical Processing
- Sanitary Pipelines

How They Operate

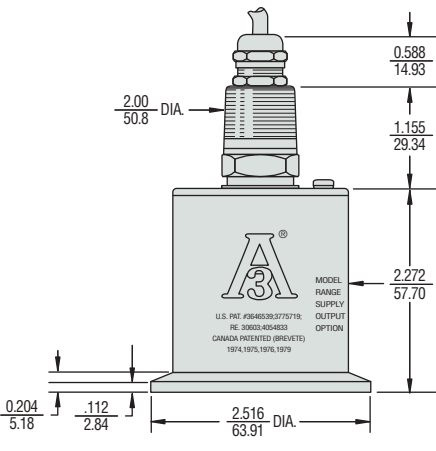
A stainless steel diaphragm and an insulated electrode form a variable capacitor. Pressure on the diaphragm alters the sensor's capacitance, which is then detected and converted to a highly accurate linear 4-20 mA signal by electronic circuitry featuring Gems' patented charge-balance principle. Low hysteresis, very stable operation and negligible clamping effect are inherent.

Dimensions

1.5" Fitting



2" Fitting



Gems adheres to strict quality standards including MIL-1-45208A and ANSI-2540-1.

How to Order

Order as 890 Series Sanitary Pressure Transmitters. Specify Pressure Range (tabulated below), Fitting Size and any Options. Use **bold** characters to construct a product code.

SELECT

1. Series **C890** - 890 Series

2. Pressure Ranges

2" Tri-Clover Sanitary Fittings			
Operating Range psig	in. H ₂ O	Proof psig	Burst psig
1	27.7	50	100
2	55.4	100	150
5	138.4	150	200
10	276.8	150	200
15	415.2	150	200
30	830.4	150	300
60	1160.8	180	400
100	2768.0	200	400
150	4152.0	225	400
-14.7 to 15	-407 to 415	150	300

1.5" Tri-Clover Sanitary Fittings		
Operating Range psig	Proof psig	Burst psig
30	1000	1200
60	1000	1200
100	1000	1200
300	1000	1200
500	1000	1500
1000	1250	2400
-14.7 to 15	1000	1200
-14.7 to 45	1000	1200

3. Pressure Port **1.5** - 1.5" Tri-Clover Sanitary Fitting
2.0 - 2" Tri-Clover Sanitary Fitting

4. Options (*Add as suffix to base part code as needed)
715 - ±0.1% FS accuracy
884 - 20 Ra finish
911 - Etched metal stainless steel tag
Cable Length:
816-825 - For cable lengths of 16 to 25 feet (15 ft. is standard).
Please specify cable length by code (e.g., 820 for 20 ft. cable).
Consult factory for cable longer than 25 feet.
Calibration Certificate:
901 - 11-point calibration certificate.

C890 - 10 - 1.5 - * - * - * - *

31EP/EA and 32EP/EA Series Explosion Proof

- ▶ CSA Approved
- ▶ ATEX Approved

Oil & Gas equipment needs a pressure transducer that is reliable and able to withstand extreme environmental and pressure conditions. Gems Sensors explosion proof units offer an alternative to high priced, unreliable alternatives. The 31EP and 32EP are CSA approved explosion proof, and the 31EA/32EA carries the ATEX approval. They all feature all stainless steel wetted parts, a broad selection of pressure connections and a wide choice of electrical outputs—the 32 Series of each group provide higher proof pressures. Our manufacturing process includes the latest automated equipment, producing consistent sensor performance.

The compact yet rugged construction of these units makes them ideal for installation where space in a hazardous environment is at a premium.

Specifications

Performance	
Long Term Drift	0.2% FS/YR (non-cumulative)
Accuracy	0.25% FS
Thermal Error	
31EP/EA	±1.5% max., ±1% typical / 212°F (100°C)
32EP/EA	±2% max.
Compensated Temperatures	-40°F to +203°F (-40°C to +95°C)
Operating Temperatures	-40°F to +203°F (-40°C to +95°C)
Zero Tolerance, Max.	0.5% of span
Span Tolerance, Max.	0.5% of span
Fatigue Life	Designed for more than 100 M cycles
Mechanical Configuration	
Pressure Port	See under "How to Order," last page
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See under "How to Order," last page
Enclosure	IP67
Vibration	BSEN 60068-2-6 (FC) Sine (20G) BSEN 60068-2-64 (FH) Random (14.1 Grms)
Shock	BSEN 60068-2-27 (Ea) (50G, 11ms)
Approvals	
CSA (31EP/32EP)	Class I, Division 1, Groups A, B, C and D Class I, Zone 1 Exd IIC T4 Gb Class I, Zone 1 AExd T4 Gb
ATEX (31EA/32EA)	Exd IIC T4 Gb (Ambient Temperature: -40°C to +95°C)

EMC Specifications

Emissions Tests: EN61326-1:2006 and EN61326-2-3:2006	
EN55011:2007	Radiated Emissions: 30-230MHz 30dB µV/M @10M 230-1000MHz 37dB µV/M @10M
Immunity Tests: EN61326-1:2006 and EN61326-2-3:2006	
EN61000-4-2:2009	Electrostatic Discharge: ±4Kv contact ±8Kv air
EN61000-4-3:2006	Radiated Immunity: 10V/M 80-1000MHz 3V/M 1400-2000MHz 1V/M 2000-2700MHz
EN61000-4-4:2004	Fast Transients: ±0.25, 0.5, 1Kv
EN61000-4-6:2007	Conducted Immunity: 3V 0.15 to 80MHz 80% 1KHz modulation



Individual Specifications

Voltage	
Output (3-wire)	0 V min. to 10 V max. See under "How to Order," last page
Supply Voltage	1 Volt above full scale to 30 V max @ 4.5 mA
Source and Sinks	2 mA
Current	
Output (2-wire)	4-20 mA
Supply Voltage	8-24 Volts measured at the input to the transducer terminals
Maximum Loop Resistance	(Supply Voltage-8) x 50 ohms
Ratiometric	
Output	0.5 to 4.5 V (Source and sink 2 mA)
Supply Voltage	5 Vdc ±10% @ 4.5 mA

Pressure Capability

Pressure Range PSI (Bar)	Proof Pressure (x Full Scale)		Burst Pressure (x Full Scale)	
	31EP/EA	32EP/EA	31EP/EA	32EP/EA
100-300 (7-20)	3.00 x FS	3.00 x FS	40 x FS	
500-1,500 (40-100)	2.00 x FS		20 x FS	
2,000-6,000 (160-400)			10 x FS	
10,000 (700)			>60,000 PSI (4,000 bar)	
15,000 (1,000)	2.50 x FS			

Pressure Ports

NPT and SAE Dimensions in Inches. Metric and BSP Dimensions in MM.

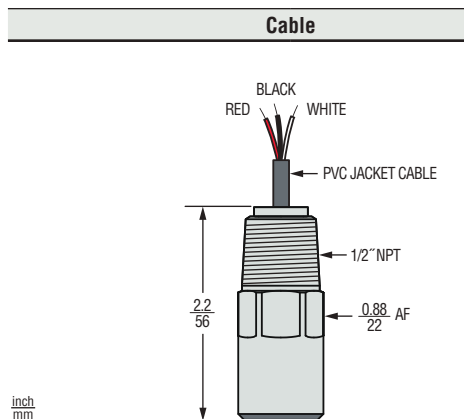
<div>NPT</div>	<div>NPT</div>	<div>NPT</div>	<div>NPT</div>	
Fitting Code	08 = 1/8"-27 NPT	4D = 1/8"-27 NPTF Dryseal	02 = 1/4"-18 NPT	0E = 1/4"-18 NPT Internal
Torque	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*
<div>NPT</div>	<div>NPT</div>	<div>SAE</div>	<div>SAE</div>	
Fitting Code	4C = 1/4"-18 NPTF Dryseal	0H = 1/2"-13 NPT	4N = 3/8"-24 UNF	1J = 7/16"-20 UNF
Torque	2-3 TFFT*	2-3 TFFT*	18-20 NM	18-20 NM
<div>SAE</div>	<div>SAE</div>	<div>SAE</div>	<div>SAE</div>	
Fitting Code	04 = 7/16"-20 UNF with 37° Flare	1G = SAE 4 Female 7/16"-18 Schraeder	1P = 9/16"-18 "Heavy Duty"	4B = 1/4"-28 Female (7/16UN with Schraeder Deflator)
Torque	15-16 NM	18-20 NM	18-20 NM	
<div>BSP</div>	<div>BSP</div>	<div>BSP</div>	<div>BSP</div>	
Fitting Code	0S = G1/8"-A Stud (BS 5380 Port)	01 = G1/4"-19 A	05 = G1/4"-19 A Integral Face-Seal	0A = G1/4"-19 PT (JIS) or BSPT
Torque	30-35 NM	30-35 NM	30-35 NM	30-35 NM
<div>BSP</div>	<div>Metric</div>	<div>Metric</div>	<div>Metric</div>	
Fitting Code	4P = G1/2"-A 27A/F	0L = M12 x 1.5	2T = M12x1.5 HP Metal Washer Seal	0K = M14 x 1.5
Torque	30-35 NM	28-30 NM	30-35 NM	2-3 TFFT*

*NPT Threads 2-3 turns from finger tight. Wrench tighten 2-3 turns.

General Notes:

- The diameter of all cans is 19 mm (0.748").
- Hex is 22 mm (0.866") Across Flats (A/F) for deep socket mounting, except Fitting Code 4P which is 27mm (1.063").
- O-Ring material, where applicable, is Viton® unless otherwise specified.

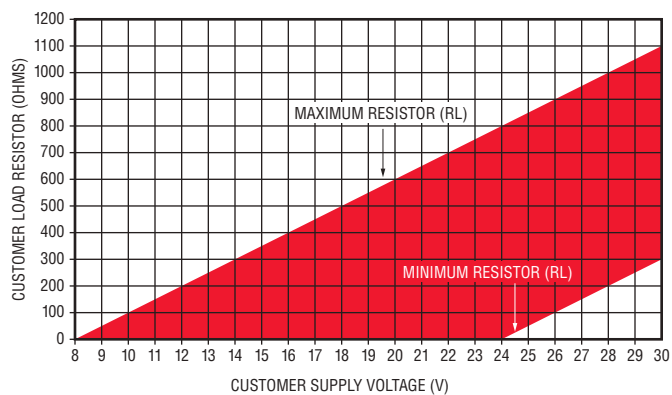
Cable-Out Type



Code S

Wire Color	Voltage Mode	Current Mode
Red	Supply	Supply
Black	Ground	Return
White	V _{out}	No Connect

Current Output Mode (Load Resistor Range)



Minimum Resistor Value = $50 \times (+V - 24)$ for $+V > 24V$

Maximum Resistor Value = $50 \times (+V - 8)$ for $+V > 8V$

PS41 – Economical Miniature Pressure Switches

► 4 to 100 psi (0.28 to 7 bar)

These miniature pressure switches are designed for demanding applications where space and/or price are strong concerns. The switches utilize a piston/diaphragm design, which incorporates the high proof pressure of piston technology with the sensitivity of diaphragm designs. Switches are field adjustable via an Allen head screw that is hidden to protect against unauthorized tampering.

Specifications

Switch	SPST; SPDT
Repeatability	See Table 1
Wetted Parts	
Diaphragm Material	Nitrile (optional EPDM, Viton® or Neoprene)
Fitting	Brass (optional 316 Stainless Steel)
Electrical Termination	DIN 43650A IP65; Terminals IP00; Flying Leads IP65; Option IP: IP66; Conduit with Flying Leads IP65
Proof Pressure	350 psi (24 bar)
Burst Pressure	700 psi (48 bar)
Approvals	CE, UL Approved units available
Weight, Approximate	Brass: 0.3 lbs. (0.14 kg)

Recommended Operating Temperature Limits

Diaphragm Material	Options Selected		
	No option, -10A, -SP or -RD	-RD or -RD and -G	-SP or -10A
Nitrile	15°F to 185°F (-9°C to +85°C)	15°F to 250°F (-9°C to +121°C)	15°F to 212°F (-9°C to +100°C)
Viton®	0°F to 185°F (-18°C to +85°C)	0°F to 250°F (-18°C to +121°C)	0°F to 212°F (-18°C to +100°C)
EPDM	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)	-10°F to +212°F (-23°C to +100°C)
Neoprene	-10°F to +185°F (-23°C to +85°C)	-10°F to +250°F (-23°C to +121°C)	-10°F to +212°F (-23°C to +100°C)

Note: Switches may function below the cold temperature limit but the set points and deadband will increase. Consult factory for details.

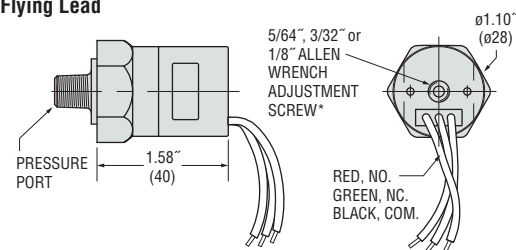
Electrical Switch Ratings

Options Selected	AC	DC
No option or -RD	5 amps @ 125/250 Volts	5 amps resistive, 3 amps inductive @ 28 Volts
-G or -RD with -G	1 amp @ 125 Volts	1 amp resistive, 0.5 amp inductive @ 28 Volts
-SP without -G	10.1 amps @ 125/250 Volts	—
-SP with -G	2 amps @ 125/250 Volts	—



Dimensions

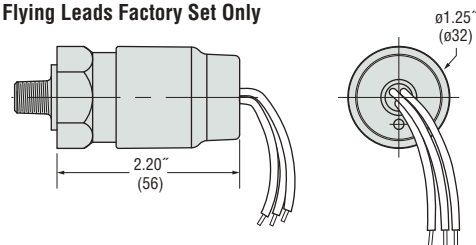
Flying Lead



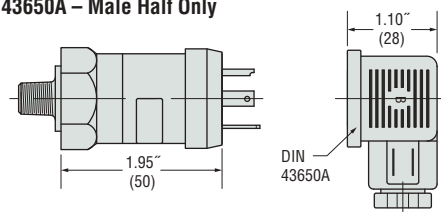
* Adjustment screw is located under protective screw.

Ingress Protection Option (IP66)

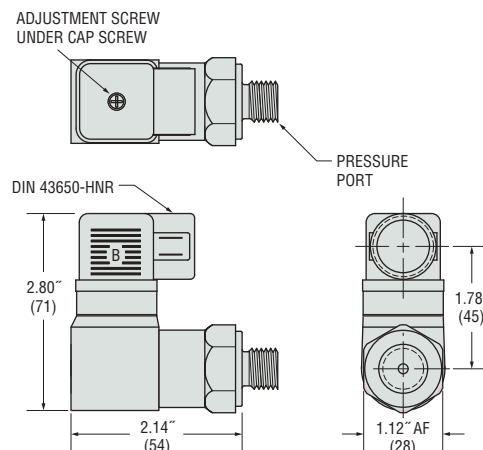
with Flying Leads Factory Set Only



DIN 43650A – Male Half Only



Right Angle DIN (HNR)



How To Order

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

PS41 **-10** **-4MNB** **-C** **-H** **-XX** **-XXXX**

1
2
3
4
5
6

1 Pressure Range Code

Insert Pressure Range Code from Table 1, below.

2 Pressure Fitting¹

Brass

- 2MNB = 1/8" NPTM
- 4MNB = 1/4" NPTM
- 2MGB = 1/8" BSPM (G type)
- 4MGB = 1/4" BSPM (G type)
- 4MSB = 7/16"-20 SAE Male
- 6MSB = 9/16"-18 SAE Male

316 Stainless Steel

- 2MNS = 1/8" NPTM
- 4MNS = 1/4" NPTM
- 4MGS = 1/4" BSPM (G type)
- 4MSS = 7/16"-20 SAE Male

3 Circuit

- A = SPST/N.O.
- B = SPST/N.C.
- C = SPDT

4 Electrical Termination

- SP = Spade Terminals²
- FLXX = Flying Leads³
- FLSXX = Flying Leads w/PVC Shrink Tubing³
- ELXX = 1/2" NPT Male Conduit w/Flying Leads⁴
- CABXX = 18 AWG PVC Cable⁵
 - H = DIN 43650A Male Half Only⁶
 - HR = Right Angle DIN 43650A Male Half Only⁶
 - HC = DIN 43650A 9mm Cable Clamp⁶
 - HCR = Right Angle DIN 43650A 9mm Cable Clamp⁶
 - HN = DIN 43650A with 1/2" Female NPT Conduit⁶
 - HNR = Right Angle DIN 43650A with 1/2" Female NPT Conduit⁶

5 Options⁷

- V = Viton® Diaphragm
- N = Neoprene Diaphragm
- E = EPDM Diaphragm
- 10A = 10A @ 125/250 VAC Max. Rating
- G = Gold Contacts
(for loads less than 12 mA @ 12 VDC)
- RD = Reduced Differential
(25% reduction typical)
- IP = Ingress Protection⁸
- OF = Oil Free Cleaned
- WF = Weather Pack Connector, Female
- WM = Weather Pack Connector, Male
- DE = Deutsch Connector, Male, DT04 Series

6 Fixed Set Point (optional)

- A. Specify set point **-FS**
(in PSI or BAR, see example)⁹
- B. Set Point Actuation
R on Rising Pressure
F on Falling Pressure
Example: **-FS0.5BARF** for 0.5 BAR Falling
or **-FS5PSIR** for 5 PSI Rising

Notes:

1. Other fittings available. Consult factory.
2. Requires **-10A** or **-G** option. (20% increase in deadband typical)
3. 18" is standard. Specify lead length in inches (max. 48"). e.g. **-FL18** or **-FLS30**.
4. 18" is standard. Specify lead length in inches (max. 48"). e.g. **-EL18** or **-EL30**.
5. 36" is minimum. Specify cable length in inches. e.g. **-CAB36** or **-CAB120**.
6. DIN connectors require **-C** SPDT circuit.
7. Options **-10A**, **-G** or **-RD** cannot be combined.
8. Ingress Protection is available only with **-FL**, **-FLS** or **-CAB** Electrical Termination choices. Ingress Protection requires Fixed Set Point **-FS**.
9. Set Point must be within Pressure Range selected in Step 1.

Table 1 — Pressure Range Codes

Pressure Range Code	Pressure Range	Accuracy*	Average Deadband**
10	4-8 psi (0.28-0.55 bar)	±0.35 psi (0.024 bar) +2% of setting	1.50 psi (0.10 bar) +7% of setting
20	7-30 psi (0.48-2.07 bar)	±0.8 psi (0.055 bar) +2% of setting	3 psi (0.21 bar) +8% of setting
30	25-100 psi (1.7-6.9 bar)	±2.0 psi (0.138 bar) +2% of setting	5 psig (0.28 bar) +10% of setting

* Accuracy and set point of units may change due to the effects of temperature.

** These numbers are for the standard microswitch. With either the **-SP** or **-10A** option, the values are typically 20% greater than those listed. With the **-RD** option, the values will be typically 25% less than those listed. In certain applications deadband can be tailored and controlled to customer specifications. Consult factory for details.

Flow Rate Monitoring – RFA Types

► 0 to 10 VDC Analog Output

GEMS Sensors popularized the RotorFlow'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. RFA Types feature a 0 to 10 VDC analog output which is proportional to flow rate.

Specifications

Wetted Materials	
Body	Brass, 316 Stainless Steel or Polypropylene (Hydrolytically Stable, Glass Reinforced)
Rotor Pin	Ceramic
Rotor	PPS Composite, Black ¹
Lens	Polysulfone
O-Ring	Viton® (Alloy Bodies); Buna N (Polypropylene Body)
Low Flow Adaptor	Glass Reinforced Polypropylene
Operating Pressure, Maximum	
Brass or Stainless Steel Body	200 PSIG (13.8 bar) @ 70°F (21°C), 100 PSIG (6.9 bar) @ 212°F (100°C) ²
Polypropylene Body	100 PSIG (6.9 bar) @ 70°F (21°C), 40 PSI (2.8 bar) Max. @ 180°F (82°C)
Operating Temperature	
Brass or Stainless Steel Body	-20°F to 212°F (-29°C to 100°C)
Polypropylene Body	-20°F to 180°F (-29°C to 82°C)
Electronics	150°F (65°C) Ambient
Viscosity, Maximum	200 SSU
Input Power	24 VDC, ±10%
Output Signal	0-10 VDC Analog Signal @ 1mA, Max.
Current Consumption	25 mA, Max.
Current Source Output, Max.	10 mA
Accuracy	See Table Below
Electrical Termination	22 AWG PVC-Jacketed, 24" Cable. Color Coded: Red = +VDC; Black = Ground; White = Signal Output

Notes:

1. Standard on Stainless Steel bodies.
2. For higher pressure/temperature ratings stainless steel face plates are available. Consult factory.

How To Order

For standard configurations, specify Part Number based on desired body material and port size.

Body Material	Port Size NPT	Flow Ranges – GPM			
		Low Range (Accuracy)	Part Number	Standard Range (Accuracy)	Part Number
Polypropylene	.25"	0.1 to 1.0 (±7.0%)	230206 ⚡	0.5 to 5.0 (±7.0%)	230205 ⚡
	.50"	1.5 to 12.0 (±7.0%)	230207 ⚡	4.0 to 20.0 (±15.0%)	230201 ⚡
Brass	.25"	0.1 to 1.0 (±7.0%)	230209 ⚡	0.5 to 5.0 (±7.0%)	230202
	.50"	1.5 to 12.0 (±7.0%)	230210 ⚡	4.0 to 20.0 (±15.0%)	230203
	.75"	—	—	5.0 to 30.0 (±10.0%)	230212 ⚡
	1.00"	—	—	8.0 to 60.0 (±15.0%)	230214
Stainless Steel	9/16"-18	0.1 to 1.0 (±7.0%)	230211	0.5 to 5.0 (±7.0%)	230204
	.50"	1.5 to 12.0 (±7.0%)	230216	4.0 to 20.0 (±15.0%)	230208
	.75"	—	—	5.0 to 30.0 (±10.0%)	230213
	1.00"	—	—	8.0 to 60.0 (±15.0%)	230215

⚡ – Stock Items.

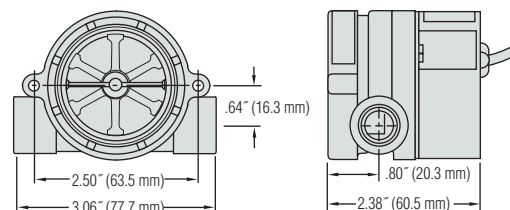


Typical Applications

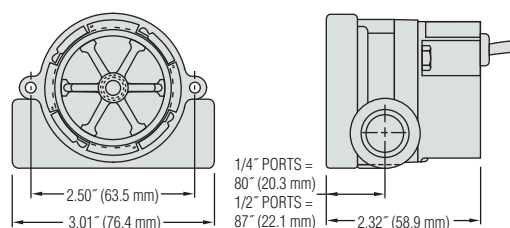
- Water Purification/Dispensing Systems
- Chemical Metering Equipment
- Lasers and Welders
- Water Injection Systems
- Semiconductor Processing Equipment
- Chillers and Heat Exchangers

Dimensions

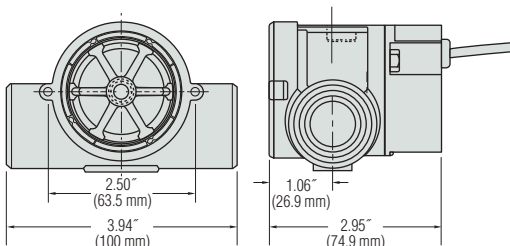
Polypropylene Bodies



Brass and Stainless Steel Bodies - .25" and .50" Ports



Brass Bodies – .75" and 1.00" NPT Ports



High Resolution Black Rotor

PPS composite. Each of the six rotor arms is magnetized. A PTFE loaded bushing ensures long life.



FS-550 Series – High Pressure, Metal Paddle Switch

- ▶ **Pipe Line Size:** $\geq 1\text{-}1/4"$
- ▶ **Primary Construction Material:** Stainless Steel or Brass
- ▶ **Setting Type:** Fixed

Standard FS-550 switches sense liquid flow in either direction to monitor flow/no-flow conditions. They are supplied in two paddle lengths. 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 3 psig of pressure drop regardless of pipe size.

Specifications

Wetted Materials	
Housing	Brass or 316 Stainless Steel
Paddle	302 Stainless Steel
Spring	316 Stainless Steel
Other Wetted Parts	Ceramic and Teflon®
Maximum Operating Pressure	2000 psig (138 bar)
Maximum Pressure Drop	3 psig (0.2 bar)
Operating Temperature	-30°F to + 300°F (-34.4°C to + 148.9°C)
Set Point Accuracy	±25%
Switch*	SPDT, 20 VA
Repeatability	±5%
Electrical Termination	8 AWG, 24" L., Polymeric Lead Wires

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

Standard Actuation and De-actuation Set Points

The Table below indicates paddle lengths which achieve switch actuation for specific flow rates. Approximate pipe line sizes are marked on paddle.

	Pipe Size Marked at Paddle Cut-Off Point	Pipe Line Sizes					
		1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
		Approximate Actuation and (De-Actuation) Flow Rates GPM Water					
Short Paddle Unit	1-1/4"	5 (3)	13 (8)	22 (15)	29 (22)	—	—
Long Paddle Unit	1-1/2"	—	15 (11)	28 (21)	38 (30)	—	—
	2"	—	—	22 (15)	27 (20)	48 (38)	—
	2-1/2"	—	—	—	21 (14)	40 (26)	52 (39)
	3"	—	—	—	—	31 (20)	45 (32)
	4"	—	—	—	—	—	39 (25)

All flow rate tests for the above table were conducted with the switch installed in a standard "T" fitting. For calculation of flow rates in pipe sizes larger than 5", a flow velocity of approximately 6"/second actuates the switch with a full length (5") paddle. The paddle can be trimmed to achieve different actuation points.

How To Order – Standard Models

Select switch type, paddle length and housing material, then specify adjacent part number.

Switch Type	Paddle Length	Housing Material	Switch Operation	Part Numbers	
				Standard	3-Pin J-Box
SPDT Standard Unit	Long	Brass	N.O. or N.C.	29609 ⚡	56730
		316 S.S.		29608 ⚡	56729
	Short	Brass		30641 ⚡	—
		316 S.S.		30640 ⚡	—

Note: The FS-550 Switch is not recommended for use with 1" plastic tees.

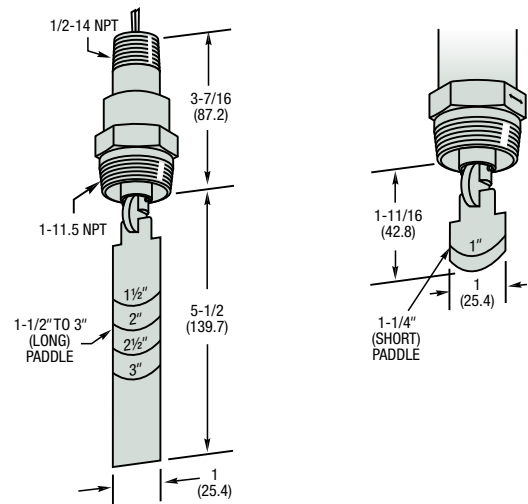
⚡ Stock Items



U.L. Recognized:
File No. E31926

CSA Listed:
File No. LR30200
and LR22666

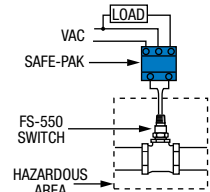
Dimensions



FS-550 switches are U.L. Approved for Class I, Division 2, Groups A, B, C, D hazardous areas.

Using GEMS SAFE-PAK Relays and barriers, these switches provide automatic flow/no flow interlock and are intrinsically-safe without explosion-proof housing and piping.

U.L. Approved:
File No. E183854



FS-500 Series – Low Cost Units for Threaded Plastic Piping

Flow Rate Settings: 0.25 GPM to 5.0 GPM

Port Size: 3/4" NPT

Primary Construction Material: Polypropylene

Setting Type: Fixed

The FS-500 offers low cost flow monitoring with a variety of switch actuation points and low pressure drop. All wetted parts are polypropylene or stainless steel, making this switch ideal for a wide range of chemical and temperature requirements. These Flow Switches can be used in water treatment applications including chlorinators, purifiers and heaters. The FS-500 is ideal for equipment cooling including welders, lasers, etc. A J-box version with a 5 amp relay is also available for direct control of higher electrical loads, such as chlorinator pumps.

Specifications

Wetted Materials*	
Housing, Bonnet, Shuttle, Shuttle Cap	Polypropylene, Hydrolytically Stable
O-Ring	Viton® or Buna N
Spring	316 Stainless Steel
Retaining Clip	PH 15-7 Mo Stainless Steel
Operating Pressure, Maximum	100 PSIG (6.9 bar) @ +70°F (21°C)
	50 PSIG (3.4 bar) @ +180°F (82°C)
	40 PSIG (2.8 bar) @ +212°F (100°C)
Operating Temperature, Maximum	0° to 212°F (100°C)
Set Point Accuracy	± 20%
Set Point Differential	± 20% Maximum
Switch**	SPST, N.O. Pilot Duty 20 VA, 120-240 VAC or VDC
J-Box with 5A Relay	
Coil	120 VAC 50/60 Hz
Contacts SPDT	5A – 240 VAC Res
	1/3 HP – 120 VAC
	5A – 28 VDC Res.
Inlet/Outlet Ports	3/4" Female NPT
Electric Termination	
Pilot	No. 22 AWG, 24" Zip Cord Lead Wires
J-Box	6" PVC Cable

* Materials of Construction are available for FDA Compliance.

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

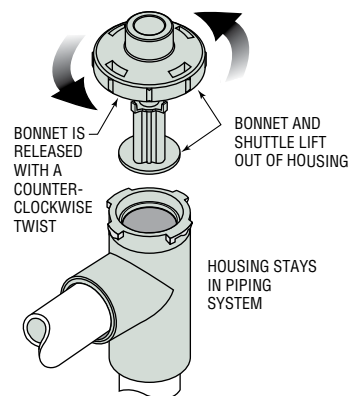
How To Order – Standard Models

Specify Part Number based on switch actuation set point. Set points other than those listed are available as special order; contact GEMS with your requirements. Normally closed switch logic units available as special orders.

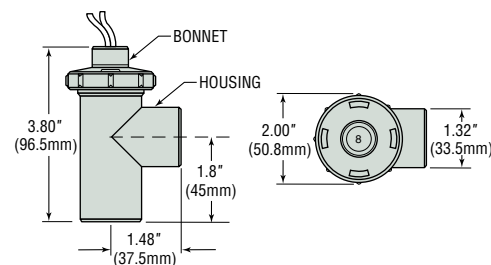
Switch Actuation Set Point GPM	Part Numbers	
	Pilot Duty	J-Box w/5A Relay
0.25	170231 ⚡	175901
0.50	170232 ⚡	175902
1.00	170233 ⚡	—
2.00	175117	—
2.50	170234 ⚡	—
5.00	170235 ⚡	—

Note: Use of 100 micron filtration is recommended.

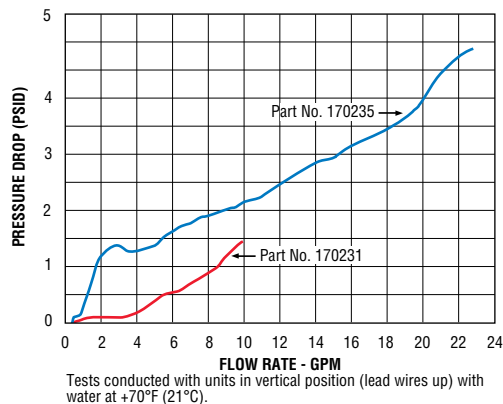
⚡ – Stock Items.



Dimensions



Pressure Drop - Typical



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

Flow Rate Settings: 0.07 GPM to 2.00 GPM

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	125 PSI (8.6 bar) @ 70°F (21°C), 50 PSI (3.4 bar) @ 212°F (100°C)
Operating Temperature	0°F to 212°F (-18°C to +100°C)
Set Point Accuracy	20% of Set Point
Set Point Differential	20% Maximum
Switch*	SPST, 10VA, N.O. at no Flow
Electrical Termination	24" to 26" Polymeric Leads, 22 AWG
Filtration	100 Micron
Approvals	CUL, RoHS

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



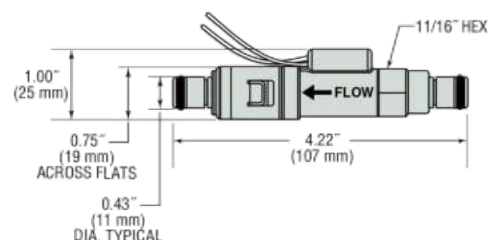
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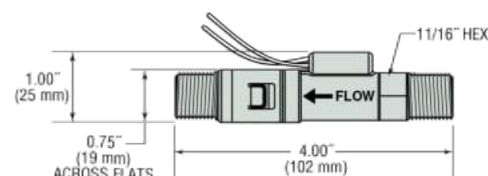
Dimensions

1/4" Quick Disconnect Male Adapter

See table at bottom right for adapter Part Numbers.



3/8" NPT Port



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 GPM	Part Numbers	
	3/8" NPT Male	1/4" QDC Male*
0.07	216445** ⚡	216446** ⚡
0.15	209876 ⚡	203206
0.25	197081 ⚡	197091 ⚡
0.50	197082 ⚡	197092
1.00	197083 ⚡	197093
1.50	197084 ⚡	197094 ⚡
2.00	197085 ⚡	197095

* See selection of adapters at right.

QDC = Quick Disconnect

** Set point accuracy 0.06 to 0.1 GPM

⚡ – Stock Items.

Acetal Adapters for 1/4" Quick Disconnect Male Tube Fitting Units (180°F 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

Description	Part Numbers	
	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. (6 mm O.D., 4.3 mm I.D.) Polytube	198096 ⚡	198097
3/8" O.D., 1/4" I.D. (9.5 mm O.D., 6 mm I.D.) Polytube	198099	198098
1/4" (6.4 mm) I.D. Barb	198401 ⚡	198402
5/16" (7.9 mm) I.D. Barb	198403 ⚡	198404
3/8" (9.5 mm) I.D. Barb	198408 ⚡	198405
1/4" O.D. (6.4 mm) O.D. JG®	198470 ⚡	198406
3/8" O.D. (9.5 mm) O.D. JG®	198459 ⚡	198407

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

LWC-700/720 Series Low Level Cut Off and Pump Up Control

- ▶ Internal Mounting
- ▶ Meets CSD1 Requirements
- ▶ U.L. Recognized "Limit Control"
- ▶ Compact Size
- ▶ Options Include: Manual Reset, Power Outage Feature, and Test Feature

Gems LWC-700 is designed for boiler low-water cutoff protection, and offers the most compact internally mounting package for boiler and steam generators. The 720 Series includes the low-water cutoff function and adds Pump Up control for more sophisticated and convenient automation. For added safety, the sensor assembly incorporates redundant reed switches at the actuation level. The LWC-700 and LWC-720 Series are ideal for R.O., distilled, or deionized water systems.

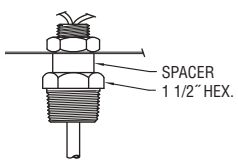
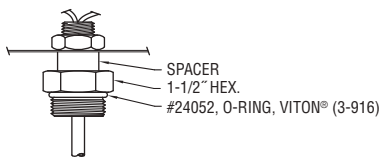
Optional Features:

- Power Outage feature allows for resets after nuisance power outages;
- Reset Button feature to be used when device has been deactivated due to low water condition. A Reset is activated only after water has returned to normal level.

Specifications

Wetted Materials	
Stem, Mounting, Collars	Brass or Stainless Steel
Float Assembly	316 Stainless Steel
Pressure Rating	150 PSI (1034 KPA)
Temperature Range	0°F to 305°F (-18°C to 151°C); 350°F (176°C) max. intermittent
Float Acceptable Overtravel	1/16" to 1/4" (1.6 mm to 6.5 mm) on Closure; 1/16" (1.6 mm) min. on Opening
Mounting Attitude	Vertical, J-Box Up
Controller	
Contacts	SPDT, Dry Contacts
Contact Ratings	10A @ 120/220/240 VAC Resistive (120°F/49°C) 1A @ 120, 208/240, 240 Resistive (150°F/66°C) 1/3 HP @ 120, 208/240, 240 VAC
Secondary Circuit	2.3 VAC RMS, <1 mA
Sensitivity	10K
Ambient Temperature	-40°F to +150°F (-40°C to +66°C)
Time Delay	0.5 Seconds on Rising Level
Approvals	UL Recognized per UL-353, Limit Controls (for supply voltages of 120 VAC or less)

Mounting Types

Type 1 1" NPT	Type 2 1-5/16"-12UNF-2A ¹
	

Notes:

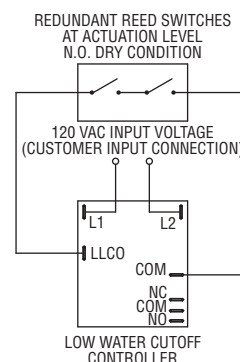
1. Mounting plug dimensions per SAE J1926.



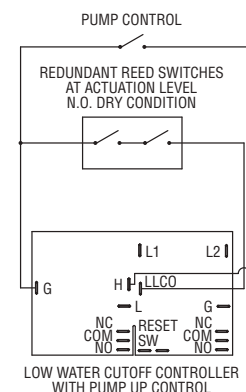
720 Series shown

Switch Actuation

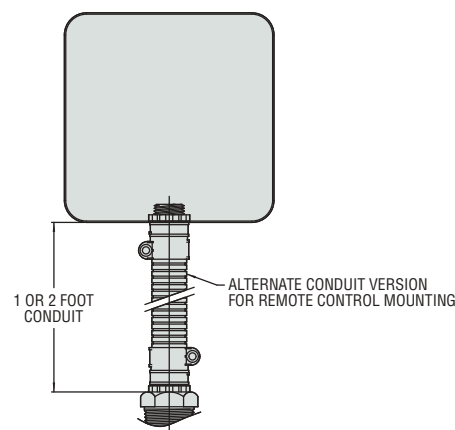
700 Series



720 Series

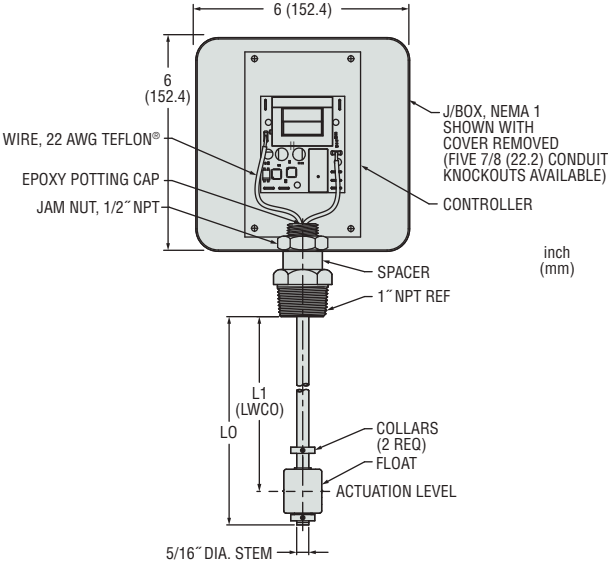


Conduit Option



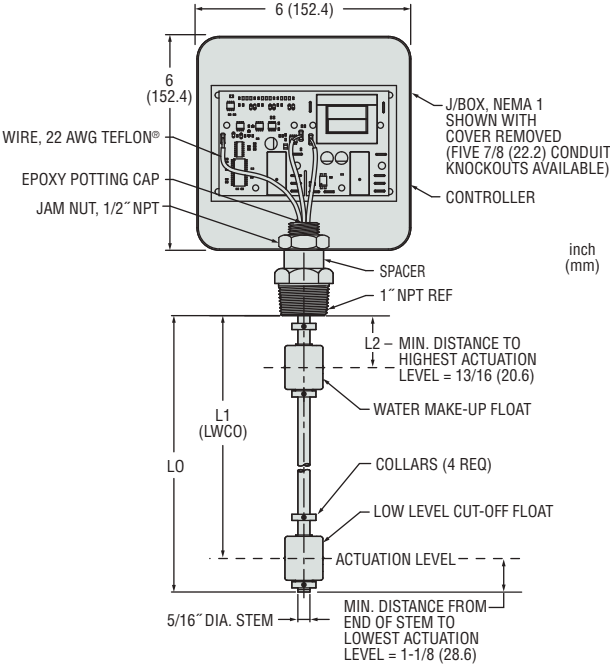
Dimensions

700 Series



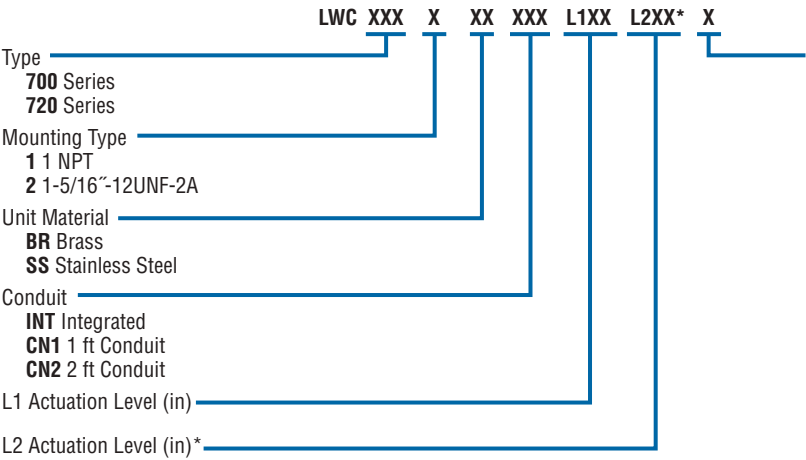
Note: Actuation levels are calibrated on ascending fluid levels.

720 Series



How to Order

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



* Used for 720 Series only; leave blank for 700 Series.

- Actuation level distances and LO (Length Overall) are measured from the inner surface of the mounting plug.
- LO = L1 + 1-1/8" (28.6mm)
- L2 may be no less than 2 inches (50.8mm) from L1 actuation level.

Notes:

- Dimensions based on liquid specific gravity of 1.0.
- Tolerance on actuation levels is $\pm 1/8"$ (3.2mm).

Control Options

700 Series

Control Options			Part No. Code
N.C. Pushbutton	Power Outage	Test Feature	
•			C
	•		E
		•	B
•	•		F
•		•	Y
	•	•	Z
•	•	•	A

720 Series

Control Options			Part No. Code
N.C. Pushbutton	Power Outage	Test Feature	
•			S
	•		K
		•	B
•	•		G
•		•	Y
	•	•	Z
•	•	•	A

Series M Mechanical Tilt Float Level Switch

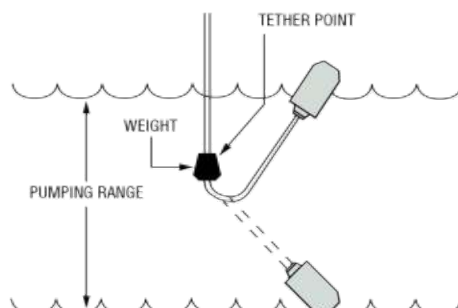
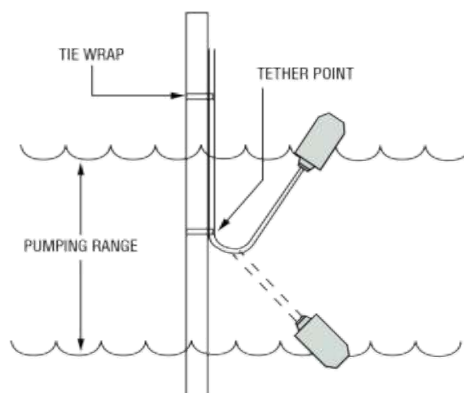
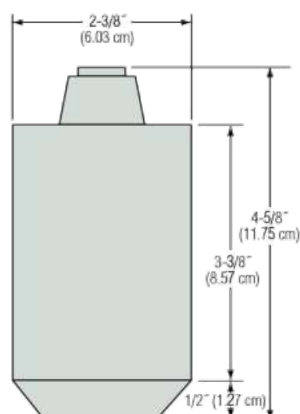
- ▶ Non-Mercury Switch
- ▶ Sealed Cable
- ▶ Impact & Corrosion Resistant ABS Shell
- ▶ N.O., N.C., SPDT Contacts
- ▶ Various Cable Lengths
- ▶ Color Coded Body

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

Specifications

Cord	2 or 3 conductor 16 AWG wire SJOW Oil Resistant CPE
Contact Rating	13 amp @ 120/240 VAC 1/2 hp
Contact Design	SPST, Normally Open or Normally Closed Common with N.O. & N.C. (form C)
Temperature Rating	
Dry	32°F to 194°F (0°C to 90°C)
Water Resistant	32°F to 140°F (0°C to 60°C)
Overall Weight	1.0 lbs. (not including weight)
Tether Method	Tie-wrap nylon, weight: 2.5 lbs.
Approvals	U.L. Recognized, CSA Cert. RoHS – In compliance with EU-directive 2011/65/EC requirements for chemicals and substances

Dimensions



Applications

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

How to Order

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

	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 ²				
WHI – SPST, Normally Closed, wide angle ²				
GRE – SPDT, Form C, wide angle ²				
Length				
40 – 40 feet (12.19 m)				
Tether Method				
T – Tie				
W – Weight				

Tether Method	Part Number
Tie Wrap	7762360
Weight	7762381

Notes:

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

ORDER IT!

Ordering is Easy! See Page D-9.
Easy online ordering too!

Standard Alloy Versions – Standard Size

- ▶ Temperatures to 750°F (399°C)
- ▶ Pressures to 700 psi (48 bar)

Rugged, welded construction makes these 2-1/2" (63.5 mm) diameter design, alloy SureSite Indicators dependable over a long service life indoors and out.

1. Mounting Configuration Types

To choose the best configuration for your application, focus on the process connections (connections where the liquid typically enters/leaves the SureSite).

	Type AA	Type BA	Type CA	Type DA
	Top and Bottom Process Connections	Side and Side Process Connections	Top and Side Process Connections	Side and Bottom Process Connections
L = Length of Visual Indication				
Typical Lengths*	C to C = L + 10-1/4" (260.4 mm)	C to C = L	C to C = L + 3-3/4" (95.2 mm)	C to C = L + 6-1/2" (165.1 mm)
Flag Material	Plastic (300°F / 148.9°C) or Aluminum (750°F / 399°C)			
Length of Indication (Uninterrupted)	240" (610 cm)			
Minimum Specific Gravity	0.39			

* Dimensions vary due to connections, material and specific gravity.

Note: Additional materials, floats, connections and manufacturing techniques are available to extend lengths and operational capabilities. Please contact GEMS Sensors if the parameters above do not meet your requirements.

2. Material

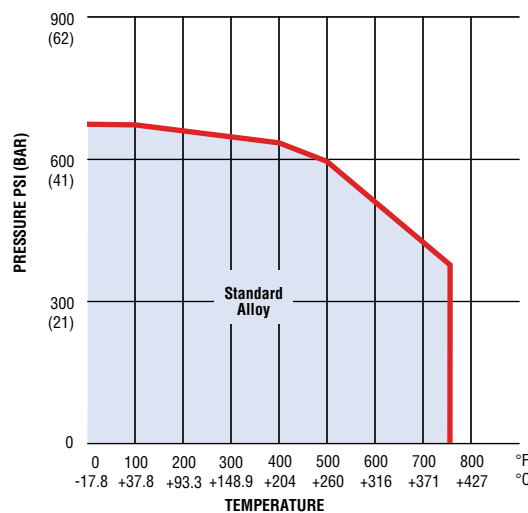
Housing and Float: 316 Stainless Steel

Pressure/Temperature performance parameters for alloy SureSite versions are specified in the chart at right. Please consult the factory with temperature/pressure requirements that fall outside the parameters shown here.

= Stock Material (Best economy and delivery).

Materials		Code
Housing	Float	
316L Stainless Steel	316L Stainless Steel	2
Carpenter 20	Hastelloy C276	3*
Hastelloy C276	Hastelloy C276	4*

* Consult factory for pressure/temperature capabilities.



Note: SureSite Indicators are available for temperatures as low as -200°F (-129°C).



Type BA Shown

RLI-80 Non-Contact Radar Level Sensor

- ▶ Measuring Range up to 49.2 ft (15 m)
- ▶ Accuracy: ± 0.2 in (5 mm)
- ▶ Measurement is Independent of Temperature, Pressure and Moisture Variations
- ▶ Minimum Dielectric Constant (ϵ_r) > 2
- ▶ 4–20 mA and Modbus® Outputs
- ▶ Temperature Range: -40°F to $+176^\circ\text{F}$ (-40°C to $+80^\circ\text{C}$)
- ▶ Pressure: Full Vacuum to 43 PSI (3 bar)
- ▶ IP67 Protection
- ▶ Approvals: Intrinsically Safe, cULus, CE, ATEX/IECEX

The RLI-80 Non-Contact Radar Level Sensor is a no-moving parts continuous level transmitter for reliable performance in challenging OEM and industrial tank level applications. RLI-80 Non-Contact Radar comes standard with 4–20 mA, Modbus®, and Bluetooth® connectivity for configuration and setup.

The RLI-80 provides accurate level measurement in medias with a dielectric constant of 2 or greater. Constructed of chemically inert PVDF material and designed to withstand IP67 conditions, the RLI-80 withstands the harshest conditions. The 2" NPT mounting provides adaptability to be used in tanks as large as 49.2 ft (15 m). The RLI-80 is unaffected by changes in physical properties of the application such as pressure, temperature, or vapors.



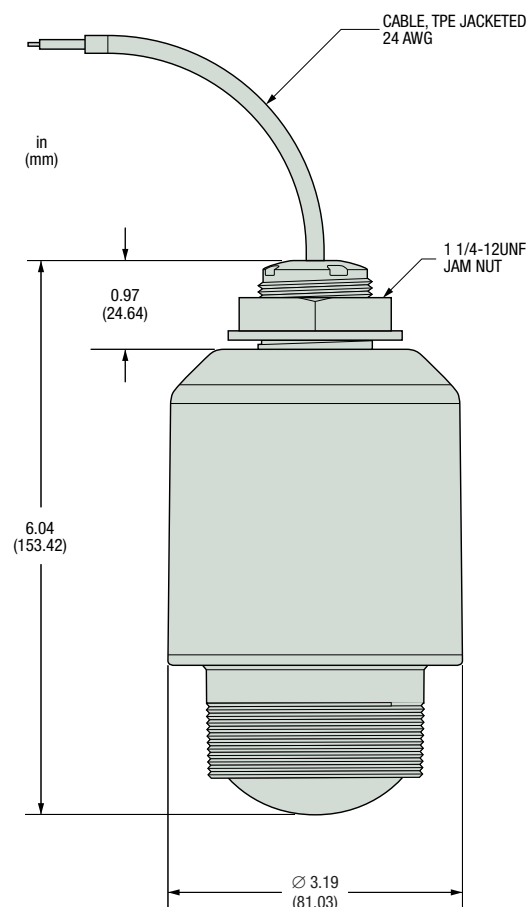
Applications

- Water & Wastewater
- Food & Beverage Process Tanks
- Fuel Tank Farms
- Chlorination Systems
- Oil & Water Reclamation Systems
- Commercial Marine
- Cooling Towers
- Water Purification
- Power Generators
- Hydraulic Power Units
- Agriculture Tanks & Equipment

Specifications

Measuring Range	Up to 49.2 ft (15 m)
Accuracy	± 0.2 in (5 mm)
Output	2-wire 4–20 mA or 4-wire Modbus
Configuration	Bluetooth® and Modbus®
Ingress Protection	IP67
Media Dielectric Constant	(ϵ_r) > 2
Temperature Range	-40°F to $+176^\circ\text{F}$ (-40°C to $+80^\circ\text{C}$)
Pressure Range	Full Vacuum to 43 PSI (3 bar)
Frequency	80 GHz
Beam Angle	8°
Process Connection	2" NPT
Bracket Mounting	1 1/4-12 Straight Thread (cable end)
Electrical Connection	15', or 30' TPE Jacketed Cable
Supply Voltage	24–36 VDC
Wetted Materials	
Housing	PVDF
Seal	FKM
Approvals	Intrinsically Safe, cULus, CE, ATEX/IECEX

Dimensions



Configuration & Setup

- ▶ Wireless configuration via Bluetooth® or Modbus® connection to iOS or Android devices and Windows PCs
- ▶ Download the Gems Sensors Radar App from the Apple App Store or the Google Play Store



How to Order

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

	RLI-80	-	C	-	X	-	X
Series							
Process Connection							
C - 2" NPT							
Output Option							
1 - 4-20mA							
2 - Modbus							
Cable Length							
1 - 15 feet							
2 - 30 feet							

Accessories

- ▶ For mounting onto walls and ceilings

Accessories	Order Code
RLI-80 Mounting Bracket	261977



The RLI-80 has a 1¼-12 UNF thread connection at the top of the sensor for attaching to a bracket

M Series – Subminiature

- ▶ MOPD: 100 PSI (6.9 Bar)
- ▶ C_v Range: 0.018 to 0.070 (K_v Range: 0.017 to 0.032)
- ▶ As Low as 0.5 Watts

The M Series implements efficient power conservation in a solenoid valve that is specifically designed for sub-miniature two- and three-way pneumatic and select liquid applications. Field proven to exceed performance requirements in battery-powered applications, the M Series can be designed for extreme low wattage conditions. With a compact size, consistent high-speed response time, and reliable operation over 200 million cycles, the M Series delivers extended performance and precision flow control in a small lightweight environment.

Typical Applications

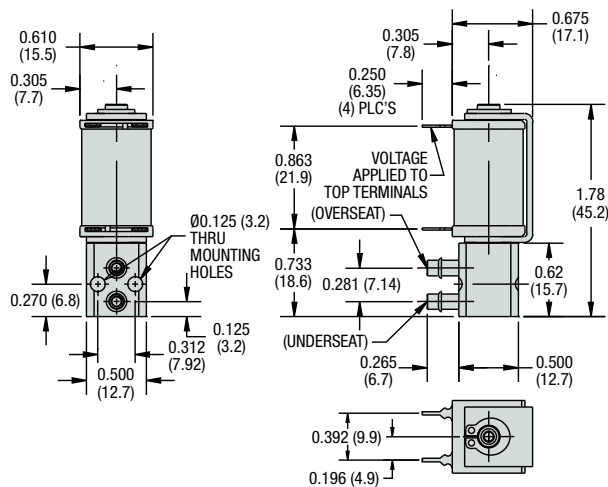
Ideal for inline PC interfacing and manifold assemblies:

- Medical and Therapeutic Healthcare
- Clinical Chemistry and Analysis Equipment
- Drop-on-Demand Printing
- Environmental Instrumentation

Dimensions

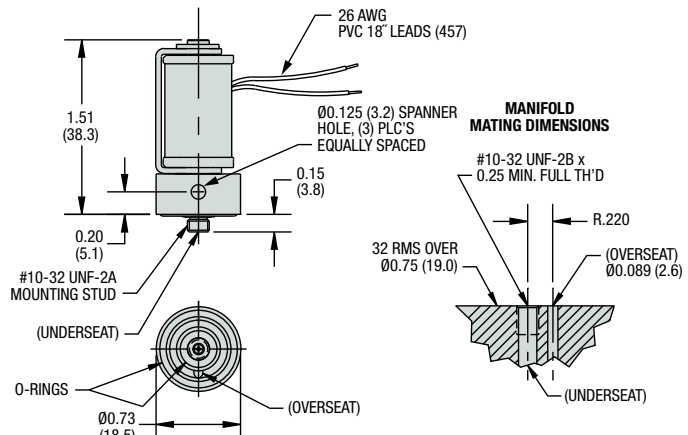
Barbed Port Body

(PCB 4-pin shown)



Manifold Mount Body

(Lead wires shown)



How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

M	B	20	29	-	03	8B	-	V	-	P1	-	204
Series	1	2	3	-	4	5	-	6	-	7	-	8
	Power Rating	Function	MOPD		Body Material	Body Port		Seal Material		Coil Construction		Supply Voltage

Product Description from Example Shown Above:

MB2029-038B-V-P1-204

MB2029 = M Series with 1 Watt Power Rating, 2-Way Normally Closed Valve Function; 50 MOPD

-038B = Brass Body Material; 1/8" Barb Body Port

-V = Viton® Seal Material

-P1 = Tape-Wrapped (Class B) PCB 4-pin Coil Construction

-204 = 24 VDC Supply Voltage



M Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

M				-			-		-		
Series	1	2	3		4	5		6		7	8

1 + 2 + 3 Power Rating, Valve Function, & Maximum Operating Pressure Differential

Valve Function	Code	Power Rating	MOPD		C _v	K _v	Orifice	
			psig	bar			Body	
							inches	mm
2-WAY Normally Closed	A2034	0.5W	25	1.7	0.018	0.015	1/32	0.787
	A2037		10	0.7	0.037	0.032	0.052	1.321
	B2029	1W	50	3.4	0.018	0.015	0.031	0.787
	B2034		25	1.7	0.037	0.032	0.052	1.321
	H2022	2W	100	6.9	0.018	0.015	0.031	0.787
	H2029		50	3.4	0.037	0.032	0.052	1.321

4 Body Material

03 Brass
18 Aluminum

6 Seal Material

B Nitrile
V Viton®

8 Supply Voltages

201 5 VDC
203 12 VDC
204 24 VDC

5 Body Port

FM Face Mount
6B 5/64" (2.0mm) barb
8B 1/8" (3.2mm) barb
MM Manifold Mount (#10-32 Threaded Stud)

7 Coil Construction



Y1 Tape-Wrapped (Class B) Lead Wires
P1 Tape-Wrapped (Class B) PCB 4-pin

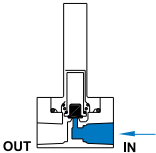
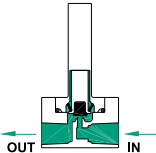
M Series – Additional Component Details & Dimensions

2 Valve Function

Flow Schematic

Flow Key

 Blocked Flow
 Free Flow
O/S = Over Seat
U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		

Flow Rate Monitoring – RFO Type

► 4.5 to 24 VDC Pulsed Output

GEMS Sensors popularized the RotorFlow'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. RFO Types feature a VDC pulsed output.

Typical Applications

- Water Purification/Dispensing Systems • Chemical Metering Equipment
- Lasers and Welders • Water Injection Systems
- Semiconductor Processing Equipment • Chillers and Heat Exchangers

Specifications

Wetted Materials	
Body	Brass, 316 Stainless Steel or Polypropylene (Hydrolytically Stable, Glass Reinforced)
Rotor Pin	Ceramic
Rotor	PPS Composite, Black
Lens	Polysulfone ¹
O-Ring	Viton® (Alloy Bodies); Buna N (Polypropylene Body)
Low Flow Adaptor	Glass Reinforced Polypropylene
Operating Pressure, Maximum	
Brass or Stainless Steel Body	Optional SS Face Plate 500 PSI 200 PSIG (13.8 bar) @ 70°F (21°C), 100 PSI (6.9 bar) Max. @ 212°F (100°C) ¹
Polypropylene Body	100 PSIG (6.9 bar) @ 70°F (21°C), 40 PSI (2.8 bar) Max. @ 180°F (82°C)
Operating Temperature,	
Brass or Stainless Steel Body	-20°F to 212°F (-29°C to 100°C)
Polypropylene Body	-20°F to 180°F (-29°C to 82°C)
Electronics	150°F (65°C) Ambient
Viscosity, Maximum	200 SSU
Input Power	4.5 VDC to 24 VDC
Output Signal	4.5 VDC to 24 VDC Pulse. (Sourcing) Pulse Rate Dependent on Flow Rate, Port Size and Range.
Current Consumption	8 mA, No Load
Current Source Output, Max.	70 mA
Frequency Output Range	15 Hz (Low Flow) to 225 Hz (High Flow)
Accuracy	See Table Below
Electrical Termination	22 AWG PVC-Jacketed, 24" Cable. Color Coded: Red = +VDC; Black = Ground; White = Signal Output

Notes:

1. For higher pressure/temperature ratings, stainless face plates are available. Consult factory.

How To Order

For standard configurations, specify Part Number based on desired body material and port size.

Body Material	Port Size NPT	Flow Range – GPM		Part Number
		Low Range* (Accuracy)	Standard Range (Accuracy)	
Polypropylene	.25"	0.1 to 1.0 (±7.0%)	0.5 to 5.0 (±7.0%)	155421 ⚡
	.50"	1.5 to 12.0 (±7.0%)	4.0 to 20.0 (±15.0%)	155481 ⚡
Brass	.25"	0.1 to 1.0 (±7.0%)	0.5 to 5.0 (±7.0%)	156261 ⚡
	.50"	1.5 to 12.0 (±7.0%)	4.0 to 20.0 (±15.0%)	156262 ⚡
	.75"	—	5.0 to 30.0 (±15.0%)	194761 ⚡
	1.00"	—	8.0 to 60.0 (±15.0%)	194762 ⚡
Stainless Steel	9/16"-18**	0.1 to 1.0 (±7.0%)	0.5 to 5.0 (±7.0%)	165071 ⚡
	.50"	1.5 to 12.0 (±7.0%)	4.0 to 20.0 (±15.0%)	165075 ⚡
	.75"	—	5.0 to 30.0 (±15.0%)	194763 ⚡
	1.00"	—	8.0 to 60.0 (±15.0%)	194764 ⚡

⚡ – Stock Items.

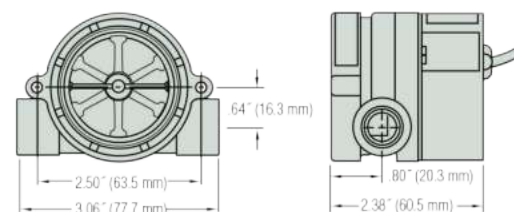


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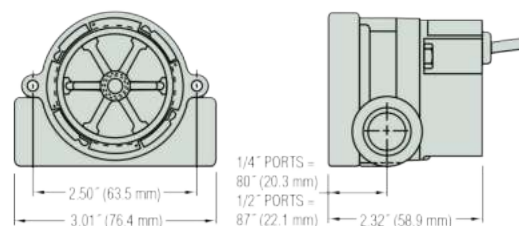


Dimensions

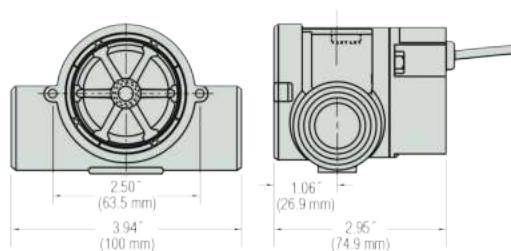
Polypropylene Bodies



Brass and Stainless Steel Bodies - .25" and .50" Ports



Brass Bodies – .75" and 1.00" NPT Ports



High Resolution

Black Rotor

PPS composite. Each of the six rotor arms is magnetized. A PTFE loaded bushing ensures long life.



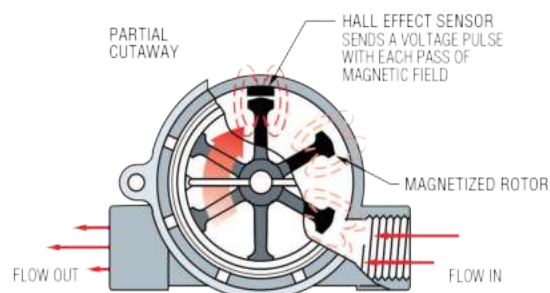
Note: Improved accuracy can be achieved by calibrating the individual RFO unit.

*With use of Low Flow Adaptor supplied.

See Page F-8 for more information.

**Straight thread with O-ring seal.

Operating Principle



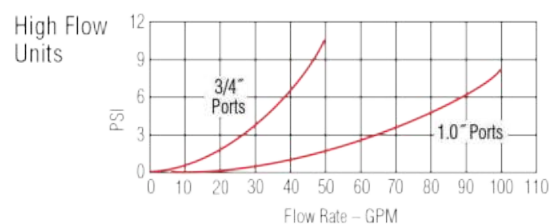
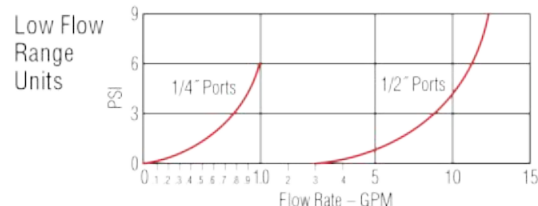
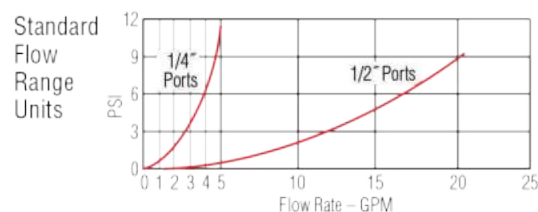
1. As liquid passes through the RotorFlow body, the magnetic rotor spins at a rate proportional to flow. This causes a series of magnetic fields (the rotor vanes) to excite the Hall Effect sensor, producing a series of voltage pulses.
2. The output pulses (RFO) are at the same voltage level as the input (4.5 - 24 VDC) with a frequency proportional to the flow rate. The output signal can be utilized by digital rate meters totalizers or other electronic controllers. RFA Type analog sensors condition the output signal to 0-10 VDC.
3. RotorFlow Indicators may be mounted with flow entering either port. Performance is optimized by positioning ports at the top of the unit, in a horizontal plane.

Frequency vs. Flow Rate-Typical

Flow Rate (GPM)	Output Frequency – Hz					
	RFO Model – Based on Port Size					
	.25"	.25" with Adapter*	.50"	.50" with Adapter*	.75"	1"
0.10		13				
0.25		41				
0.50	15	90				
0.75		137				
1.0	34	186				
1.5	54			17		
2.0	73			25.9		
2.5	90			34		
3.0	110			43		
3.5	128					
4.0	148		34	60		
4.5	168					
5.0	185		44.8	76.7	24	
6.0			55	94		
7.0			65.9	111		
8.0			76	129		22
9.0			87.5	147		
10			99	165	61	30
11			110	185		
12			122	204		
13			135			
14			147			
15			158		93	43
16			170			
17			183			
18			195			
19			207			
20			220		128	60
25					163	74
30					196	91
35						107
40						123
45						137
50						153
55						170
60						185

*Low Flow Adapter

Pressure Drop-Typical



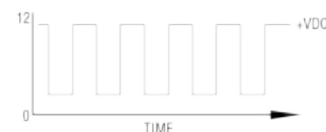
Signal Output

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 VDC. Frequency of the output pulse is proportional to the flow rate and ranges from approximately 15 Hz at low flow to 225 Hz at high flow.

Example:
Low Flow



High Flow



Note: Consult factory for flow rate/frequency curves.

Visual Indicators – RFI Types

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 bayonet mounting lens is easily removed for quick cleanout. RFI Type RotorFlow sensors are easy to see, easy to install and easy to afford.

Typical Applications

- Visual flow confirmation on heat exchangers
- Plastic injection molding equipment

Specifications

Wetted Materials	
Body	Brass, 316 Stainless Steel or Polypropylene (Hydrolytically Stable, Glass Reinforced)
Rotor Pin	Ceramic
Rotor	High Visibility Orange, Molded Nylon
Lens	Polysulfone
O-Ring	Viton® (Brass Body); Buna N (Polypropylene Body)
Low Flow Adaptor	Glass Reinforced Polypropylene
Operating Pressure, Brass or Stainless Steel Body	
	100 PSIG (7 bar) @212°F (100°C) 200 PSIG (13.8 bar) Max. @ 70°F (21°C)
Polypropylene Body	
	100 PSIG (6.9 bar) at 70°F (21°C), 40 PSI (2.8 bar) Max. @ 180°F (82°C)
Operating Temperature, Brass or Stainless Steel Body	
	-20°F to 212°F (-29°C to 100°C)
Polypropylene Body	
	-20°F to 180°F (-29°C to 82°C)

Operating Principle

1. As liquid passes through the RotorFlow body, the rotor spins at a rate proportional to flow.
2. RotorFlow Indicators may be mounted with flow entering either port. At low flow rates, performance is optimized by positioning ports at the top of the unit, in a horizontal plane.

How To Order

Specify Part Number based on desired body material and port size.

Body Material	Port Size NPT	Flow Ranges – GPM		Part Number
		Low* Range	Standard Range	
Polypropylene	.25"	0.1 to 1.0	0.5 to 5.0	155420 ⚡
	.50"	1.5 to 12.0	4.0 to 20.0	155480 ⚡
Brass	.25"	0.1 to 1.0	0.5 to 5.0	142541 ⚡
	.50"	1.5 to 12.0	4.0 to 20.0	142542 ⚡
	.75"	—	5.0 to 30.0	180392 ⚡
	1.00"	—	8.0 to 60.0	181681 ⚡
Stainless Steel	9/16" - 18**	0.1 to 1.0	0.5 to 5.0	174596
	.50"	1.5 to 12.0	4.0 to 20.0	173138 ⚡
	.75"	—	5.0 to 30.0	181682
	1.00"	—	8.0 to 60.0	181683

* With use of Low Flow Adapter supplied. See Page F-8 for more information.

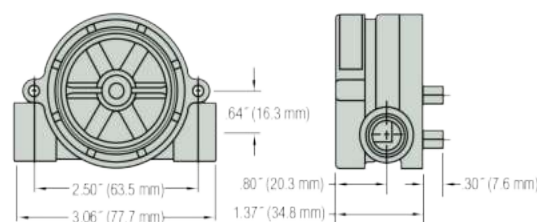
** Straight thread with O-ring seal.

⚡ – Stock Items.

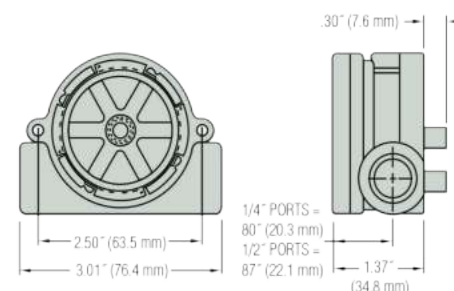


Dimensions

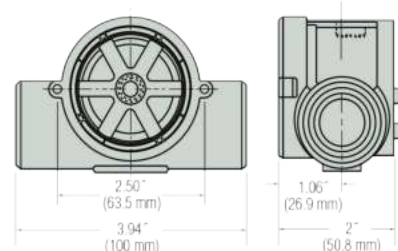
Polypropylene Bodies



Brass and Stainless Steel Bodies - .25" and .50" Ports



Brass Body - .75" and 1.00" Ports



High Visibility Orange Rotor

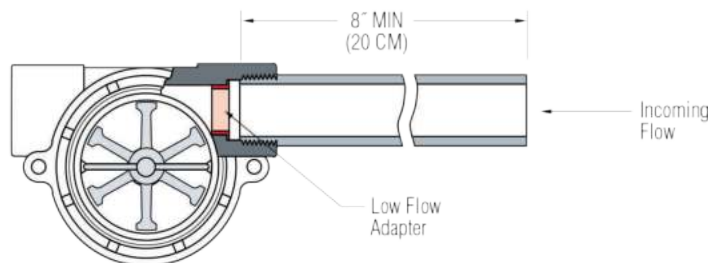
Constructed of Molded Nylon for good general purpose compatibility with a wide range of fluids. Offers high visibility.



Easy 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 8 inches (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.



Except for straight-thread versions, 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. Straight-thread versions require an O-ring for sealing.

150 micron filtration is recommended. However, should foreign particles enter the RotorFlow sensor, accumulation is easily cleared by removing the lens from the body. The lens is removed by turning its 7/16" hex center hub 45° counter-clockwise with a standard socket wrench. To reinstall the lens, simply reverse the process. Pressure must be relieved from the system prior to sensor clean-out. O-rings should be lubricated prior to re-assembly.

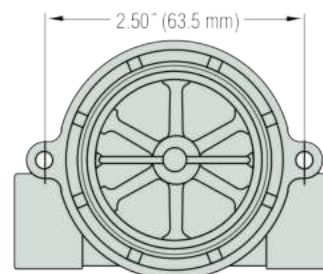
Low Flow Applications

A low flow adapter 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.

Panel Mounting

Plastic Bodies. Two (2) mounting ears are provided at the body center line to receive #8 self-tapping screws to accommodate panel mounting of the plastic RotorFlow units. Note: ANSI T type 23 self-tapping screws are recommended. They may be replaced with standard machine screws if re-installation should be required.

Brass and Stainless Steel Bodies. Two (2) mounting holes are provided on the body centerline, as shown below. #8-32UNC-2B screws are required for mounting.



RotorFlow® Maintenance Kits

Rebuild your RotorFlow® Sensors and Switches in less than 5 minutes with one of these kits.

Includes:

- Ceramic Rotor Pin
- 6-Pole Magnetic Rotor with PPS/PTFE Bushing
- Buna N or Viton® O-Ring
- Polysulfone Lens

Rotorflow® Type		O-Ring Material in Kit	Part Numbers	
Line Size	Body Material		RFA/RFO/RFS	RFI
1/4" & 1/2"	Plastic	Buna-N	155870	155872
	Brass/SS	Viton®	167364	166267
3/4" & 1"	Brass/SS	Viton®	182695	157187

⚡ – Stock Items.

RotorFlow® Sensor Special Capabilities are Yours for the Asking.

Gems caters to OEM needs with special configurations that go beyond the standards in this catalog. We can provide RotorFlow sensors with enhanced chemical compatibility, higher temperature and pressure capabilities, and alternate electrical terminations.

Other Capabilities Available to OEMs:

- Electrical outputs: Combined switch and frequency; transistor switching; 0-10 VDC analog.
- Custom face plate (cast stainless steel face plate pictured)



We are committed to providing our customers with the product that best meets the requirements of their applications. Please call us and tell us what you need, and ask us about Swagelok® tube fittings, faceplate options, and 9/16" and 3/4" straight-thread versions.

Call 800-378-1600

Flow Rate Monitoring for Potable Water – RFO-PW Type

► 4.5 to 24 VDC Pulsed Output

FDA-compliant rotor and bodies for compatibility with potable water applications. Gems Sensors popularized the RotorFlow® sensor'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. The RFO-PW Potable Water RotorFlow® sensor features a VDC pulsed output for potable water applications where a flow rate monitoring sensor is needed.

Typical Applications

- Water Purification/Dispensing Systems • Chemical Injection Systems

Specifications

Wetted Materials	
Body	316 Stainless Steel or Polypropylene (Hydrolytically Stable, Glass Reinforced)
Rotor Pin	Ceramic
Rotor	Molded Nylon/FDA Epoxy
Lens	Polysulfone ¹
O-Ring	EPDM
Low Flow Adaptor	Glass Reinforced Polypropylene
Operating Pressure, Maximum	Optional SS Face Plate 500 PSI
	Stainless Steel Body 200 PSIG (13.8 bar) @ 70°F (21°C), 100 PSI (6.9 bar) Max. @ 212°F (100°C) ¹
Operating Temperature	Polypropylene Body 100 PSIG (6.9 bar) @ 70°F (21°C), 40 PSI (2.8 bar) Max. @ 180°F (82°C)
	Stainless Steel Body -20°F to 212°F (-29°C to 100°C)
Operating Temperature	Polypropylene Body -20°F to 180°F (-29°C to 82°C)
	Electronics 150°F (65°C) Ambient
Input Power	4.5 VDC to 24 VDC
Output Signal	4.5 VDC to 24 VDC Pulse. (Sourcing) Pulse Rate Dependent on Flow Rate, Port Size and Range.
Current Consumption	8 mA, No Load
Current Source Output, Max.	20 mA
Frequency Output Range	15 Hz (Low Flow) to 225 Hz (High Flow)
Accuracy	See Table Below
Electrical Termination	22 AWG PVC-Jacketed, 24" Cable. Color Coded: Red = +VDC; Black = Ground; White = Signal Output

Notes:

1. For higher pressure/temperature ratings, stainless face plates are available. Consult factory.

How To Order

Specify Part Number based on desired body material and port size.

Body Material	Port Size NPT	Flow Ranges – GPM		Flow Ranges – LPM		Part Number
		Low*	Standard	Low*	Standard	
Polypropylene	.25"	0.1 to 1.0	0.5 to 5.0	0.1 to 1.0	1.9 to 18.9	247436
	.50"	1.5 to 12.0	4.0 to 20.0	5.7 to 45.4	15.1 to 75.7	155483
Stainless Steel	.50"	1.5 to 12.0	4.0 to 20.0	5.7 to 45.4	15.1 to 75.7	261017
	.75"	—	5.0 to 30.0	—	18.9 to 113.6	261018
	1.00"	—	8.0 to 60.0	—	30.2 to 227.1	261019

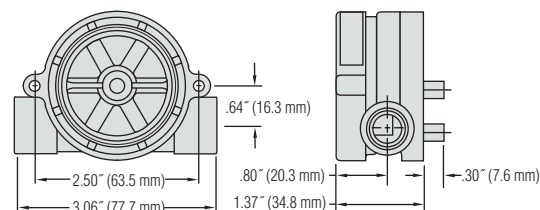


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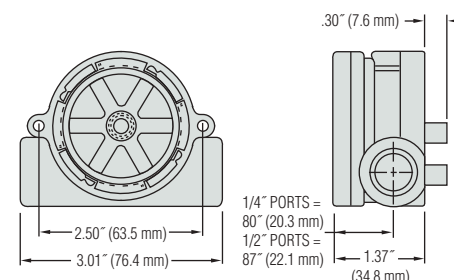


Dimensions

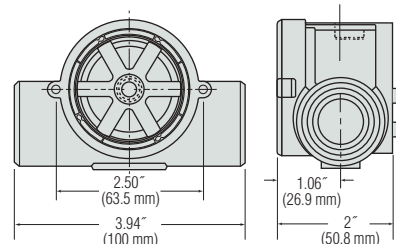
Polypropylene Bodies



Stainless Steel Bodies - .50" Ports



Stainless Steel Bodies – .75" and 1.00" NPT Ports



High Visibility Blue Rotor

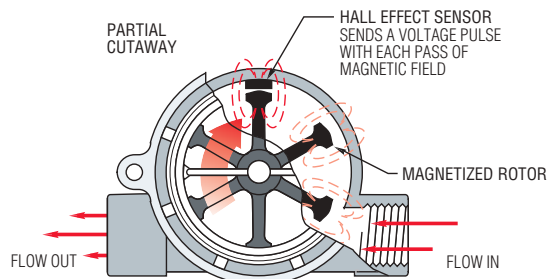
FDA-compliant molded nylon and epoxy RotorFlow® indicator for compatibility with potable water applications.



Note: Improved accuracy can be achieved by calibrating the individual RFO unit.

*With use of Low Flow Adapter supplied.
See Page F-8 for more information.

Operating Principle



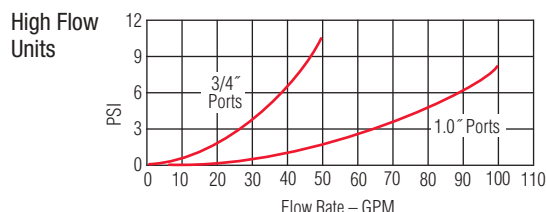
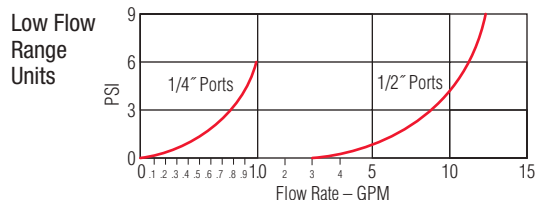
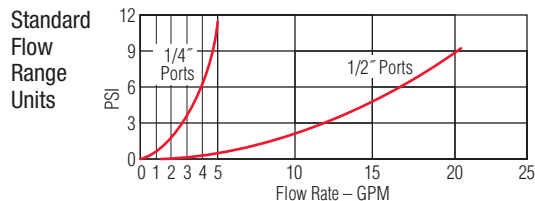
1. As liquid passes through the RotorFlow® body, the magnetic rotor spins at a rate proportional to flow. This causes a series of magnetic fields (the rotor vanes) to excite the Hall Effect sensor, producing a series of voltage pulses.
2. The output pulses (RFO) are at the same voltage level as the input (4.5 - 24 VDC) with a frequency proportional to the flow rate. The output signal can be utilized by digital rate meters totalizers or other electronic controllers. RFA Type analog sensors condition the output signal to 0-10 VDC.
3. RotorFlow® Indicators may be mounted with flow entering either port. Performance is optimized by positioning ports at the top of the unit, in a horizontal plane.

Frequency vs. Flow Rate-Typical

Flow Rate (GPM)	Output Frequency – Hz					
	RFO Model – Based on Port Size					
	.25"	.25" with Adapter*	.50"	.50" with Adapter*	.75"	1"
0.10		13				
0.25		41				
0.50	15	90				
0.75		137				
1.0	34	186				
1.5	54			17		
2.0	73			25.9		
2.5	90			34		
3.0	110			43		
3.5	128					
4.0	148		34	60		
4.5	168					
5.0	185		44.8	76.7	24	
6.0			55	94		
7.0			65.9	111		
8.0			76	129		22
9.0			87.5	147		
10			99	165	61	30
11			110	185		
12			122	204		
13			135			
14			147			
15			158		93	43
16			170			
17			183			
18			195			
19			207			
20			220		128	60
25					163	74
30					196	91
35						107
40						123
45						137
50						153
55						170
60						185

*Low Flow Adapter

Pressure Drop-Typical

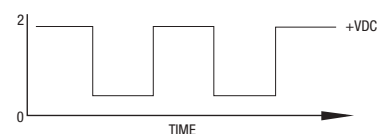


Signal Output

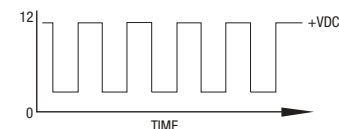
Output signal for RFO Types is an on/off pulse of the DC voltage supplied to the unit, it is compatible with all digital logic families. Input voltage range is 4.5 to 24 VDC. Frequency of the output pulse is proportional to the flow rate and ranges from approximately 15 Hz at low flow to 225 Hz at high flow.

Example:

Low Flow



High Flow



Note: Consult factory for flow rate/frequency curves.

Humidifier Solenoid Valves

- ▶ MOPD: 125 PSI (8.6 bar)
- ▶ 2.3 Watts

Originally designed and manufactured for original equipment manufacturers (OEM's), the humidifier solenoid valve is now available as a replacement solenoid valve for in-home and commercial humidifiers. Available in two orifice sizes, the humidifier solenoid has a brass body and is constructed with an in-line strainer for added protection to humidifier water lines.

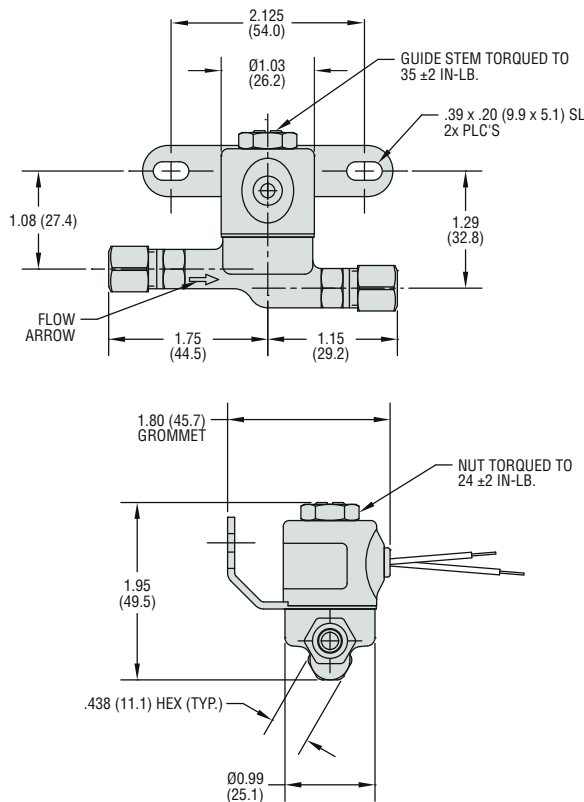
Typical Application

- Replacement solenoid valve for commercial and in-home humidifiers

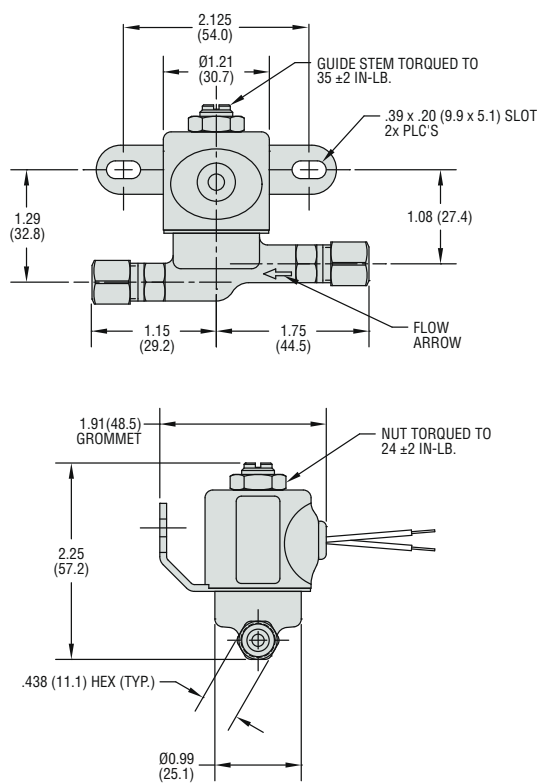


Dimensions

24V, 60Hz AC



120V, 60Hz, AC



How To Order

Orifice		Voltage (VAC)	MOPD		Part Number
inch	mm		psi	bar	
3/64	1.19	24/60	125	8.6	A2012-S150
3/32	2.38	120/60	125	8.6	B2015-S135

Small Size – Alloys

XM/XT-700 Series Combines Durability of Metal With a Compact Design for Restricted Spaces

Your most complete line of small, metal liquid level sensors...all from Gems Sensors.

- ▶ Stainless Steel or Brass Mountings and Stems
- ▶ 4 mm Resolution
- ▶ Indicating Length to 14" (356 mm); Stem Length to 20" (508 mm)

Designed for the needs of the OEM, XM/XT-700 Series transmitters are the ideal level sensor for shallow tanks and reservoirs. These compact units feature the rugged durability of stainless steel or brass construction in a lightweight package for continuous level indication. Ideal for tanks less than 2 feet deep.

XM/XT-700 Series transmitters are exceptionally versatile because of the many configurable options available.

1. Mounting Types

Each mounting type can be configured with stem lengths (L_0) and float material indicated in this table.

Note: Sanitary flange mountings are also available, but not shown.
Please contact factory.



Type 1 1/8-27 NPT	Type 2 3/4-14 NPT ¹	Type 3 11-11.5 NPT ¹	Type 4 Ø 3-5/8" Flange
Type 5 1 5/16-12 UNF-2A	Type 6 3/8-24 UNF-2A	Type 7 1 1/4-11.5 NPT ¹	

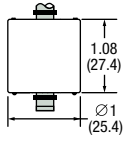
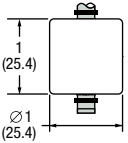
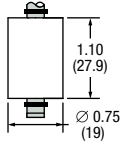
in
(mm)

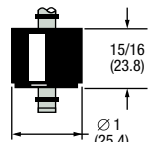
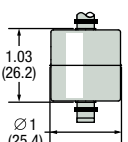
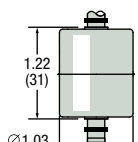
Stem & Mounting Material	Brass or 316 Stainless Steel	
Maximum Length	20" (508 mm)	
Mounting Position	Vertical ± 30° Inclination	
Float Stops ²	Brass Units: Beryllium Copper Grip Rings; Stainless Steel Units: SS ARMCO® PH 15-7 Mo Grip Rings	
Max. Pressure Rating ³	See Float Value on Following Page	50 psi (3.45 bar)

Notes

1. Mounting Types 2, 3, 4, 5 & 7 are available with a 1/2" MNPT conduit adaptor. This option can be selected on the checklist.
2. In some instances, concentrations of chlorine and other corrosive compounds in the media require the use of collar type float stops. Consult factory for details.
3. Mounting only. Maximum pressure rating for complete unit will be the lower of this pressure or the selected float pressure (see Float Types, on next page).

2. Float Types

Float Materials	Polypropylene		
	Hollow	Foamed	Molded
Compatible Mounting Types	1, 3, 4, 5, 6, 7	1, 3, 4, 5, 6, 7	1, 2, 3, 4, 5, 6, 7
Float Dimensions			
Part Number	259125	119455	231500
Operating Temperature	−40 °F to +221 °F (−40 °C to +105 °C)	−40 °F to +221 °F (−40 °C to +105 °C)	−40 °F to +200 °F (−40 °C to +95 °C)
Maximum Pressure	50 psi (3.45 bar)	250 psi (17.24 bar)	Atmospheric
Min. Liquid Specific Gravity	0.65	0.90	0.95

Float Materials	Buna N	Polysulfone	316/316L SS
	Compatible Mounting Types	Compatible Mounting Types	Compatible Mounting Types
Float Dimensions			
	Part Number	Part Number	Part Number
Operating Temperature	Water: to 180 °F (82.2 °C)	−40 °F to +221 °F (−40 °C to +105 °C)	−40 °F to +257 °F (−40 °C to +125 °C)
	Oil: −40 °F to +221 °F (−40 °C to +105 °C)		
Maximum Pressure	300* psi (20.68 bar)	50 psi (3.45 bar)	275 psi (18.96 bar)
Min. Liquid Specific Gravity	0.45	0.75	0.85

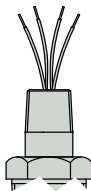
* De-rated with temperature.

in
(mm)

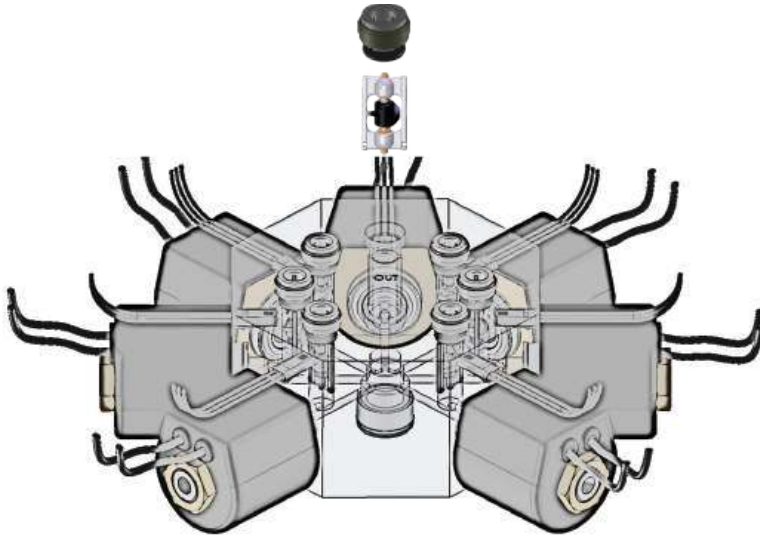
Options

Conduit Adapter

A 1/2" MNPT conduit is available for Mounting Type 2, 3, 4, 5 & 7. Select from list of options on the Check List.



TURBOFLOW®



Specifications

All specifications listed are of "typical applications" and do not represent the extreme ranges of applications. For extreme applications consultations are encouraged.

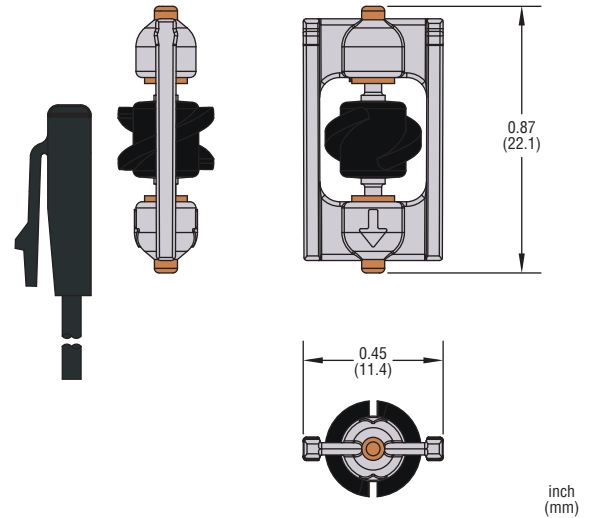
Flow Range	0.2 to 4 GPM (0.8 to 15.1 l/min)
Turn Down Ratio*	10x
Accuracy	±2%
Signal Outputs	
Pulsed DC	25-350Hz
Analog Voltage	0-10Vdc
Current Output	4-20mA
Threshold Switch	20VA
Operating Temperature	-4°F to +185°F (-20°C to +85°C)
Operating Pressure	
Plastic Manifolds	200 PSIG (13.8 bar)
Alloy Manifolds	500 PSIG (34.5 bar)
Wetted Materials	
Turbine	PA Composite
Pin	316 Stainless Steel
Bearing	PEEK
Cage	PPO, Glass Filled
Maximum Viscosity (To maintain linearity)	32-81SSU
Recommended Filtration (Integrated prefilters available)	50 Microns or Better

* Turn down ratio is the difference between the lowest and highest flow range the system operates within the linear range. i.e. If the porting is designed to go as low as 0.1 GPM the highest reading would be 1.0 GPM.

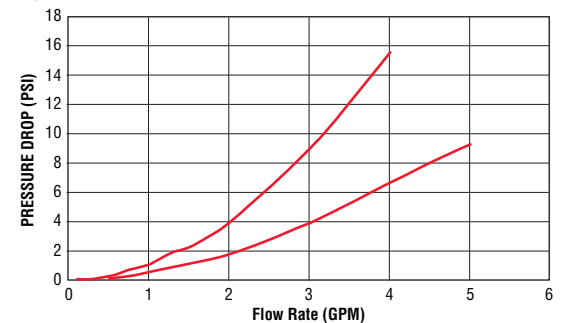
Continuous Flow Solutions

The compact FT-100 is specifically designed to be easily integrated within a fluid control system. The 316SS shaft and PEEK bearings allow for accurate measurements during quick dispense cycles making the TurboFlow ideal for pump housings, chemical dosing and water dispensing systems.

Typical Space Requirements



Typical Pressure Drop



TM-950 – Open Thermistor Sensor

- ▶ Hermetically Sealed
- ▶ High Pressure Capability
- ▶ Direct Reading Ceramic Thermistor
- ▶ Ideal For Non-Conductive Oils & Refrigerants

The Gems TM-950 is an Open Thermistor Sensor ideal for temperature sensing in non-conductive liquids, such as oil and refrigerants. It utilizes a proprietary fused glass hermetic seal, an axial feed-through design to provide exceptional high pressure, and temperature sensing capability.

Specifications

Temperature Capability	-40°F to +250°F (-40°C to +125°C)
Referenced Temperature Range	32°F to 100°F (0°C to 38°C)
Setting Tolerance	±6°F (±3°C)
Wetted Parts	
Housing	Zinc Plated Steel
Thermistor	Ceramic, Tinned Copper
Fused Hermetic Seal	Soda Lime Glass
Spacer Disc	PTFE
Electrical Termination	Flying Leads IP65, 18 AWG PTFE Insulated, 6.5"
Maximum Pressure	450 PSIG (31 bar) ¹

Note:

1. Higher Pressure Capability Available Upon Request.

Sensor Color Codes

Color Code	Sensor Type
Green	50 Ohms
Red	100 Ohms

Typical Resistance Values at Referenced Temperatures

Media Temperature	Resistance Reading (Ohms)	
	Green	Red
@ 32°F (0°C)	124.0 – 161.0	242.1 – 321
@ 75°F (24°C)	48.5 – 59.5	97 – 121
@ 90°F (32°C)	31.5 – 42.5	65.6 – 87

How To Order

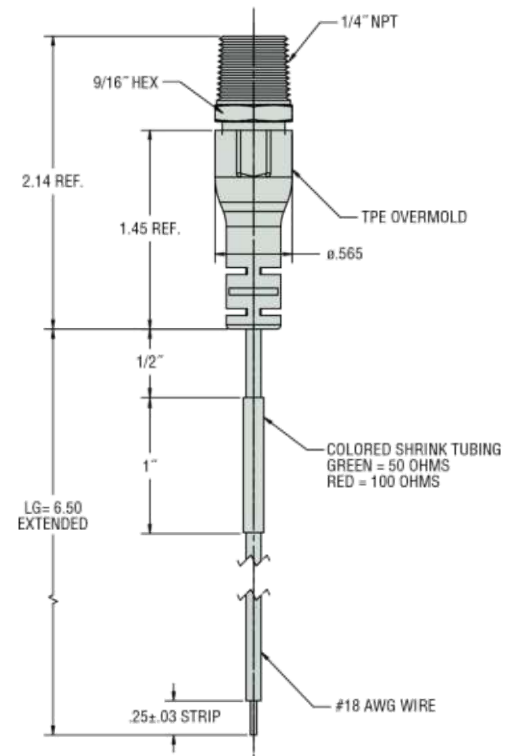
Select Part Number based on Thermistor, Nominal Value and Shrink Tubing Color.

Nominal Thermistor Value	Shrink Tubing Color	Part Number
50 Ohm	Green	243650
100 Ohm	Red	243700

Note: Other alternate Thermistor values with R-T curves are available upon request.



Dimensions



FS-10798 Series – Externally Adjustable for Water, Oils and Gases

Flow Rate Settings: Liquids: Infinite Adjustment between 0.5 GPM and 20.0 GPM

Air/Gases: See Gas Flow Adjustment Ranges below

Port Size: 1/2" NPT

Primary Construction Material: Brass or Stainless Steel

Setting Type: Adjustable

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 1000 PSIG, 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

Wetted Materials	
Housing	Brass or 316 Stainless Steel
Piston	
In Brass Housing	Polysulfone for water; Brass for oil or air
In Stainless Steel Housing	316 Stainless Steel Only
Spring	316 Stainless Steel
O-Ring	Viton®
Other Wetted Parts	Epoxy
Pressure Rating	
Operating	1000 PSIG (69 bar)
Proof	2500 PSIG (172 bar)
Burst	5000 PSIG (345 bar)
Operating Temperature	
With Brass or S.S. Piston	-20°F to +300°F (-29°C to +148.9°C)
With Polysulfone Piston	-20°F to +225°F (-29°C to +107.2°C)
Repeatability	1% Maximum Deviation
Set Point Accuracy	±10% Maximum
Set Point Differential	15% Maximum
Switch*	SPDT, 20 VA
Inlet/Outlet Ports	1/2" NPT
Electrical Termination	No. 18 AWG, 24" L., Polymeric Lead Wires

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

Air/Gas Flow Adjustment Ranges

Water or oil flow units should not be utilized for air/gas applications. The FS-10798 Gas Flow configuration utilizes a special dash-pot piston for reliability. The flow adjustment ranges are typical for air service. For other gases, the flow range will vary with the density of the gas. Please consult factory for more information.

For 5 PSIG Line*	1 to 75 SCFM Approx.
For 100 PSIG Line	3 to 160 SCFM Approx.

* Minimum 5 PSI line pressure required.



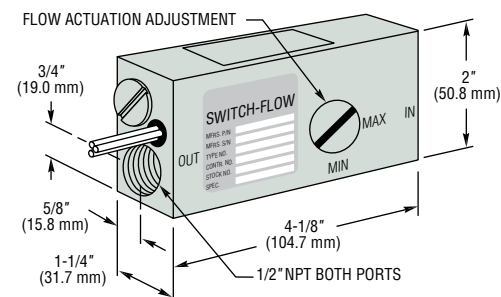
Shown with optional 1/2" conduit connector.



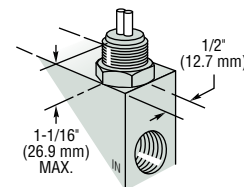
U.L. Recognized — File No. E31926
CSA Listed — File No. LR30200

Dimensions

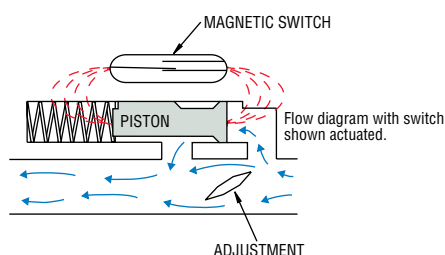
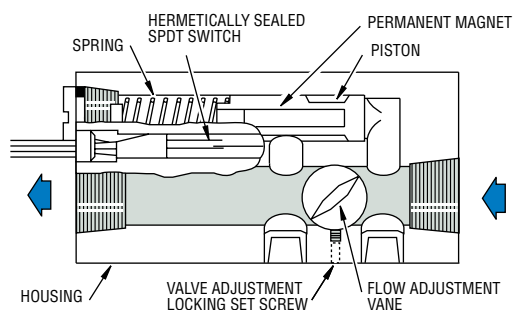
With Wire Leads and Strain Relief



With 1/2" NPT Conduit Connector



How It Works



An externally rotatable vane is positioned in the main flow path within the unit. The magnet carrier piston is located in a bypass flow chamber. Pressure differential, caused by flow around the adjusting vane, displaces the spring-biased piston which actuates a hermetically sealed SPDT reed switch within the unit.

How To Order – Standard Models

Specify Part Number based on desired media, piston material and electrical termination.

Media	Materials		Part Numbers	
	Housing	Piston	With Lead Wires	With 1/2" Conduit Connector
Liquids	Brass	Brass (for Oils)	61205	49073 ⚡
		Polysulfone (for Water)	25357 ⚡	25363 ⚡
	316 Stainless Steel		25358	25364 ⚡
Gases	Brass		25359 ⚡	25365 ⚡
	316 Stainless Steel		25360	25366

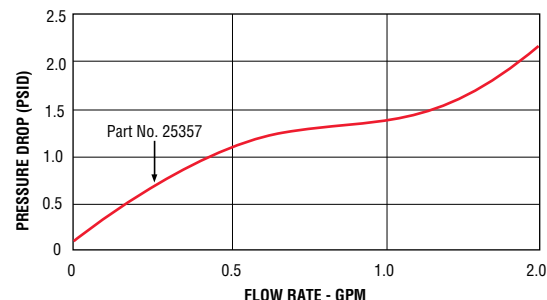
Notes:

- Temperature changes will slightly affect the standard water or gas flow settings listed. Oil flow settings will vary with temperature and viscosity.
- Use of 50 micron filtration is recommended.

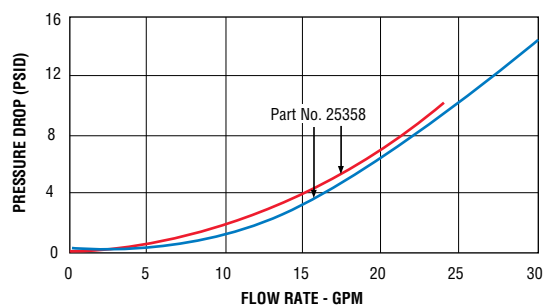
⚡ – Stock Items.

Pressure Drop - Typical

0.5 GPM



10 GPM and 20 GPM



Tests conducted with units in horizontal position with water at +70°F (21°C). Data will vary slightly for vertically mounted units.

FS-10798 switches are U.L. Approved for Class I, Division 2, Groups A, B, C, D hazardous locations. U.L. Approved — File No. E183854

Standard Wiring Color Code

Wire Color	Terminal
Orange	N.O.
Black	Common
Red	N.C.

BL Series – Latching Valve

- ▶ 3-Way or 2-Way Valves
- ▶ Low Power Requirements
- ▶ MOPD: 240 PSI (12.4 bar)
- ▶ Dual Diode Protection Optional

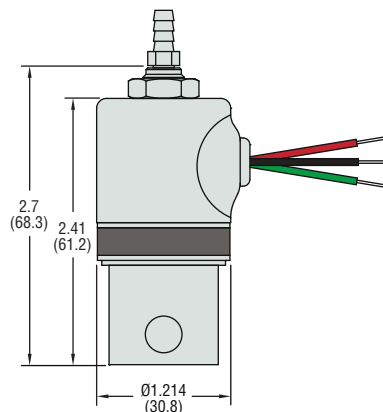
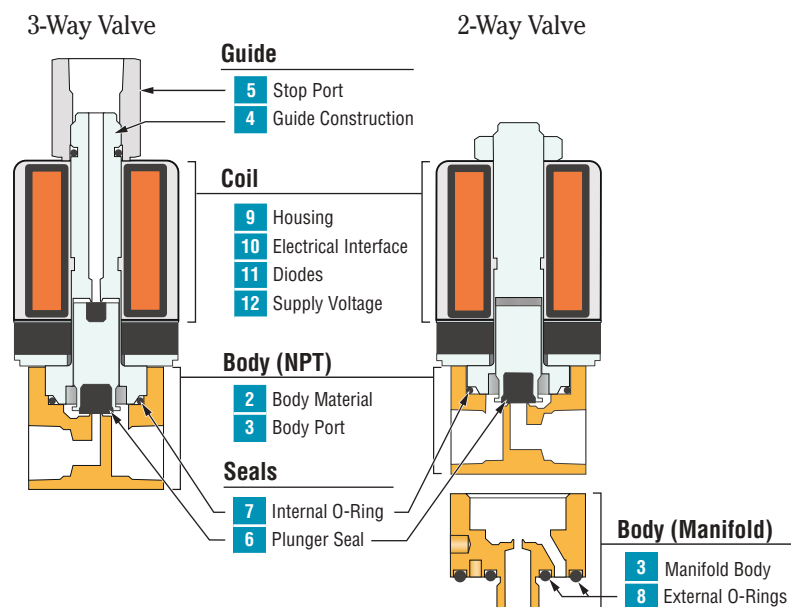
The BL series latching valve allows the user to pulse the valve and have it change state. The voltage does not need to be constantly applied in order to hold it in a state. These valves are ideal for controlling larger pneumatic valves in remote applications where power is limited or when the temperature of the media cannot be impacted as it flows through the valve. The larger pneumatic valves can close and open large pipes and these latching valves control them. The term Latch refers to the valve in the open state where supply pressure goes to the external valve. The unlatched state is when the supply is cut off and the external valve is exhausted to ambient.



Typical Applications

- Natural Gas Plunger Lifts
- Gas Chromatography
- Natural Gas Separators
- Irrigation Systems

Reference



Example Shown
Part Number: BL311-01LC-18B-VBX-GPBD2
From How to Order example below.

How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

BL	311	-	01	LC	-	1	8B	-	V	B	X	-	G	PB	D	2
Series	Function		Body Material	Body Port		Guide Construction	Stop Port		Plunger Seal	Internal O-Ring	External O-Ring		Housing	Electrical Interface	Diodes	Supply Voltage

Product Description from Example Shown Above:

BL311-01LC-18B-VBX-GPBD2

- BL311 = BL Series with 3-Way Latching Valve Function (Orifice Body/Stop: 1/32" / 3/64");
- 01LC = 303 SS Body Material; 1/8" FNPT Body Port;
- 18B = 303 SS 1-piece Guide Construction; 1/8" Barb Stop Port;
- VBX = Viton® Plunger Seal; Nitrile (Buna-N) Internal O-Ring;
- GPBD2 = Grommet Housing Construction; Positive Pulse, Black Common Electrical Interface; With Diodes; 12 VDC Supply Voltage

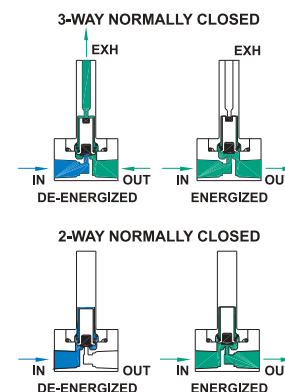
BL Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

BL	-	-	-	-	-	-	-	-	-	-	-
1	2	3	4	5	6	7	8	9	10	11	12

1 Valve Function and Orifice Size

Valve Function	Code	Orifice				MOPD		C _v		K _v	
		Body		Stop		psi	bar	Body	Stop	Body	Stop
		inches	mm	inches	mm						
3-WAY Normally Closed	311	1/32	0.79	3/64	1.19	100	6.9	0.018	0.040	0.0153	0.034
	313	1/16	1.59	1/16	1.59	50	3.4	0.070	0.070	0.060	0.060
2-WAY Normally Closed	201	1/16	1.59	—	—	240	12.4	0.065	—	0.056	—
	202	5/64	1.98	—	—	180	10.3	0.09	—	0.078	—
	203	3/32	2.38	—	—	150	8.3	0.155	—	0.134	—
	204	7/64	2.78	—	—	120	6.2	0.2	—	0.173	—
	205	1/8	3.18	—	—	60	4.1	0.24	—	0.208	—
	206	5/32	3.97	—	—	50	2.1	0.3	—	0.259	—
	207	3/16	4.76	—	—	15	1	0.43	—	0.372	—



2 Body Material

- 01 303 Stainless Steel
- 03 Brass
- 05 316 Stainless Steel

3 Body Port

- LC 1/8" Female NPT
- LB 1/4" Female NPT
- M3 Manifold Mount – 5/16" Thread Stud
- OB Omit Body (Operator Style)

4 Guide Construction

- 1 303 Stainless Steel 1-Piece

5 Stop Port

- BS #10-32 Internal (Recommended for Free Venting)
- 8B 1/8" Brass Barb Fitting
- AC 1/8" Female NPT Adaptor
- AB 1/4" Female NPT Adaptor
- XX Not Applicable (All 2-Way Valves)

6 Plunger Seal Material

- H Hydrin®
- V Viton®
- P Perfluoroelastomer

7 O-Ring Material (Internal)

- B Nitrile (Buna-N)
- V Viton®
- P Perfluoroelastomer

8 O-Ring Material (Manifold Mount External)

- B Nitrile (Buna-N)
- V Viton®
- P Perfluoroelastomer
- X Not Applicable

9 Housing Construction

- C Conduit
- G Grommet

10 Electrical Interface

- PB Positive Pulse, Black Common
- NB Negative Pulse, Black Common
- NW Negative Pulse, White Common

11 Diodes

- N No Diode
- D Diode

12 Supply Voltage

Unlatch voltage should not exceed 25% rated voltage to ensure change of state.

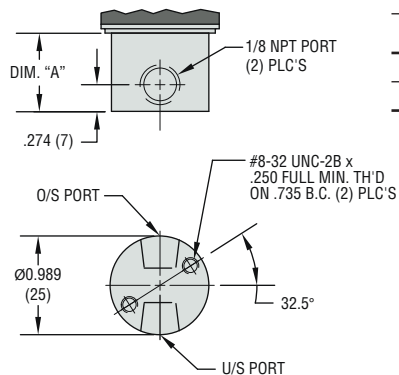
- 2 12 VDC, 9 Watts Latching, 7 Watts Unlatching
- 4 24 VDC, 7 Watts Latching, 9 Watts Unlatching
- 6 6 VDC, 7 Watts Latching, 5 Watts Unlatching

Additional ordering details on following pages.

BL Series – Additional Component Details & Dimensions

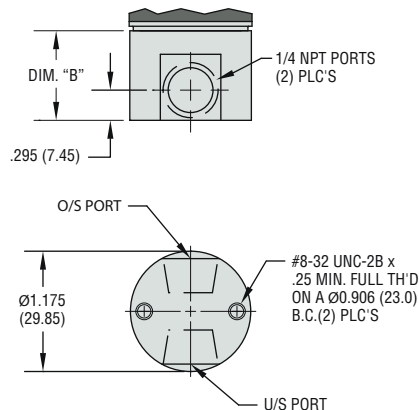
3 Body Port

1/8" NPT Port (LC)



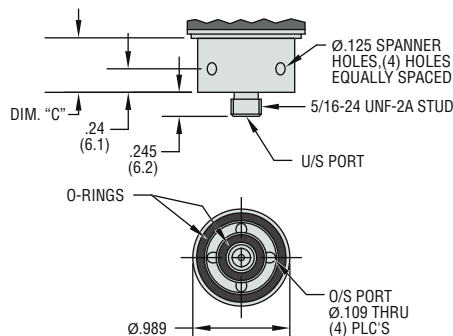
Valve Type	Dim. "A"
3-Way	.900 (22.9)
2-Way	.795 (20.2)

1/4" NPT Port (LB)



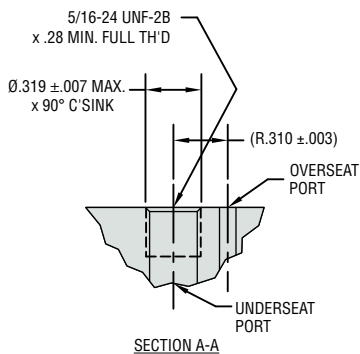
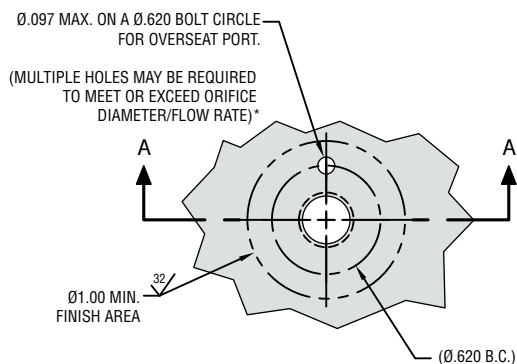
Valve Type	Dim. "B"
3-Way	.980 (24.9)
2-Way	.875 (22.2)

Manifold Mount Body (M3)



Valve Type	Dim. "C"
3-Way	.610 (15.5)
2-Way	.550 (13.9)

Manifold Preparation



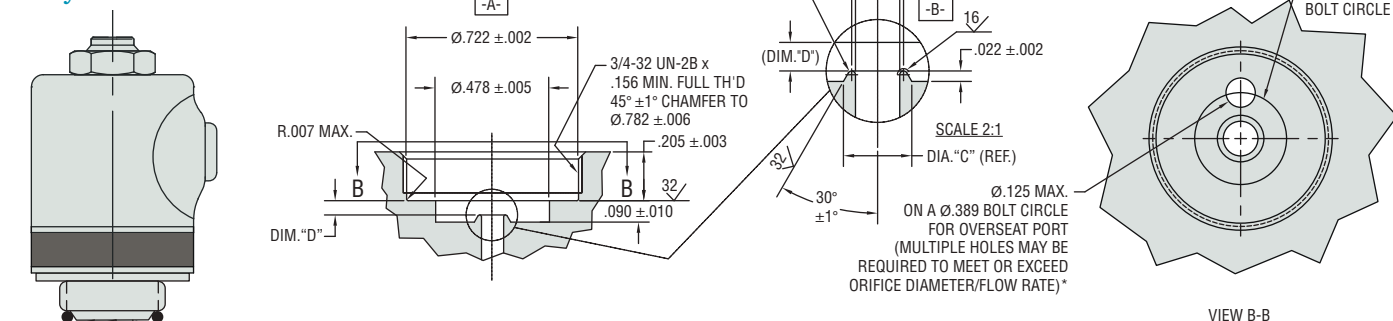
*IF THE TOTAL AREA OF OVERSEAT PORT IS LESS THAN THE ORIFICE DIAMETER, THEN THE OVERSEAT IS THE RESTRICTOR.

Valve Type	Overseat Port	Underseat Port
2-Way N.C.	IN	OUT
3-Way N.C.	CYL	IN

BL Series – Additional Component Details & Dimensions, cont.

Omit Body Manifold Mount (OB)

2-Way



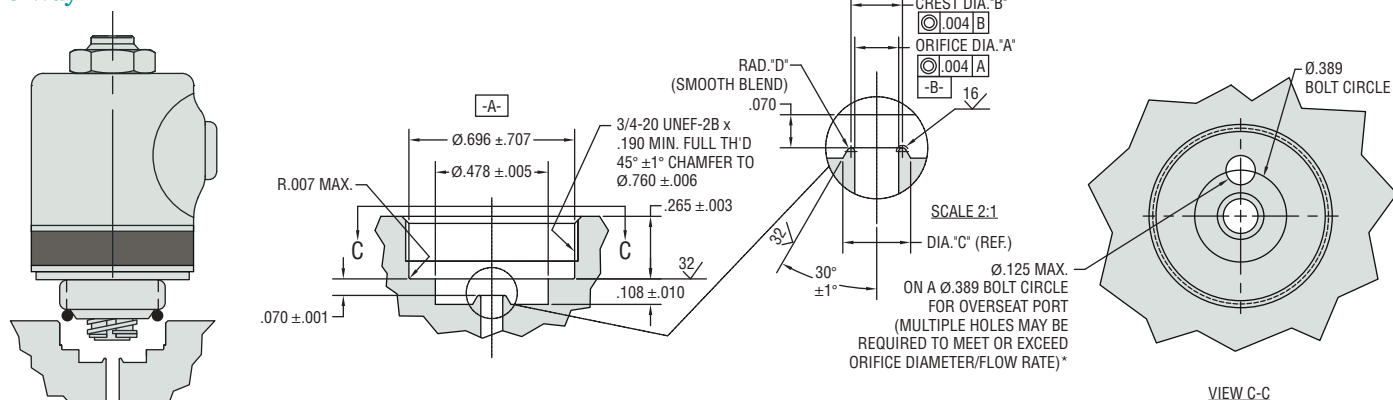
Note: All diameters to be concentric to datum -A- within .003 T.I.R.

* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Dimensions

Valve Prefix (Code 1)	Orifice Dia. "A" ±.001	Crest Dia. "B" ±.002	Base Dia. "C" Ref.	Orifice Depth Dim. "D" ±.001
BL201	.062	.078	.1126	.052
BL202	.078	.094	.1286	.056
BL203	.093	.109	.1436	.060
BL204	.109	.125	.1596	.064
BL205	.120	.136	.1706	.067
BL206	.148	.164	.1986	.074
BL207	.176	.192	.2266	.081

3-Way



Note: All diameters to be concentric to datum -A- within .003 T.I.R.

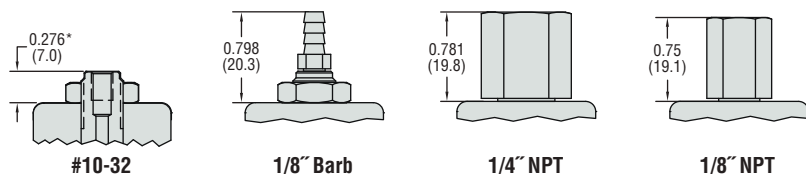
* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Dimensions

Valve Prefix (Code 1)	Orifice Dia. "A" ±.001	Crest Dia. "B" ±.002	Base Dia. "C" Ref.	Rad. "D" ±.001
BL311	.040	.052	.0843	.006
BL313	.062	.078	.1126	.008

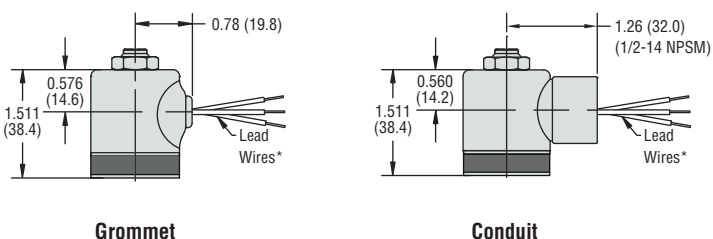
BL Series – Additional Component Details & Dimensions, Cont.

5 Stop Port (3-Way Only)



* Dimension is same for 2-way valves.

9 Housing Construction

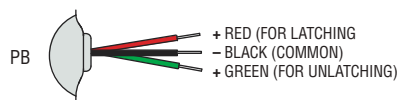


* **Lead Wires**
- #20 AWG PTFE
- 18" Length

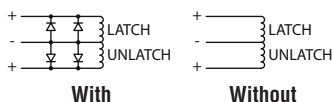
10 Electrical Interface

11 Diodes

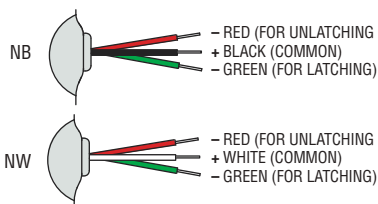
Positive



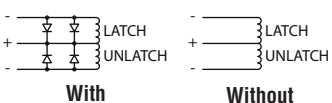
Diodes



Negative



Diodes



31CS Series and 32CS Heavy Duty Series

CSA Intrinsically Safe Industrial Pressure Transmitters

For OEMs that need Intrinsically Safe pressure sensors with consistent high levels of performance, reliability and stability, the 31/32CS Series sputtered thin film units offer an unbeatable price performance ratio in a small package size. They feature all stainless steel wetted parts, a broad selection of electrical and pressure connections and a wide choice of electrical outputs.

Our manufacturing process includes the latest automated equipment, producing consistent sensor performance.

Additionally the 32CS Series transmitters feature a thicker diaphragm and a pressure restrictor to withstand the rigors of cavitation or extreme pressure spikes, delivering years of reliable and stable performance in pulsating applications.

The compact construction of both these series makes them ideal for installation where space is at a premium.

Specifications

Performance	
Long Term Drift	0.2% FS/YR (non-cumulative)
Accuracy	0.25% FS
Thermal Error	
31CS	±1.5% max, ±1% typical / 212°F (100°C)
32CS	±2% max
Operating & Compensated Temperatures	-40°F to +176°F (-40°C to +80°C)
Zero Tolerance, Max.	0.5% of span
Span Tolerance, Max.	0.5% of span
Fatigue Life	Designed for more than 100 M cycles
Mechanical Configuration	
Pressure Port	See under "How to Order," last page
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See under "How to Order," last page
Enclosure	IP67 (IP65 for electrical code G)
Vibration	BSEN 60068-2-6 (FC) Sine (20G) BSEN 60068-2-64 (FH) Random (14.1 Grms)
Shock	BSEN 60068-2-27 (Ea) (50G, 11ms)
Approvals	CSA Certified Intrinsically Safe for use in: Class I, Division 1, Groups C and D Class I, Zone 0 Ex ia IIB T4 Ga Class I, Zone 0 AEx ia IIB T4 Ga When used in conjunction with a Zener safety barrier. Fully RoHS Compliant
Weight	1.8 to 5.3 ounces (50-150 grams). Configuration dependant

EMC Specifications

Emissions Tests: EN61326-1:2006 and EN61326-2-3:2006

EN55011:2007	Radiated Emissions:	30-230MHz 30dB µV/M @10M 230-1000MHz 37dB µV/M @10M
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Immunity Tests: EN61326-1:2006 and EN61326-2-3:2006

EN61000-4-2:2009	Electrostatic Discharge:	±4Kv contact ±8Kv air
EN61000-4-3:2006	Radiated Immunity:	10V/M 80-1000MHz 3V/M 1400-2000MHz 1V/M 2000-2700MHz
EN61000-4-4:2004	Fast Transients:	±0.25, 0.5, 1Kv
EN61000-4-6:2007	Conducted Immunity:	3V 0.15 to 80MHz 80% 1KHz modulation



Individual Specifications

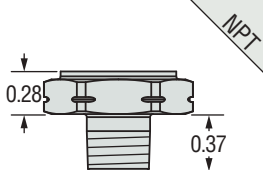
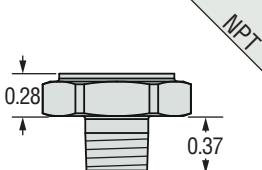
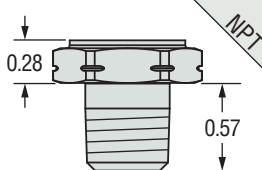
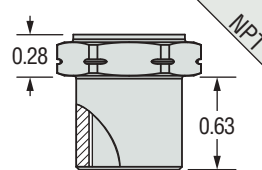
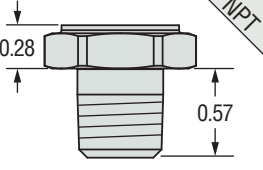
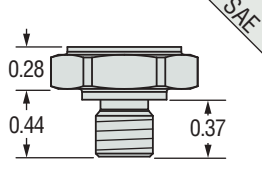
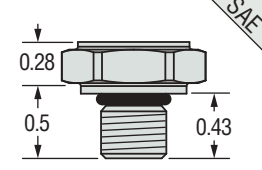
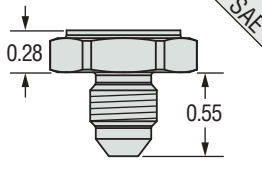
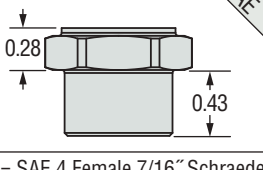
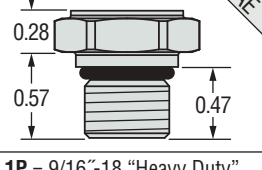
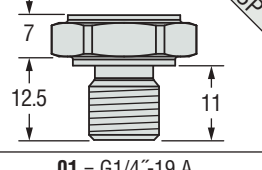
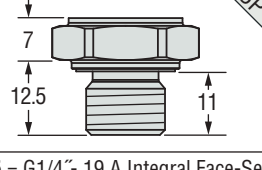
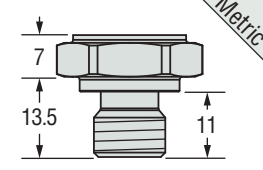
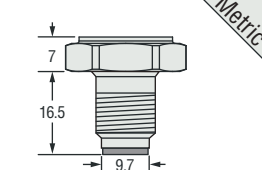
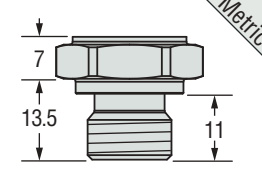
Voltage	
Output (3-wire)	0V min. to 10V max. See under "How to Order," last page
Supply Voltage	1 Volt above full scale with minimum supply of 8V; maximum 30V @ 4.5 mA
Source and Sinks	2 mA
Current	
Output (2-wire)	4-20 mA
Supply Voltage	8-24 Volts measured at the input to the transducer terminals
Maximum Loop Resistance	(Supply Voltage – 8) x 50ohms See Graph
Ratiometric	
Output	0.5 to 4.5V (Source and sink 2mA)
Supply Voltage	5 Vdc ±10% @ 4.5mA

Pressure Capability

Pressure Range PSI (Bar)	Proof Pressure (x Full Scale)		Burst Pressure (x Full Scale)	
	31CS	32CS	31CS	32CS
100-300 (7-20)	3.00 x FS	3.00 x FS	40 x FS	
500-1,500 (40-100)	2.00 x FS		20 x FS	
2,000-6,000 (140-400)			10 x FS	
10,000 (700)			> 60,000 PSI (4,000 bar)	
15,000 (1,000)	2.50 x FS			
25,000 (1,800)	1.70 x FS			
30,000 (2,200)	1.40 x FS	—		

Pressure Ports

NPT and SAE Dimensions in Inches. Metric and BSP Dimensions in MM.

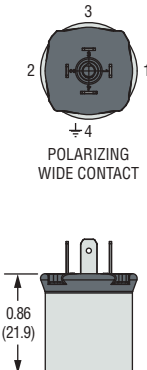
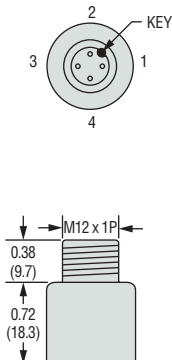
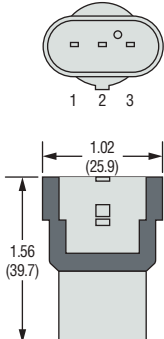
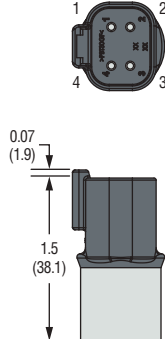
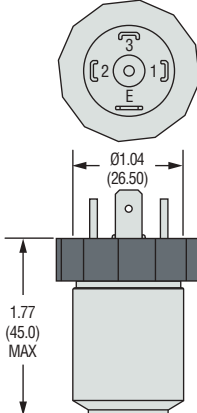
				
Fitting Code	08 = 1/8~27 NPT	4D = 1/8~27 NPTF Dryseal	02 = 1/4~18 NPT	0E = 1/4~18 NPT Internal
Torque	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*
				
Fitting Code	4C = 1/4~18 NPTF Dryseal	4N = 3/8~24 UNF	1J = 7/16~20 UNF	04 = 7/16~20 UNF with 37° Flare
Torque	2-3 TFFT*	18-20 NM	18-20 NM	15-16 NM
				
Fitting Code	1G = SAE 4 Female 7/16" Schraeder	1P = 9/16~18 "Heavy Duty"	01 = G1/4~19 A	05 = G1/4~ 19 A Integral Face-Seal
Torque	18-20 NM	18-20 NM	30-35 NM	30-35 NM
				
Fitting Code	0L = M12 x 1.5	2T = M12x1.5 HP Metal Washer Seal	0K = M14 x 1.5	
Torque	28-30 NM	30-35 NM	2-3 TFFT*	

*NPT Threads 2-3 turns from finger tight. Wrench tighten 2-3 turns.

General Notes:

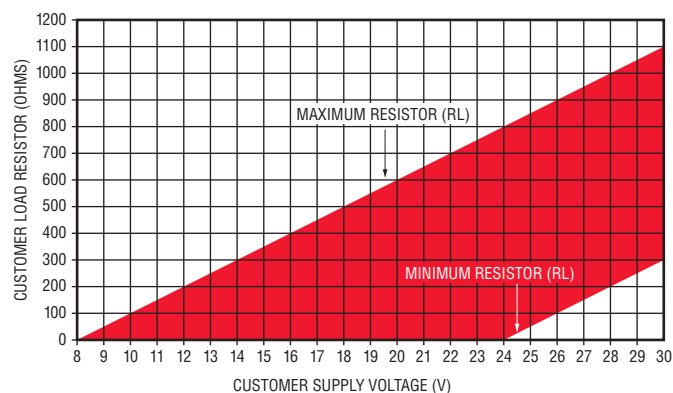
1. The diameter of all cans is 19 mm (0.748")
2. Hex is 22 mm (0.866") Across Flats (A/F) for deep socket mounting
3. O-Ring material, where applicable, is Viton® unless otherwise specified.

Electrical Connector

DIN 9.4 mm			M12 x 1P		Amp Superseal 1.5		Deutsch DT04-4P		DIN 43650A	
										
Code R			Code E		Code 6		Code 8		Code G	
Pin #	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode
1	V _{supply}	Supply	V _{supply}	Supply	V _{out}	No Connect	Ground	Return	V _{supply}	Supply
2	Ground	Return	V _{out}	No Connect	Ground	Return	V _{supply}	Supply	Ground	Return
3	V _{out}	No Connect	Ground	Return	V _{supply}	Supply	No Connect	No Connect	V _{out}	No Connect
4	No Connect	No Connect	No Connect	No Connect	—	—	V _{out}	No Connect	No Connect	No Connect

* This pin is used for temperature sensing output when this option is utilized. Otherwise, the pin is used for PE.

Current Output Mode (Load Resistor Range)



Minimum Resistor Value = $50 \cdot (+V - 24)$ for $+V > 24V$

Maximum Resistor Value = $50 \cdot (+V - 8)$ for $+V > 8V$

Cable-Out Types

Packard MetriPack			Mil-C 10-6P (26482)	
Code 9			Code C	
Pin ID	Voltage Mode	Current Mode	Voltage Mode	Current Mode
A	Ground	Return	+IN	+IN
B	V_{supply}	Supply	$V_{\text{out}1}$ (pressure)	0V
C	V_{out}	No Connect	0V	Do Not Connect
E	—	—	PE or $V_{\text{out}2}$ (temp)*	PE

Cable			1/2" Conduit Connection	
Code F			Code 3	
Wire Color	Voltage Mode	Current Mode	Voltage Mode	Current Mode
Red	Supply	Supply	Supply	Supply
Black	Ground	Return	Ground	Return
White	V_{out}	No Connect	V_{out}	No Connect

How to Order

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

Series	31CS	B	200PG	02	R	R	01	Cable Length (For electrical connections F & 3 only)
								00 - No Cable 03 - 3 meters 10 - 10 meters
								01 - 1 meter 04 - 4 meters
								02 - 2 meters 05 - 5 meters
Output								Optional Restrictor (32IS only)
								R - Restrictor
								0 - No Restrictor
Pressure Range – psi								Electrical Connection ⁴
								C - Mil-C 10-6P (26482)
								E - M12 x 1P (4-Pin)
								F - Cable version
								G - Large DIN
								R - Industrial DIN 9.4 mm (alternate pin out)
								3 - 1/2" NPT Male Conduit
								6 - Amp - Superseal 1.5 Series
								8 - Deutsch DT04-4P
								9 - Packard MetriPack
Pressure Range - bar								Pressure Port ³
								08 - 1/8-27 NPT External
								02 - 1/4-18 NPT External
								04 - 7/16-20 External (SAE #4, J514)
								1J - 7/16-20 External (SAE #4, J1926-2)
								0E - 1/4"-18 NPT Internal
								0K - M14 x 1.5 Straight
								1G - Schrader SAE #4, 7/16" Internal
								1P - SAE 6 (9/16"-18 UNF 2A)
								4C - 1/4-18 NPTF External (Dryseal)
								4D - 1/8-27 NPTF External (Dryseal)
								4N - SAE 3 (3/8-24 UNF External)
								01 - G1/4 External
								05 - G1/4 External Soft Seal
								0L - M12 x 1.5 (<1,000 bar, 15,000 psi)
								2T - M12 x 1.5 (6g) (≥1,000 bar, 15,000 psi)

Notes:

- For use with pull-up or pull-down resistors, contact factory.
- Ranges 15,000 psi (1,000 bar) and above available with -2T pressure port only.
- Pressure ports **0E** and **1G** are NOT available with the Restrictor option.
- For electrical codes **F** & **3**, specify cable length in meters.

FS-4 Series – Low Cost, Molded Plastic Construction

Flow Rate Settings: 0.1 GPM to 1.5 GPM

Port Size: 9/16"-18 UNF

Primary Construction Material: Ryton®

Setting Type: Fixed

The FS-4 Series makes flow protection economical for a broad range of industrial applications such as welders, lubrication systems, medical sterilizers and laundry chemicals dispensing.

Specifications

Wetted Materials	
Housing and Piston	Ryton® R4
Spring	316 Stainless Steel
O-Ring	Viton®
Other Wetted Parts	
	Epoxy
Operating Pressure, Maximum	250 PSIG (17.2 bar) @ 70°F (21°C)
Operating Temperature	0°F to 225°F (-17°C to +107°C)
Set Point Accuracy	±15% Maximum
Set Point Differential	20% Maximum
Switch*	SPST or SPDT, 20 VA (SPDT: 240 VAC Max.)
Inlet/Outlet Ports	9/16"-18 UNF-2B Thread
Recommended Filtration	50 Microns or Better
Electrical Termination	SPST
	18 AWG, Zipcord, 24" Long
	SPDT
	18 AWG, PVC 24" Long Leads

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

How To Order – Standard Models

Housing and Piston Material	Flow Setting GPM	Part Numbers		
		SPST Switch		With SPDT Switch
		N.O., No Flow	N.C., No Flow	
Ryton®	0.1	122340 ⚡	122346	122352 ⚡
	0.25	122341 ⚡	122347	122353 ⚡
	0.5	122342	122348	122354
	0.75	122343	122349	122355
	1.0	122344	122350	122356
	1.5	122345	122351	122357 ⚡

Note:
Flow settings are calibrated using water @ +70°F on increasing flow, with units in a vertical position (lead wires up).

Port Adapters for FS-4

Converts 9/16" threaded ports to NPT or barbed connection. Made of Ryton®-R4 or polypropylene with O-Rings in place.

CAUTION: Do not exceed 15 in./lbs. maximum torque when installing adapter fittings.

Material	Adapter Size	Part Numbers
Ryton®	1/8" NPT*	123028 ⚡
	1/4" NPT*	123029 ⚡
Polypropylene	1/4" NPT*	158602 ⚡
	1/2" Barb**	158603 ⚡

*Wrench flats provide for proper assembly.

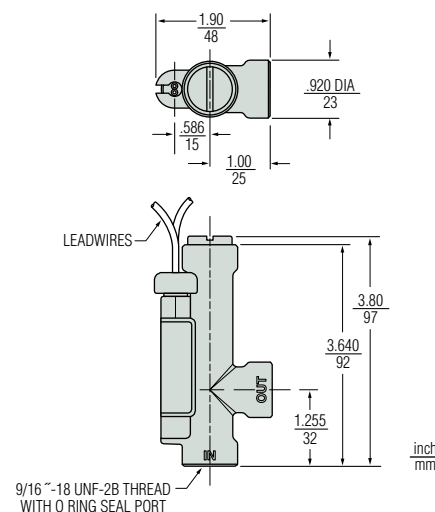
**Accepts 1/2" I.D. flexible hose

⚡ – Stock Items.

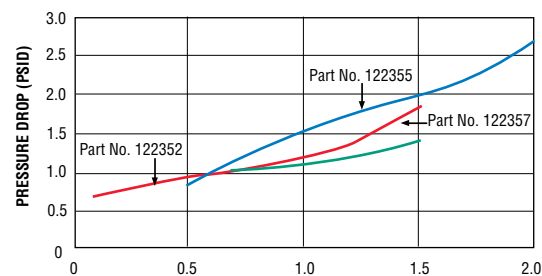


U.L. Recognized —
File No. E31926
CSA Listed —
File No. LR30200

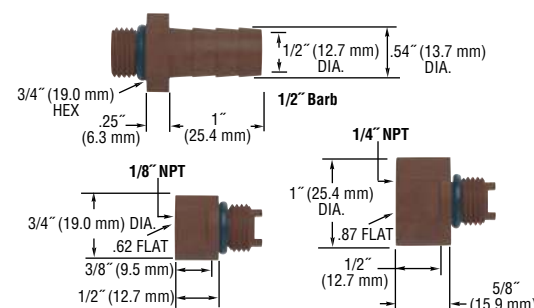
Dimensions



Pressure Drop – Typical



Tests conducted with units in vertical position (lead wires up) with water at +70 F (21 C).

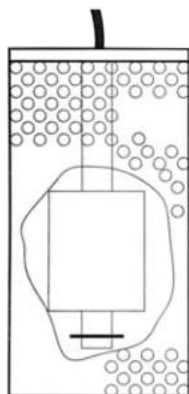


Leak Detection Sensors

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

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

DLP-1 & DLP-2



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

DWP-25



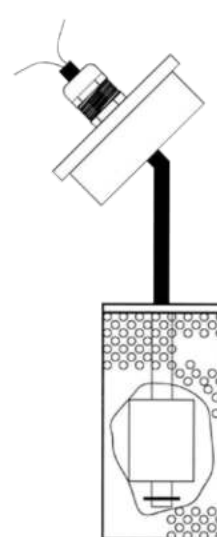
Designed for use in the annular space of double wall fiberglass tanks to detect the presence of conductive liquid. When combined with Warrick DMS or TA alarm panel, DWP-25 sensors can detect the presence of water or other conductive liquids in normally dry annular spaces.

DFP-25



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

SVP-2



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

DSP-2



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

How to Order

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

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

* EPA Approved when used with Warrick TA or DMS panel. See pages E-27 and E-28 respectively.

Applications

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

54800 Series Dual Channel Zener Barriers Provide Intrinsic Safety to Signal Producing Sensors

- ▶ Intrinsic safety with solid-state reliability
- ▶ Since no explosion-proof enclosures are needed for sensor wiring, these units further provide economical installation
- ▶ With encapsulated construction, 54800 Series Barriers are impervious to dust and moisture
- ▶ Optional clip available for rail mounting

For most non-voltage-producing devices located in a hazardous area, a single zener barrier that is negative-earth-grounded (see preceding two pages) can be used for intrinsic safety.

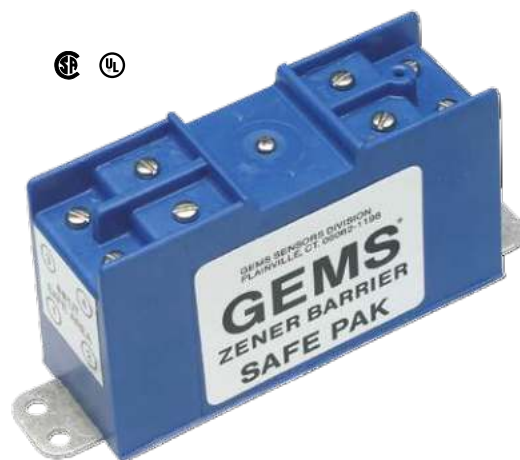
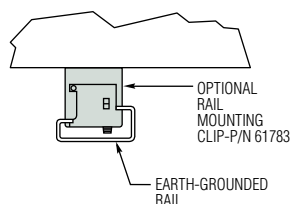
Instrumentation that produces an output (signal conditioners) usually requires two barriers, one for each "floating" lead. In this case, select one of the 54800 Series dual channel barriers shown here.

Any non-voltage-producing sensor or switch is rendered intrinsically safe for hazardous locations when properly connected to the output of these Zener Barriers.

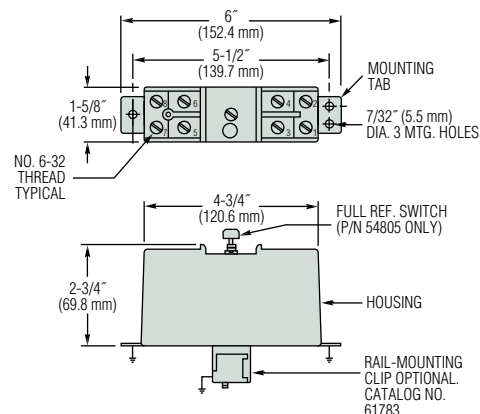
See table on Page L-2 for specific approval information.

Optional Rail Mounting

Gems SAFE-PAK Relays can be supplied on special order with a clip for rail mounting. Clip is in addition to standard mounting tabs.

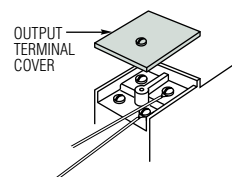


Dimensions



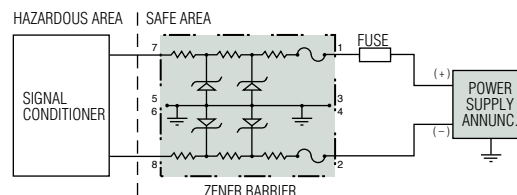
Protective Cover

Assures intrinsic safety integrity of sensor terminals and wiring.



Typical Wiring Diagram

Positive dual-channel Zener Barrier with floating leads.



How To Order

Specify Part Number based on the specifications tabulated below.

DC Input to Barrier, Max.	Signal Polarity	Total Series Resistance Per Channel	Application Group	Reactive Limits		Part Numbers
				Capacitance μ f	Inductance mh	
15 VDC, 200 mA	Positive	65	D	5.6	0.7	54801
20 VDC, 100 mA (Full Ref. Sw.)	Positive	270	A, B	0.4	0.9	54805
			C	1.2	5.0	
			D	3.2	10.0	
30 VDC, 60 mA	Positive	275	D	2.4	6.0	54806 ⚡
Optional Rail Mounting Clip						61783

Notes:

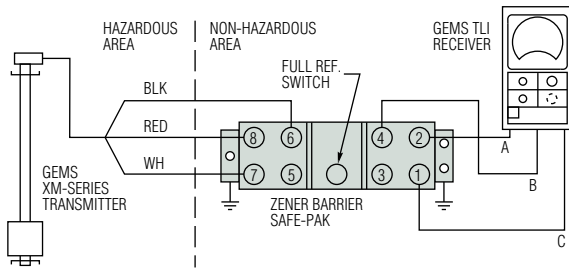
- These barriers are internally fused. If a "fault" or abnormal signal level continues for a sustained period of time, the internal fusing within the barrier will open, disconnecting the barrier. External fuses (Littlefuse Type 3AG or equal) are recommended to protect the Barrier from incorrect wiring at start-up, or from other equipment fault.
- Housing material is blue Lexan®.
- All models shown are for Class I and II, Division 1 and 2. Specific Application Groups are tabulated.
- Ambient operating temperature for all models shown is -40°F to +140°F (-40°C to +60°C).
- Terminals 3, 4, 5 and 6 are common and are bonded to the mounting tabs for positive redundant grounding.

⚡ – Stock Items.

Installation and maintenance must be in accordance with the National Electrical Code and the applicable GEMS INSTRUCTION, INSTALLATION and SERVICE Bulletin

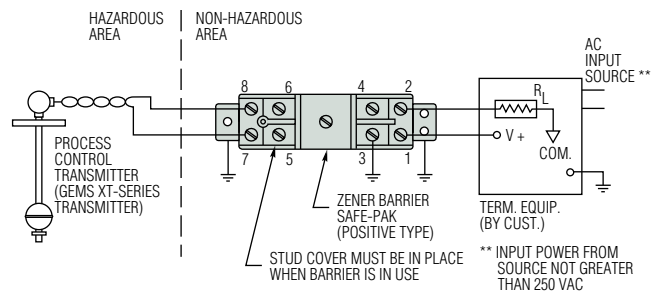
Typical Application Examples

Sensor switch may be any non-voltage-producing device. Typical are: flow and level switches, temperature switches (thermostats), pressure switches or passive, resistive transducers or transmitters. Below are typical examples.



P/N 54805 in a continuous liquid level monitoring system.

Note: Terminals 3, 4, 5 and 6 are common and are bonded to the mounting tabs for positive redundant grounding.



P/N 54806 in process control system.

To Determine Loop Resistance:

$$R_{\text{Loop}} = \frac{V_A^* - 10}{.02}; R_{\text{Loop}} = R_{\text{SUPPLY BARRIER}} + R_{\text{RETURN BARRIER}} + R_{\text{MONITORING EQUIPMENT}}$$

* V_A must be less than 28 VDC (30 Volt Barriers)

BG Series

- ▶ MOPD: 400 PSI (28 Bar)
- ▶ C_v Range: 0.018 to 0.430 (K_v Range: 0.016 to 0.372)
- ▶ 7 Watts

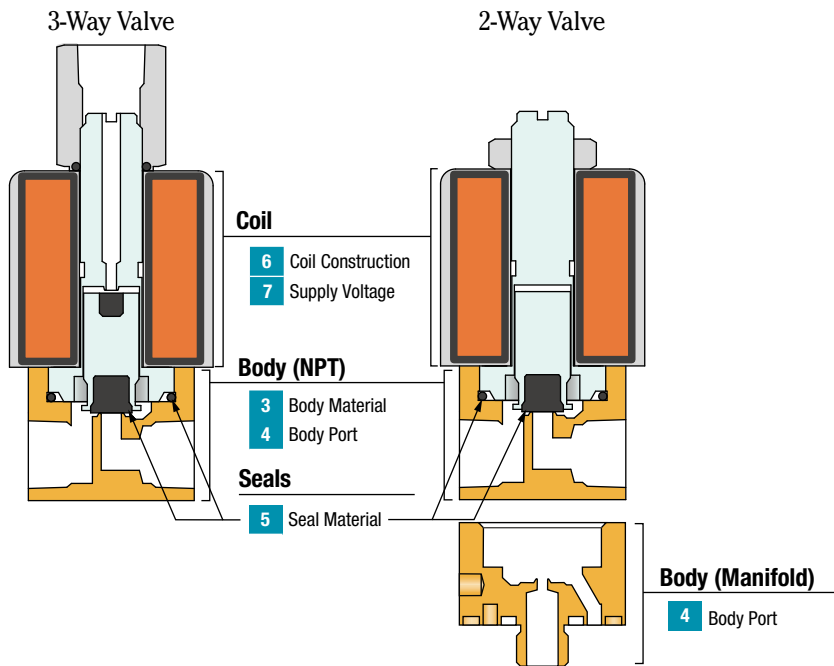
The BG Series gives you a highly adaptable design for practically all applications requiring flow between C_v 0.018 and 0.430 (K_v 0.016 to 0.372). This robust 2- or 3-way miniature solenoid utilizes a stainless steel body to resist corrosion for most acids, alkaline solutions, and harsh environments. Available in numerous port configurations, orifice sizes, and material combinations, the BG Series is a highly flexible valve that fulfills the requirements for most applications.

Typical Applications

Stainless Steel Bodies:

- Medical Equipment
- Laboratory Equipment
- Food Processing Equipment

Reference



How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

BG	20	22	-	01	LC	-	B	-	G1	-	203
Series	1	2	-	3	4	-	5	-	6	-	7
	Function	MOPD		Body Material	Body Port		Seal Material		Coil Construction		Supply Voltage

Product Description from Example Shown Above:

BG2022-01LC-B-G1-203

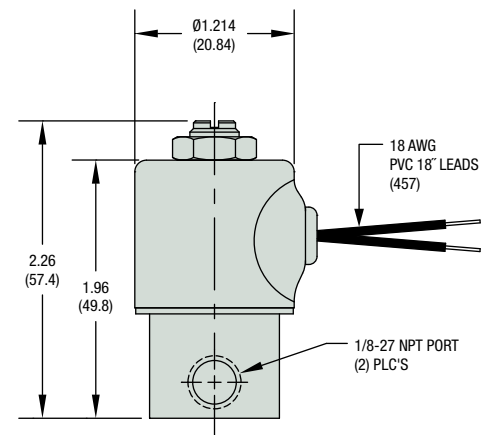
BG2022 = BG Series with 2-Way Normally Closed Valve **Function**; 100 MOPD

-01LC = 303 Stainless Steel **Body Material**; 1/8" NPT Female **Body Port**

-B = Nitrile (Buna-N) **Seal Material**; (Plunger Seal and Internal O-Ring)

-G1 = Grommet Housing Tape-Wrapped (Class B) **Coil Construction**;

-203 = 12 VDC **Supply Voltage**



Example Shown

Part Number: BG2022-01LC-B-G1-203
From How to Order example below.

BG Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

BG			-			-		-			-	
Series	1	2		3	4		5		6		7	

1 + 2 Valve Function & Maximum Operating Pressure Differential

Valve Function	Code	MOPD		C _v		K _v		Orifice			
		psig	bar	Body	Stop	Body	Stop	Body		Stop	
								inches	mm	inches	mm
2-WAY Normally Closed	2005	400	28	0.065	—	0.056	—	1/16	1.59	—	—
	2007	300	21	0.090	—	0.078	—	5/64	1.98	—	—
	2009	250	17	0.155	—	0.134	—	3/32	2.38	—	—
	2011	200	14	0.200	—	0.173	—	7/64	2.78	—	—
	2017	150	10	0.240	—	0.208	—	1/8	3.18	—	—
	2022	100	6.9	0.300	—	0.259	—	5/32	3.97	—	—
	2029	50	3.4	0.430	—	0.372	—	3/16	4.76	—	—
3-WAY Normally Closed	3109	250	17	0.018	0.018	0.016	0.016	1/32	0.79	1/32	0.79
	3114	175	12	0.040	0.040	0.035	0.035	3/64	1.19	3/64	1.19
	3120	125	8.6	0.065	0.070	0.056	0.061	1/16	1.59	1/16	1.59
	3122	100	6.9	0.090	0.090	0.078	0.078	5/64	1.98	5/64	1.98
	3126	75	5.2	0.155	0.090	0.134	0.078	3/32	2.38	5/64	1.98
	3129	50	3.4	0.240	0.090	0.208	0.078	1/8	3.18	5/64	1.98
	3136	15	1.0	0.300	0.090	0.259	0.078	5/32	3.97	5/64	1.98
3-WAY Normally Open	3211	200	14	0.018	0.018	0.016	0.016	1/32	0.79	1/32	0.79
	3217	150	10	0.040	0.040	0.035	0.035	3/64	1.19	3/64	1.19
	3220	125	8.6	0.065	0.070	0.056	0.061	1/16	1.59	1/16	1.59
	3222	100	6.9	0.090	0.090	0.078	0.078	5/64	1.98	5/64	1.98
	3226	75	5.2	0.155	0.090	0.134	0.078	3/32	2.38	5/64	1.98
	3229	50	3.4	0.240	0.090	0.208	0.078	1/8	3.18	5/64	1.98
	3236	15	1.0	0.300	0.090	0.259	0.078	5/32	3.97	5/64	1.98
3-WAY Multi Purpose	3314	175	12	0.018	0.018	0.016	0.016	1/32	0.79	1/32	0.79
	3320	125	8.6	0.040	0.040	0.035	0.035	3/64	1.19	3/64	1.19
	3322	100	6.9	0.065	0.070	0.056	0.061	1/16	1.59	1/16	1.59
	3326	75	5.2	0.090	0.090	0.078	0.078	5/64	1.98	5/64	1.98
	3329	50	3.4	0.155	0.090	0.134	0.078	3/32	2.38	5/64	1.98
	3334	25	1.7	0.240	0.090	0.208	0.078	1/8	3.18	5/64	1.98
	3336	15	1.0	0.300	0.090	0.259	0.078	5/32	3.97	5/64	1.98
3-WAY Directional Control	3408	275	19	0.018	0.018	0.016	0.016	1/32	0.79	1/32	0.79
	3411	200	14	0.040	0.040	0.035	0.035	3/64	1.19	3/64	1.19
	3417	150	10	0.065	0.070	0.056	0.061	1/16	1.59	1/16	1.59
	3422	100	6.9	0.090	0.090	0.078	0.078	5/64	1.98	5/64	1.98
	3426	75	5.2	0.155	0.090	0.134	0.078	3/32	2.38	5/64	1.98
	3429	50	3.4	0.240	0.090	0.208	0.078	1/8	3.18	5/64	1.98
	3434	25	1.7	0.300	0.090	0.259	0.078	5/32	3.97	5/64	1.98

3 Body Material

- 01** 303 Stainless Steel
03 Brass
XX No Body
(4) Body Port **OB** only

4 Body Port

- LB** 1/4" NPT Female
LC 1/8" NPT Female
MM Manifold Mount
 (5/16"-24 Stud)
OB Omit Body (operator only)*
(3) Body Material **XX** only

5 Seal Material

- B** Nitrile
E EPR
V Viton®

7 Supply Voltages

- 203** 12 VDC
204 24 VDC

6 Coil Construction

- G1** Grommet Housing,
 Tape-Wrapped (Class B) Lead Wires
G5 Grommet Housing,
 Epoxy Encapsulated (Class B) Lead Wires

* Contact Gems for the operator orifice drawings

BG Series – Additional Component Details & Dimensions

1 Valve Function

Flow Schematics

Flow Key

Blocked Flow

Free Flow

O/S = Over Seat

U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		
3-Way Normally Closed		
3-Way Normally Open		
3-Way Multi Purpose		
3-Way Directional Control		

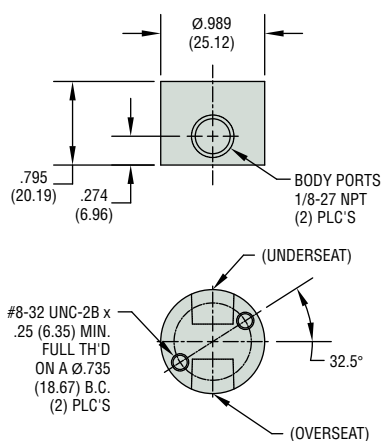
BG Series – Additional Component Details & Dimensions, cont.

4 Body Port

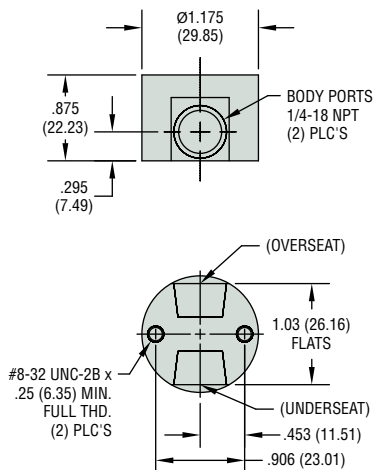
Note: Contact Gems for the operator orifice drawings

Ported Bodies

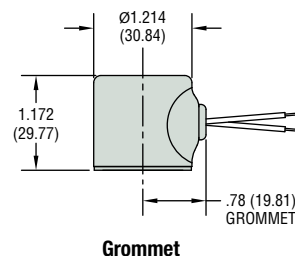
1/8" NPT Port (LC)



1/4" NPT Port (LB)

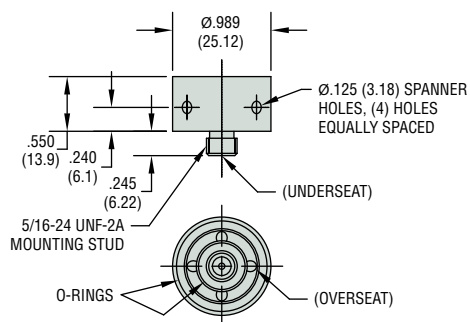


6 Coil Construction

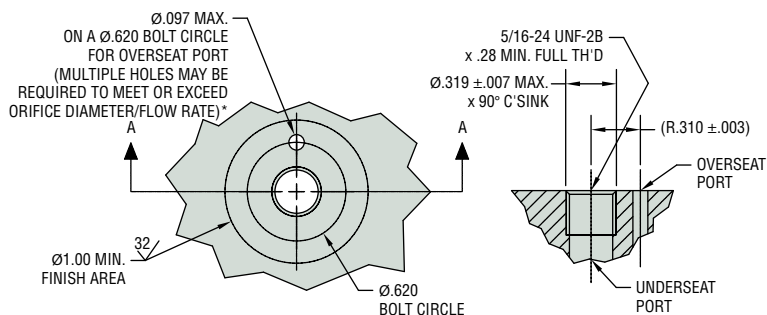


Manifold Mounting Bodies

Manifold Mount 5/16"-24 Stud Body (MM)



Manifold Preparation



* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Type	Overseat Port	Underseat Port
2-Way N.C.	IN	OUT
3-Way N.C.	CYL	IN
3-Way N.O.	CYL	EXH
3-Way M.P.	COM	N.C.
3-Way D.C.	IN	N.C.

Small Size – Alloys

LS-700 Series Combines Durability of Metal With a Compact Design for Restricted Spaces

- ▶ Stainless Steel or Brass Mountings and Stems
- ▶ 1 to 5 Actuation Levels
- ▶ Lengths to 48 inches

These compact units feature the rugged durability of stainless steel or brass construction in a lightweight package. Ideal for tanks less than 4 feet.

LS-700 Series switches are exceptionally versatile because of the many useful options available. Described briefly below, these options can extend the functionality of your GEMS LS-700 Series custom switch.

Temperature Sensing

To save space and simplify wiring, GEMS can incorporate a temperature sensor in the end of the float stem on any model type LS-700. Two sensor types are available: Transducers for continuous output, and Thermostats for switch actuation. See Page B-23 for details.



Solid-State Relays

Control motors, pumps, valves and other “load” devices with GEMS Solid-State Relays. Intrinsically-safe relays and barriers allow safe operation of level switches in hazardous areas. See Section I for details.

1. Mounting Types

Each mounting type can be configured with stem lengths (L_s) and float material indicated in this table.

Note: Sanitary flange mountings are also available, but not shown. Please contact factory.

in
(mm)

Type 1 1/8" NPT	Type 2 3/4" NPT ¹	Type 3 1" NPT	Type 4 3-5/8" Dia. Flange
Type 5 1-5/16-12UNF-2A	Type 6 3/8-24	Type 7 1-1/4" NPT ^{1,2}	

Stem & Mounting Material	Brass or 316 Stainless Steel		
Maximum Length	48 inches (121.9 cm) - 21" (53.3 cm) Max on Bent Stem Versions (Consult Factory)		
Mounting Position	Vertical $\pm 30^\circ$ Inclination		
Float Stops ³	Brass Units: Beryllium Copper Grip Rings; Stainless Steel Units: S.S. ARMCO PH-15-7MO Grip Rings		
Max. Pressure Rating ⁴	See Float Value on Following Page		50 psi (3.5 bar)

Notes:

1. Mounting Types 2, 3 & 7 are available with a 1/2" MNPT conduit adaptor. This option can be selected on the checklist.
2. Mounting Type 7 is not U.L. Approved.
3. In some instances, concentrations of chlorine and other corrosive compounds in the media require the use of collar type float stops. Consult factory for details.
4. Mounting only. Maximum pressure rating for complete unit will be the lower of this pressure or the selected float pressure (see Float Types, on next page).

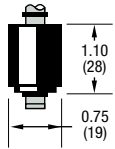
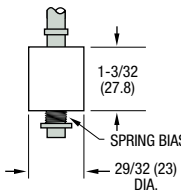
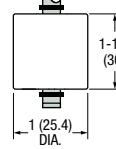
ORDER IT!

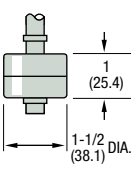
Ordering is Easy! See Page B-15.
Easy online ordering too!



2. Float Types

A single float type is selected for use at all actuation points.

Float Materials	Buna-N		PTFE – Spring Biased	Polypropylene	
Compatible Mounting Types	1, 2, 3, 4, 5, 6, 7	1, 3, 4, 5, 6, 7	1, 2, 3, 4, 5, 6, 7	1, 3, 4, 5, 6, 7	1, 2, 3, 4, 5, 6, 7
Float Dimensions					
Part Number	187553	39049	133764	145730	197732
Operating Temperature	Water: to 180°F (82.2°C) Oil: -40°F to +300°F (-40°C to 149°C)		-40°F to +300°F (-40°C to +149°C)	-40°F to +225°F (-40°C to +107°C)	-40°F to +250°F (-40°C to +121°C)
Max. Pressure	300 psi (20.7 bar)*		1000 psi (69 bar)*	50 psi (3.5 bar) @ 70°F*	100 psi (6.9 bar)
Min. Liquid Specific Gravity	0.65	0.45	0.65	0.65	0.95

Float Materials	316 Stainless Steel**				
Compatible Mounting Types	1, 4, 6	1, 3, 4, 5, 6, 7	1, 4, 5, 6, 7	1, 2, 3, 4, 5, 6, 7	1, 2, 3, 4, 5, 6, 7
Float Dimensions					
Part Number	60241	141750	156900	136550	158369
Operating Temperature	-40°F to +300°F (-40°C to +149°C)**				
Max. Pressure	100 psi (6.9 bar)	275 psi (19 bar)	600 psi (41.4 bar)	400 psi (27.6 bar)	150 psi (10.3 bar)
Min. Liquid Specific Gravity	0.70	0.85	0.90	1.10	0.85

* De-rated with increasing temperature above 70°F (21°C).

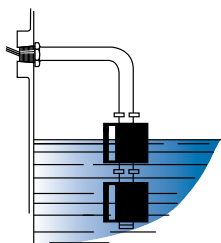
** 316 Stainless Steel floats are available with ceramic potting that allows temperatures to 400°F (204°C); contact factory for these high-temperature applications.

Optional Mountings

Please contact Gems Sensors about these mountings or other requirements not seen here.

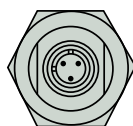
Bent Stem (LS-77700)

Used when tank top or bottom is inaccessible.



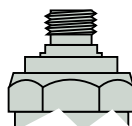
Integral Receptacle

2–5 Pin miniature receptacle for mounting Type 2 or Type 3; eliminates splicing and eases connections.



Conduit Adapter

A 1/2" MNPT conduit is available for Mounting Type 2 & 3. Select from list of options on the Check List.



3. Number of Actuation Levels and 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.): 20 /100 VA.

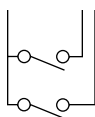
Lead Wires: 22 AWG, 24" L., PTFE.

Approvals: LS-700 Series switches are U.L. Recognized – File No. E45168; CSA Listed – 30200.

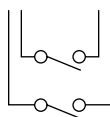
Typical Wiring Diagrams

For clarity, only two actuation levels are shown in each group diagram.

**GROUP I
SPST**



**GROUP II
SPST**



Wiring Color Code

Tinted area designates U.L. Recognized wiring configurations.

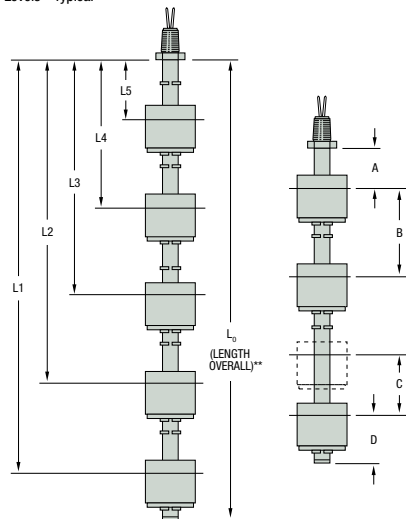
SPST Switches			
Wiring	Group I	Group II	
Common Wire	Black	None	
	NO/NC	SW Com.	NO/NC
L ₁	Red	Red	Red
L ₂	Yellow	Yellow	Yellow
L ₃	Blue	Blue	Blue
L ₄	Brown		
L ₅	Orange		

Notes:

- Units with 100 VA switches are not U.L. Recognized or CSA Listed.
- See "Electrical Data" on Page X-5.

4. Actuation Level Dimensions

Actuation Levels—Typical



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

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

Switch actuation levels are determined following the guidelines below.

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.

Float Part Number	Dimensions			
	A	B	C	D
39049	11/16" (17.5 mm)	1-5/8" (41.3 mm)	1/8" (3.2 mm) Min.	3/4" (19.1 mm)
60241	9/16" (14.3 mm)	1-15/16" (49.2 mm)		15/16" (23.8 mm)
133764	3/4" (19.0 mm)	1-1/2" (38.1 mm)		7/8" (22.2 mm), N.O. 1-3/16" (30.2 mm), N.C.
136550	5/16" (7.9 mm)	1-7/8" (47.6 mm)		1-11/16" (42.9 mm)
141750	1/2" (12.7 mm)	1-9/16" (39.7 mm)		1-1/8" (28.6 mm)
145730	5/8" (15.9 mm)	1-3/8" (34.9 mm)		13/16" (20.6 mm)
156900	9/16" (14.3 mm)	1-9/16" (39.7 mm)		13/16" (23.8 mm)
158369	5/8" (15.9 mm)	1-7/8" (47.6 mm)		1-3/8" (34.9 mm)
187553	11/16" (17.5 mm)	1-7/16" (36.5 mm)		7/8" (22 mm)
197732	1/2" (12.7 mm)	1-3/8" (34.9 mm)		1" (25.4 mm)

Notes:

- A, B and D dimensions based on a liquid specific gravity of 1.0.
- Tolerance on actuation levels is $\pm 1/8"$ (3.2 mm).
- For bent stem versions, please request drawing LS-77700.

856 Series – Industrial Pressure Transducers

- ▶ 0-2 to 0-10,000 psi (0 to 700 bar) Pressure Ranges
- ▶ Voltage or Current Output
- ▶ NEMA 4/IP65 with Zero and Span Adjustments

The 856 Series is specifically designed for NEMA4/IP65 service and features a die-cast aluminum enclosure. Their robust capacitive design is resistant to environmental effects, such as shock, vibration, temperature and EMI/RFI. A 17-4 PH stainless steel sensing element does not require isolation from corrosive media. A 1/2" threaded conduit is provided for electrical termination and a removable cover provides easy access to the internal wiring terminal strip.

Common Specifications

Input	
Pressure Range	0 to 10,000 psig (0 to 700 bar)
Proof Pressure	See ordering chart
Burst Pressure	See ordering chart
Fatigue Life	>1 million cycles
Performance	
Supply Voltage (Vs)	9-30 VDC
Long Term Drift	0.5% FS/year
Accuracy	
<25 psi	±0.25% FS
≥25 psi	±0.13% FS
Thermal Error Zero	
<25 psi	±0.02% FS/°F (±0.036% FS/°C)
≥25 psi	±0.01% FS/°F (±0.018% FS/°C)
Thermal Error Span	±0.015% FS/°F (±0.027% FS/°C)
Compensated Temperatures	-4°F to +176°F (-20°C to +80°C)
Operating Temperatures	-40°F to +260°F (-40°C to +125°C)
Storage Temperatures	-40°F to +260°F (-40°C to +125°C)
Zero Tolerance	0.5% of span (adjustable)
Span Tolerance	1% of span (adjustable)
Mechanical Configuration	
Pressure Port	see ordering chart
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	Two 1/2" Internal Threaded Ports, Screw Terminal Strip
Enclosure	Die-Cast Aluminum, NEMA 4/IP65
Vibration	20g (MIL STD 202, Method 204, Condition C)
Shock	200g (MIL STD 202, Method 213B, Condition C)
Approvals	CE
Weight	13.4 oz

Individual Specifications

Voltage Output Units	
Output	0.1-5.1 VDC (3 wire)
Current Consumption	6 mA
Min. Load Resistance	5000 ohms
Current Output Units	
Output	4-20 mA (2 wire)
Max. Loop Resistance	(Vs-9) x 50 ohms



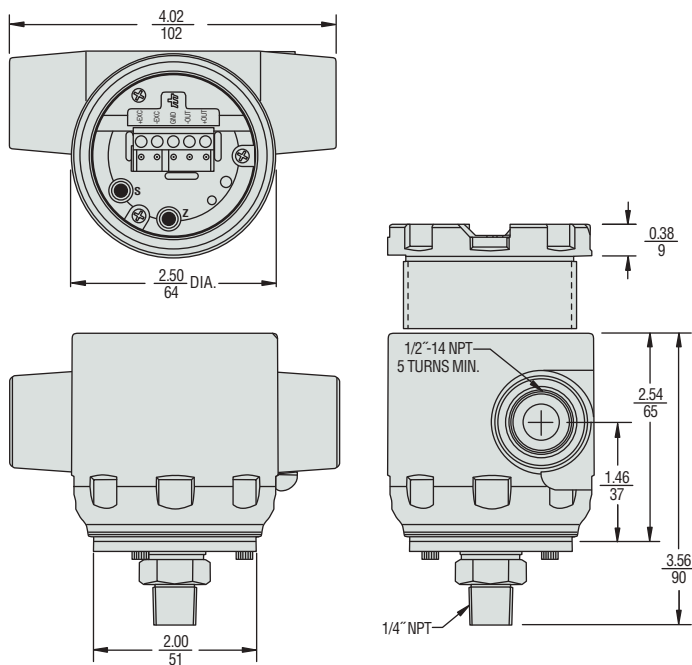
Applications

- Process Control
- Chemical Processing
- Agricultural Irrigation
- Natural Gas Pipeline
- Grain Processing
- Industrial Pressure Monitoring

How They Operate

Gems' patented variable capacitance sensor features an insulated electrode plate fastened to the center of the sensor diaphragm, which forms a variable capacitor. As pressure increases or decreases, the capacitance changes. This change in capacitance is detected and converted to a linear analog signal by Gems' custom ASIC-based circuit, producing an output signal proportional to applied pressure.

Dimensions



How to Order

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

SELECT

1. Series **8561** - 856 Series

2. Pressure Range Code

Pressures – psi			
Code	Range	Proof	Burst
002P	0 - 2	4	250
005P	0 - 5	10	250
010P	0 - 10	20	500
015P	0 - 15	30	500
025P	0 - 25	100	500
050P	0 - 50	150	750
100P	0 - 100	300	1000
150P	0 - 150	300	1000
200P	0 - 200	450	2000
250P	0 - 250	500	2000
500P	0 - 500	1000	3000
600P	0 - 600	1200	3000
10CP	0 - 1000	2000	5000
30CP	0 - 3000	4500	7500
50CP	0 - 5000	7500	10000
10KP	0 - 10000	12000	12500

Pressures – bar			
Code	Range	Proof	Burst
1R6B	0 - 1.6	6	40
004B	0 - 4	10	50
006B	0 - 6	18	60
010B	0 - 10	30	80
016B	0 - 16	32	130
025B	0 - 25	50	170
040B	0 - 40	80	240
060B	0 - 60	120	300
100B	0 - 100	200	400
160B	0 - 160	320	500
250B	0 - 250	380	550
400B	0 - 400	600	800
700B	0 - 700	800	1350

8561 - 025P - G - 4M - 11 - C

- 6. Optional **C** - Calibration Certificate
- 5. Output **11** - 4-20 mA
22 - 0.1-5.1 Vdc (≥ 25 psi ranges)
- 4. Pressure Port **2M** - 1/4" NPT (M)
4M - 1/2" NPT (M) (≥ 25 psi ranges)
2F - 1/4" NPTF (≥ 25 psi ranges)
1M - 1/8" NPTM (< 25 psi ranges)
- 3. Pressure Datum **G** - Gauge (standard)

CAP-150 Series – Capacitive Level Sensor

- ▶ For non-metallic containers
- ▶ Non-intrusive level sensing
- ▶ Optional Sight Glass Bracket
- ▶ Potentiometer for sensitivity adjustment

The CAP-150 series offers a unique level sensing solution for a wide variety of bottle types including plastic, glass and fiberglass. The non-contact sensor is ideally suited for medical applications such as waste, reagent or diluent liquids as well as dark, sticky or viscous fluids. The easy-to-calibrate sensor is available in both aqueous and non-aqueous versions and can be delivered with factory preset sensitivity for quick installation for OEM orders. The CAP-150 may also be used as a proximity sensor to detect the presence of solids such as pulp & paper.

Specifications

Performance	
Nominal Sensing Distance, Sn	0.2" (5mm)
Repeat Accuracy - (% of Sn)	<2%
Hysteresis - (% of Sn)	<20%
Mechanical	
Enclosure Ratings	IP67, NEMA 1,3,4,6,13
Operating Temperature Range	-13°F to +158°F (-25°C to +70°C)
LED Signal Indicator	Yellow
Power On LED Indicator	Green
Potentiometer	Yes
Termination	78.74" (2 meter), 3 Wire PVC
Shock	30g, 11ms
Electrical	
Supply Voltage	5-48 VDC
Continuous Switching Current	300 mA
Voltage Drop	<2 VDC
Current Consumption	<10 mA
Switching Frequency	100 Hz, maximum
Overload Protection	No
Short Circuit	Yes
Reverse Polarity Protection	Yes
Approvals	CE

How To Order

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

Fluid Properties	Sensor Material	Flush Mountable	Sensing Range	Shielded	Sink/Source	Logic	Part Number
Aqueous, Conductive (Unshielded Sensor)	Delrin® Body with Valox® Sensor Face	No	2-8mm	No	Sink	Wet	239890
						Dry	239891
					Source	Wet	241366
						Dry	241367
Non-Aqueous, Non-Conductive (Shielded Sensor)	Ni-Plated Brass Body with Valox® Sensor Face	Yes	1-5mm	Yes	Sink	Wet	240607
						Dry	240612
					Source	Wet	241368
						Dry	241369

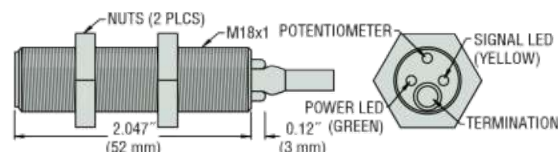


Typical Applications

Fluid Monitoring:

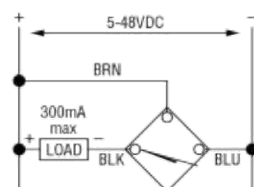
- Waste
- Reagents
- Diluent
- Detergent/Wash
- Coolant
- Printing Ink

Dimensions

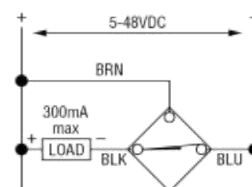


Wiring Diagram

Wet Sink



Dry Sink

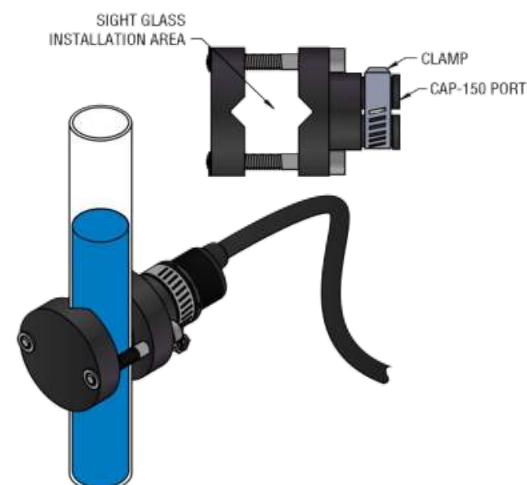


Convert Simple Sight Glass into Switch Actuation Device

- For glass tubing 1/4" to 1" Dia.

Use this easy-to-install clamp with the CAP-150 to provide liquid level sensing and switch actuation along the length of sight glasses 1/4" to 1" in diameter.

Part Number: 240836



Small Size – Alloys

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

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

LS-1700 Series –
Buna N Float



LS-1700 Series –
Teflon® Float



LS-1750 Series –
All Stainless Steel



LS-1755 Series –
All Stainless Steel



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

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

Dimensions

LS-1700 Series		LS-1750 Series	LS-1755 Series
Buna N Float	Teflon® Float	Stainless Steel Float and Stem	
<p>1/8" NPT 1/2" HEX (12.7 mm) 2-1/16" (52.4 mm) L₁† 1-1/2" (38.1 mm) 1" (25.4 mm) 1" DIA. (25.4 mm) L₁ = 9/16" (14.2 mm) N.O.; 13/16" (20.6 mm) N.C.</p>	<p>1/8" NPT 1/2" HEX (12.7 mm) 2-1/16" (52.4 mm) L₁† 1-1/2" (38.1 mm) SPRING 3/4" (19.1 mm) 1" DIA. (25.4 mm) FLAT WASHER L₁ = 1/2" (12.7 mm) N.O. and N.C.</p>	<p>1/8" NPT 1/2" HEX (12.7 mm) 2-1/16" (52.4 mm) L₁† 1-1/2" (38.1 mm) 1" (25.4 mm) 1-1/2" DIA. (38.1 mm) L₁ = 5/8" (15.7 mm) N.O.; 3/4" (19.1 mm) N.C.</p>	<p>1/8" NPT 1/2" HEX (12.7 mm) 2-21/64" (59.1 mm) L₁† 1-45/64" (42.8 mm) 1-7/32" (31.0 mm) 1-1/32" DIA. (26.2 mm) L₁ = 37/64" (14.5 mm) N.O.; 53/64" (20.8 mm) N.C.</p>

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

Common Specifications

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

Approvals: Series Nos. LS-1700, LS-1750 and LS-1755 are U.L. Recognized – File No. E45168 and CSA Listed – File No. 30200.
RoHS – In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

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

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

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

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

** Higher pressures are temperature dependent.

Series 26 Modules Low-Water Cutoff – Plug-In Modules

- ▶ Powered Contacts
- ▶ Modular Plug-In Design
- ▶ Low Voltage Sensor
- ▶ 11-Pin Socket
- ▶ U.L. "Limit Control"
- ▶ Optional Dirty Electrode Detection
- ▶ Optional Manual Reset Button Feature.
If Level Drops, Control is Deactivated Until Liquid Level Returns to Normal and Pushbutton is Depressed
- ▶ Optional Power Outage Feature Ignores Nuisance Outages and Resets When Power is Restored
- ▶ Solid State Reliability
- ▶ LED Monitoring
- ▶ Time Delays Available
- ▶ Meets CSD1 Requirements
- ▶ Optional Test Feature

Series 26M – General Purpose Control

Series 26M is designed for low-water cutoff protection. This control meets CSD1 requirements for boiler low water cutoff. Series 26M features powered contacts. If non-powered contacts are required, request information on Series 26NM.

Specifications

Contact Design	1 N.O. & 1 N.C. (powered)
Contact Rating (24/120/240VAC)	10 amp Resistive 1/3 hp
Mode of Operation	Direct
Sensitivity	0 - 26K ohm, factory set
Primary Voltage	24 VAC, 120 VAC, 240 VAC ¹
Secondary Voltage	2.3 VAC
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals¹	U.L. 353 File # MP1430
Terminal Style	Screw connector
Options	Time Delays, Power Outage, Manual Reset, Test Feature, Dirty electrode detection; See page E-11 for descriptions

Notes:

1. 240 VAC and 208/240 VAC units do not carry U.L. Limit Control recognition.

How to Order

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

1. Series	26M	X	X	X	X	X	XX	XX
2. Sensitivity	A – 4.7K B – 10K C – 26K	D – 50K E – 100K						
3. Supply Voltage	1 – 120 VAC 3 – 24 VAC	2 – 240 VAC 8 – 208/240 VAC						
4. Socket Style	A – 11 Pin Octal B – DIN Mount M – None, Module Only							
5. Enclosure	0 – None 1 – NEMA 1 4 – NEMA 4							
6. Option Package	See page E-11, Chart B for code letter.							
7. Time Delay (decreasing level) Option	03-90 seconds Blank 3 seconds							
8. Time Delay (increasing level) Option	00-90 seconds Blank 0 seconds							

Socket Details and Option Availability are located on web site.



Series 26M

Applications

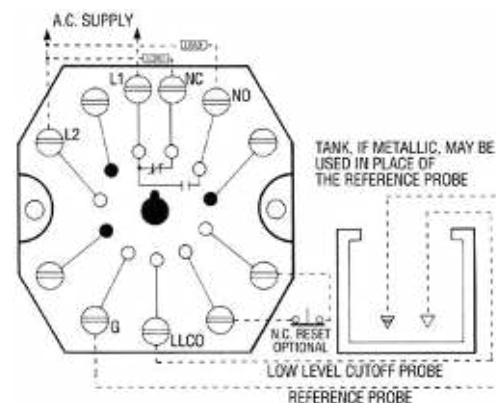
- Low-Water Cutoff
- Point Level
- Alarms

Dimensions



Note: Controls also available with DIN mount socket.

Wiring



Caution: Contacts are powered. If non-powered contacts are required, request information on Series 26NM.

Solutions in a Box: Application-Specific Kits Bring Simplicity to Systems Engineering

- ▶ Time Savers
- ▶ No Component Selection Hassles
- ▶ Compatible Components
- ▶ Little or No Assembly

If you need to automatically refill or drain tanks, wells or pressurized vessels, these convenient pre-packaged kits contain everything you need. These Warrick® level control kits combine all the know-how and components you'll need to add automatic control to pump-up/pump-down operations. Each kit is supplied with controllers, probes, electrical enclosures and full instructions.

TK Kits – Refill or Drain Open Tanks

TK-1 Kits are designed to automatically control the refill pump in open tanks and ponds that drain regularly, turning the pump ON when the liquid level in the tank drops to a point and turning it OFF when the level rises back to a second point. No assembly is required, just connect wire to control.

TK-2 Kits are designed for the opposite application—controlling the drain pump in open tanks and ponds that fill regularly. It turns the pump ON when the liquid level rises to a point and turns it OFF when the level drops back to a point.

WK Kits – Refill or Drain Wells

WK Kits are designed for use in wells. WK-1 Kits control refill in wells that drain regularly; WK-2 Kits control the pump-down in wells that fill regularly. Minimal assembly is required. WK Kits can also be used for low-water cutoff applications.

Length of suspension wire is 50 feet. Additional suspension wire (3Z1A) is available from your local Warrick Controls Stocking Representative or Distributor.

HP Kits – Refill or Drain Pressure Vessels

HP-1 Kits are designed to automatically control the refill pump in up to 125 psi pressure vessels that drain regularly, turning the pump ON when the liquid level in the vessel drops to a low point and turning it OFF when the level rises back to a high point. Minimal assembly is required. Also for low-pressure sealed vessels.

HP-2 Kits are designed for the opposite application—controlling the drain pump in pressure vessels that fill regularly. It turns the pump ON when the liquid level rises to a high point and turns it OFF when the level drops back to a certain point.

How To Order

Select Part Number based on application. Each kit contains everything needed for specified application: control, fitting, probes, electrical enclosure, and instructions.

Part No.	Application	Primary Voltage	Secondary Voltage	Sensitivity	Contact Rating	Mode of Operation
TK-1	Tank refill	115 VAC	12 VAC	26K	10 amp Resistive 1/3 hp	Inverse
TK-2	Tank drain					Direct
WK-1	Well or sump refill	115 VAC or 230 VAC		19K	30 amp Resistive 1 hp @ 115VAC or 2 hp @ 240 VAC	Inverse
WK-2	Well or sump drain					Direct
HP-1	Tank refill	115 VAC		26K	10 amp Resistive 1/3 hp	Inverse
HP-2	Tank drain					Direct



TK-1 shown



WK-1 shown



HP-2 shown

LS-350 Series

Combination Siphon and Level Sensor

- ▶ Multi-Level Switch Options
- ▶ Up to 4 Actuation Points
- ▶ Integral Siphon or Fill Tube
- ▶ Customized Mountings
- ▶ Custom Configurable

Save valuable space and costly installation/maintenance time with these highly customizable sensors. LS-350 units combine a siphon tube and up to four liquid level sensors as a single component. The complete unit installs through a single opening in the fluid container.

Simple and clean — a single component that enables remote monitoring of a tank's fluid content while allowing access for container filling and draining. These units are custom configured to fit the container of your choice, with a wide range of mountings, fluid and electrical connectors, materials and lengths.

Typical Applications

- Immuno-Chemistry/Cytology
- Hematology
- Automated Urine Analysis
- Laboratory Automation

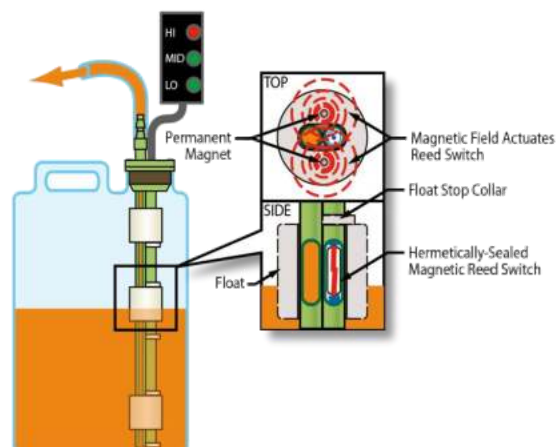
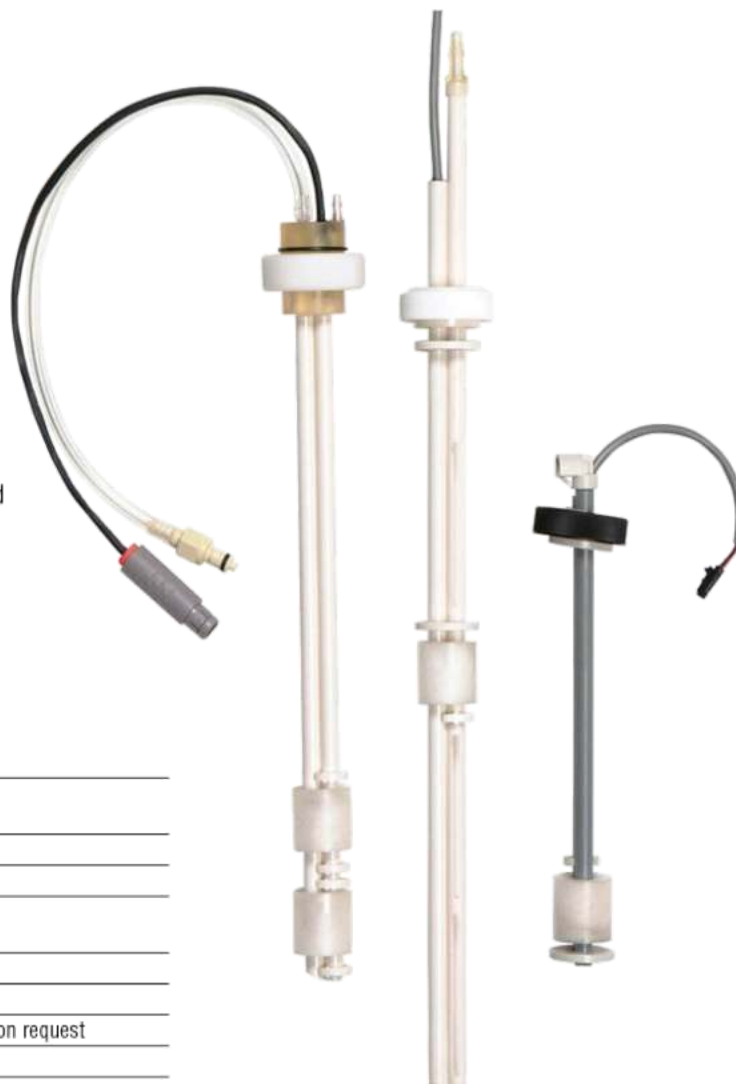
Specifications

Materials	
Stem and Mounting	Polysulfone or Noryl®
Floats	Polypropylene or Buna N
Gasket	Buna N
Operating Temperature	
Buna N Float	221°F (105°C) Max.
Polypropylene Float	210°F (99°C) Max.
Switch	SPST
Length	15" (380 mm) Max., Longer units available on request
Mounting Attitude	±30° from vertical
Actuation Level Points	6 Max.

Operating Principle

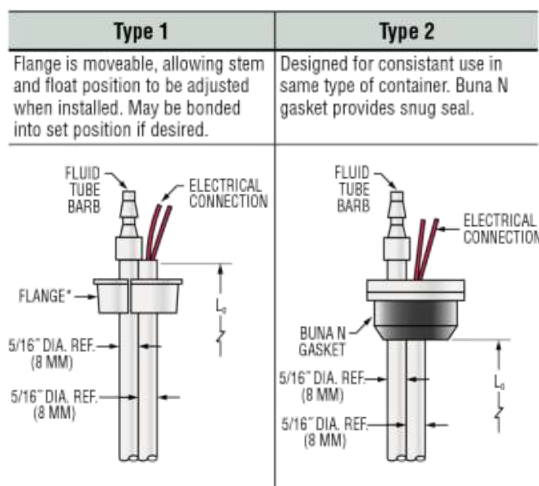
The LS-350 Series provides two functions: liquid level monitoring and fluid fill or extraction access. The latter function is accomplished with an integrated siphon tube that runs parallel to the float sensor stem and through the top mounting; it is commonly topped with a barb (or customer specified) fitting for the connection of flexible tubing. Fluid level sensing is accomplished with magnetic reed switch technology. One or more floats encircling a stationary stem are equipped with powerful, permanent magnets. As a float rises or lowers with liquid level, the magnetic field generated from within the float actuates a hermetically sealed magnetic reed switch mounted inside the stem. The switch actuation may be used for alarm, solenoid, pump or other fluid control operations.

ORDER IT!
Ordering is Easy! See Page B-13.
Easy online ordering too!



1. Mounting Types

Each mounting type can be configured with stem lengths (L_0) and as indicated below.

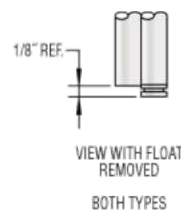
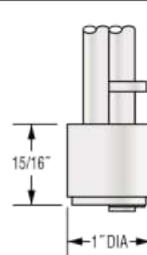
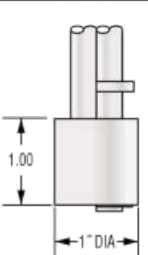


Mounting Hole Dia.	1.20~1.25" (30.5 mm/31.75 mm)	1.31~1.32" (33.3 mm/33.5 mm)
Stem, Mounting and Collar Material	Polysulfone	Polysulfone with Buna N Gasket
Pressure Rating (mounting)	Atmosphere (Not recommended for pressurized applications)	
Fluid Barb	Compatible 3/16" I.D. Hose (Options available)	
Max Length (L_0)	15 inches (38 cm) \pm 1/16" (2 mm)	
Mounting Position	Vertical \pm 30° Inclination	
Mounting Compatibility	Cubitainer® Style Opening	Tank Wall Thickness 1/32"~1/8"

* Orientation of slot in flange is not critical.

2. Float Types

A single float type is used for all actuation points.

	Buna N	Polypropylene
		
Part Number	128642	130893
Liquid Suitability	Oil-Based	Water-Based
Min. Media Specific Gravity	0.75	0.98
Operating Temperature	Oil: -40°F to +221°F (-40°C to +105°C) Water: to 180°F (82°C)	-40°F to +210°F (-40°C to +99°C)

3. 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 4 Actuation Levels.

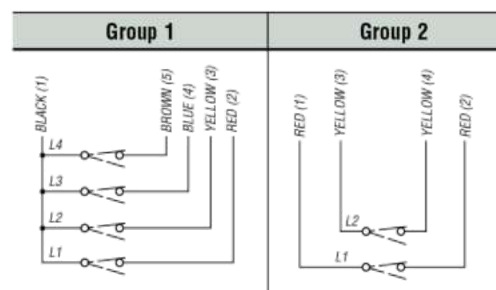
Group II Wiring: 1 or 2 Actuation Levels.

Switch (SPST, N.O. or N.C.): 10/20/50/100 VA.

Notes:

1. Other wiring options available. Consult factory.
2. Consult Factory for load information.

4. Wiring Group



5. Electrical Connections

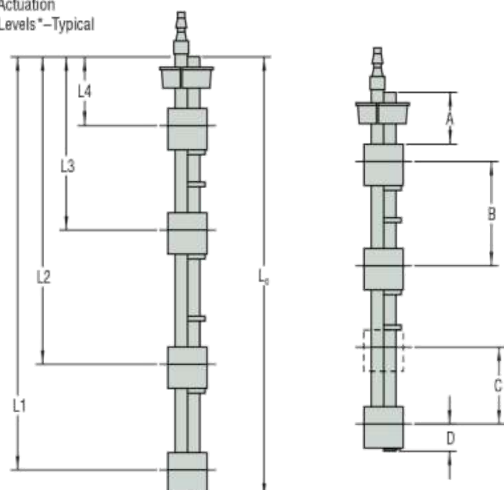
Type 1: Lead Wires, 24" to 26" (610 mm, Min.)

Type 2: Cable, 24" to 26" (610 mm, Min.)

6. Actuation Level Dimensions

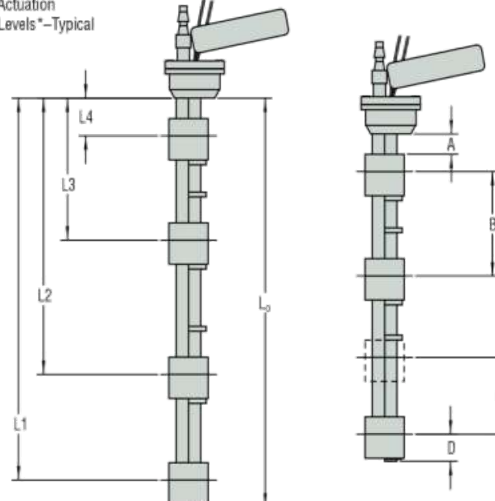
Type 1

Actuation
Levels*—Typical



Type 2

Actuation
Levels*—Typical



* Actuation level distances and L_0 (overall unit length) are measured from inner surfaces of mounting plug or flange. See mounting types on page B-11 for L_0 reference point.

** Length Overall (L_0) = L_1 + Dimension D. See Mounting Types for Maximum Length values.

Switch actuation levels are determined following the guidelines below.

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.

Float Type	Dimensions				
	A		B	C	D
	Type 1 Mount	Type 2 Mount			
Buna N	3/4" (19 mm), Min.	3/4" (19 mm)	1-3/4" (45 mm)	1/8" (3 mm) Minimum	15/16" (24 mm)
Polysulfone	1/2" (13 mm), Min.	1/2" (13 mm)	1-3/4" (45 mm)		1-3/16" (30 mm)

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 $\pm 1/8"$ (3 mm).

65800 Series Single Channel Zener Barriers Render Switches or Signal Conditioners Intrinsically Safe

Limits D.C. voltage and current to the hazardous area and provides a path for fault current

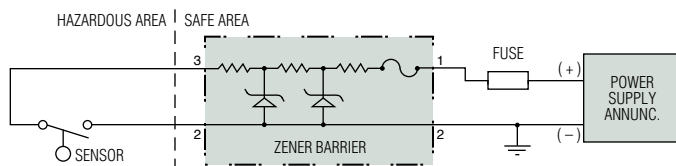
- ▶ Intrinsic safety with solid-state reliability
- ▶ Compact size streamlines installation
- ▶ Space-saving in multiples
- ▶ Encapsulated construction is impervious to dust and moisture

The exceptionally compact design of GEMS 65800 Series units saves space and simplifies installation; especially in multiples on a common mounting plate. They provide great economy as well since no explosion-proof enclosures are needed for sensor wiring. Encapsulated construction is impervious to dust and moisture. Single-screw mounting is standard, but units can be supplied with an optional clip for rail mounting. The single through-mounting screw also provides electrical connection to ground through the earth-grounded mounting surface.

Any non-voltage-producing sensor or switch is rendered intrinsically safe for hazardous locations when properly connected to the output of these Zener Barriers.

See table on Page L-2 for specific approval information.

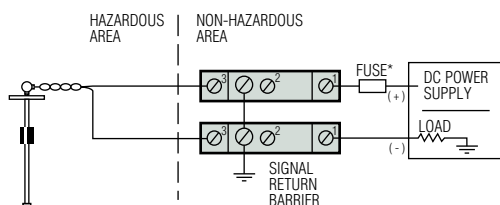
Typical Wiring Diagram



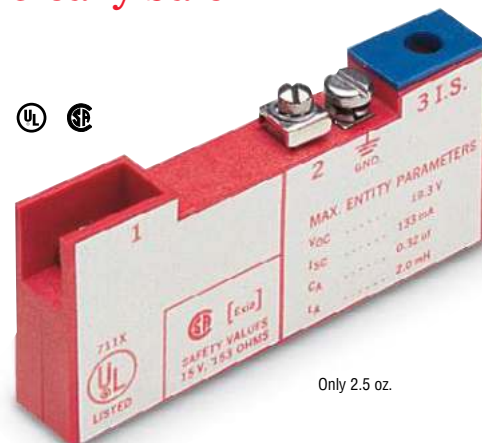
Positive single-channel Zener Barrier with negative ground.

For most non-voltage-producing devices located in a hazardous area, a single Zener Barrier that is negative-earth-ground can be used for intrinsic safety. Instrumentation that produces an output (signal conditioners) usually requires two barriers, one for each "floating" lead. In this case, a dual channel barrier can be provided (see L-10 and L-11).

Or, for applications where the instrument signal return level cannot be reduced, a supply barrier and a low resistance return barrier can be supplied (shown below).

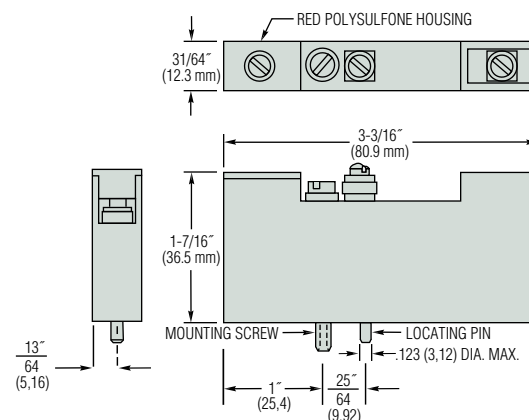


For floating leads: 65800 Series supply and return barriers for signal conditioners.



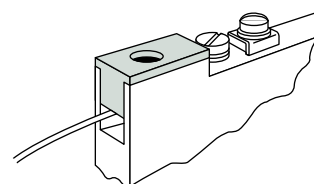
Only 2.5 oz.

Dimensions



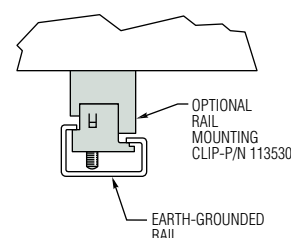
Protective Cover

Protective cover over the output terminal (3) assures intrinsic safety of sensor wiring.



Optional Rail Mounting

Gems Single Channel Zener Barriers can be supplied on special order with a clip for rail mounting. Clip attaches to barrier with standard mounting screw.



How To Order

Specify Part Number based on Barrier Type and Input Power requirements.

Zener Barrier Type	DC Input to Barrier, Max.		Signal Polarity	Series Resistance ohms	Application Group	Reactive Limits		Part Number
	Voltage	Current				Capacitance μ f	Inductance mh	
Supply	+15	250 mA	Positive	183	A, B, C, D, E, G	0.32	2.0	111950 ⚡
	+20	125 mA		303		0.18	4.1	111952
	+24	62 mA		390		0.12	3.0	111954
	+30	62 mA		750		0.07	1.8	111956
	+18	125 mA		183	C, D, E, G	0.72	3.6	114074
	+24	62 mA		234		0.33	3.1	114072
	+27	62 mA		276		0.24	3.3	114175
	+30	250 mA		303		0.20	3.0	113000 ⚡
Signal Return	+30	250 mA		33.9	A, B, C, D, E, G	0.07	.35	114166 ⚡
Optional Rail Clip								113530 ⚡

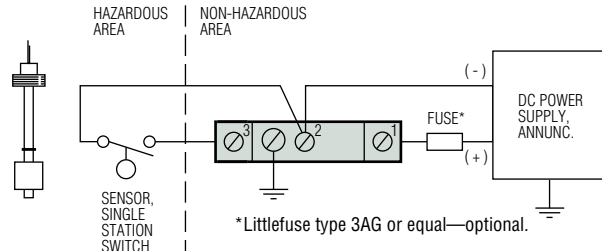
Notes:

1. All models shown are for Class I and II, Division 1 and 2. Specific Application Groups are tabulated.
2. Ambient operating temperatures for all models shown is -40°F to +140°F (-40°C to +60°C).

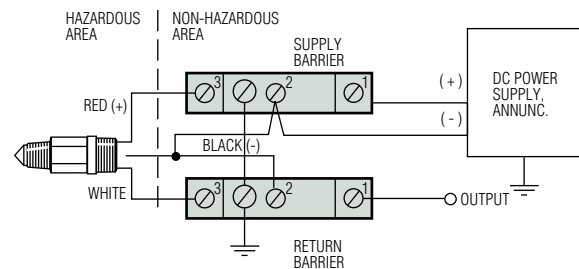
⚡ – Stock Items.

Typical Application Examples

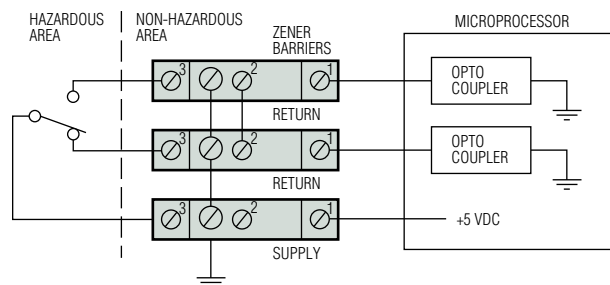
Sensors or Switches may be any non-voltage-producing device. Typical are: flow and level switches, temperature switches (thermostats), pressure switches or passive resistive transducers or transmitters. Below are typical examples.



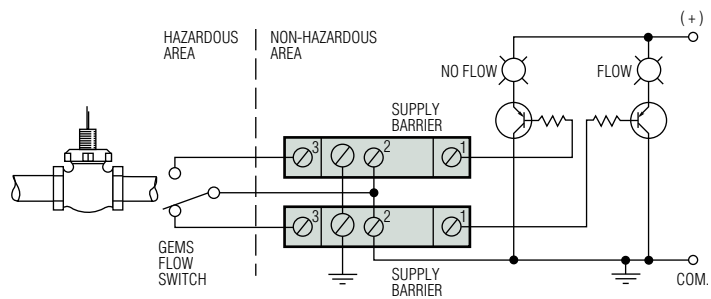
With GEMS level switch or any other non-voltage-producing device located in a hazardous area.



Supply and Return Zener Barriers used with GEMS ELS-1100 Series electro-optical level switch.



For optically coupled microprocessor. 65800 Series supply with two return barriers for SPDT switch.



Used with GEMS flow switch located in a hazardous area for flow/no flow indication.

LS-7 with 5 Amp Relay

► O-Ring Sealed, Water Resistant J-Box

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

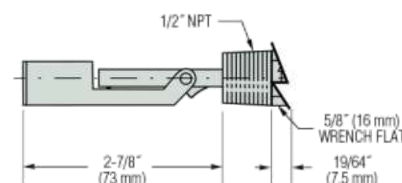
Specifications

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

Order by Part Number: 181291



Dimensions



LS-1 – Miniature Level Switch

- Extremely Compact
- Easy Installation
- Low Cost

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

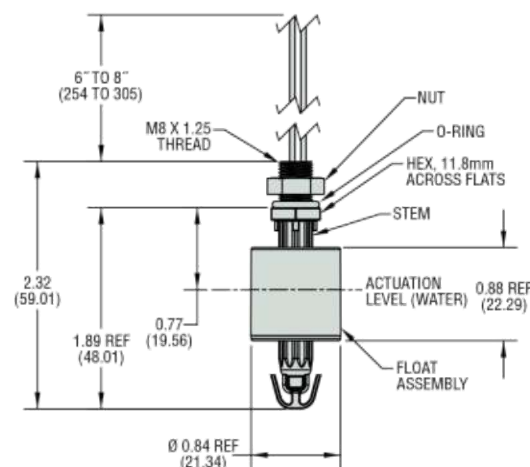
Specifications

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

Order by Part Number: 602881



Dimensions



LED Transmitter Versions – Miniature Size

- ▶ LED indicators ideal in low or no ambient light
- ▶ Integral transmitter with choice of signal conditioned output
- ▶ Lengths to 10 feet (3 meters)
- ▶ Pressures to 400 PSI (27 bar) – Temperature to 300°F (149°C)

These Mini SureSite Indicators excel where zero and low ambient light make visual indicators difficult to read. These mini indicators feature all the benefits of a SureSite, like safe and durable stainless steel process fluid containment, while combining a continuous output transmitter with a bright LED channel.

The LED indicator assembly integrates a continuous level transmitter reducing overall footprint. A variety of signal conditioners provide the output you require. Forget the flashlights and squinting required to view antiquated sightglasses.

Typical Applications

- Pharmaceuticals • Medical Equipment • Food and Beverages
- Marine • Rail • Boilers

Specifications

Indication Length	5" to 120" (13 to 305 cm) in 0.5" (13 mm) increments
Media	Waters, Coolants, Light Oils, Diesel, Hydraulics
Specific Gravity	Minimum 0.8 SG to 1.2 SG
Materials	
Chamber Housing	316/316L Stainless Steel
Float	316/316L Stainless Steel
Shroud	Polycarbonate
O-Ring (Wetted)	Viton®, unless otherwise specified
J-Box Enclosure	Die cast Aluminum
Reliability and Durability	Expected 10 year service life
Performance	
Resolution	3/8" (9.5 mm)
Accuracy	±1/2" (13 mm)
Output Signal	4-20 mA to within ±3% of full scale
Temperature Ranges	
Process	-40°F to +300°F (-40°C to +149°C)
Ambient	-40°F to +160°F (-40°C to +71°C)
Operating Pressure	Vacuum to 400 psig (27.6 bar)
Environmental	Enclosure: NEMA 4X IP65 (Water Resistant)
Input Power	20 to 28VDC, @100mA. Consult Factory for other voltages
Outputs	4-20 mA continuous current loop (3 wire) 0-5 V continuous (3 wire) 0-10 V continuous (3 wire)
Mechanical Interface	Custom configured for tank (per mini SureSite offering), 1/2" NPT to junction box
Mounting Orientation	
Unit Positions	AM-L, BM-L, CM-L, DM-L
Shroud Position	See Selection Guide; Step 2 for Codes
Calibration	Field Adjustment Null and Span/Factory Calibrated



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1. Mounting Configuration Type

Based on process connection locations.

	Type AM-L Top and Bottom Process Connections	Type BM-L Side and Side Process Connections	Type CM-L Top and Side Process Connections	Type DM-L Side and Bottom Process Connections
Typical Lengths*	C to C = L + 9.5" (241 mm)	C to C = L	C to C = L + 6" (152 mm)	C to C = L + 6" (152 mm)
Length of Indication (Uninterrupted)	120" (305 cm), Maximum			

* Formula provided is for approximation only. Final dimensions will vary due to connections type, position, cable or junction box location, and specific gravity of process liquid. Gems will confirm final dimensions before manufacturing.

2. LED Transmitter Assembly Location

Position relative to process connection location. All illustration views are from the top. Codes with "+" indicate views when 3/4" side ports are used.

Transmitter Assembly Location Code						
A	A+	B	C	D	E	E+

Approximate angle of view - 270°

3. J-Box Location

Drawings are typical, and for reference only. Final, specific locations are determined at time of manufacture.

J-Box Location Code		
1 Side Mount Below Bottom Port	2 Side Mount Above Top Port	3* Top Mount

* Requires a Blind Fixed Top Connection. See Connection Code T1 in the chart on next page.

LED Assembly Cable Egress




For J-Box Location 1,
LED Transmitter Assembly
cable will egress from the
bottom of the assembly.

For J-Box Locations
2 and 3, the cable will
egress from the top of
the assembly.



4. Connection Codes

(See complete descriptions below)

		Blind		NPT				Flange		Weld	
				Fixed		Removable		Fixed	Removable	Socket Butt	Removable Butt
		Fixed	Removable	Female	Male	Female	Male				
TOP 	Standard Connections	T1	T10	T2	T3	T11	T12	T19	T20	T18	T13
	Sanitary Connections							T7	T8		
SIDE 	Sa	S1	S2	S3	S4	S5	S6				
	Sb										
BOTTOM 	Standard Connections	B1	B10	B2	B3	B11	B12	B19	B20	B18	B13
	Sanitary Connections							B7	B8		

— Connection Codes and Materials background-shaded in this color are stocked by Gems. Select these connections where possible to obtain the most economical SureSite Indicators with prompt delivery.

Note: Gems recommends a removable top and/or bottom connection for float access.

Connection Code Descriptions

Please provide all connections when completing the **OrderIt!** Product Check List (located on the following page).

Note: Before selecting your connections, consider incorporating your vent and drain requirements.

T & B (Top and Bottom)

- T/B 1. Welded cap
T/B 2. Welded cap with FNPT
T/B 3. Welded cap with MNPT
T/B 7. Sanitary flange
T/B 8. Sanitary flange with mating blind flange
T/B 10. Standard fixed flange/mating blind flange
T/B 11. Standard fixed flange/mating FNPT reducing flange

- T/B 12. Standard fixed flange/mating flange with MNPT nipple
T/B 13. Standard fixed flange/mating flange with butt weld nipple
T/B 18. Welded cap with butt weld nipple
T/B 19. Welded cap with ANSI flange
T/B 20. Standard fixed flange/mating reducing flange spool with ANSI flange

Sa & Sb (Sides)

- S1. No connection
S2. MNPT nipple
S3. FNPT coupling
S4. ANSI flange
S5. Sanitary flange
S6. Buttweld nipple

5. Signal Conditioner Assemblies

Gems signal conditioners provide outputs for direct connection to a wide range of instrumentation. They are ideal for large, multi-tank complexes. Units with 4-20 mA outputs are particularly well suited for instrumentation control loops. Consult LED SureSite Installation, Operation and Maintenance bulletin.



Small Size – Engineered Plastics

LS-300 Engineered Plastics Series Brings Multi-Point Switching to Shallow Tanks

Your most complete line of small, polysulfone liquid level switches...all from Gems Sensors.

- ▶ All-Plastic Wetted Parts
- ▶ 1 to 4 Actuation Levels
- ▶ Lengths to 20 inches (50cm)
- ▶ U.L. Recognized; CSA Listed Versions Available

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.

1. Mounting Types

Each mounting type can be configured with stem lengths (L_0) and float materials indicated in this bulletin.

NPT Threads		Straight Threads		
Type 21 1/8" NPT	Type 22 1" NPT	Type 31 3/8" – 24	Type 32 1-5/16" – 12	Type 33 5/8" – 11
Metric Threads		Compression Types		
Type 41 G 1/4" (1/4" – 19 BSP)	Type 42 G 1" (1" – 11 BSP)	Type 51 M12 x 1.5 Straight Thread	Type 71 ¹ 5/8" – 11	Type 11 No Mounting
Flange Mountings ²				
Type 61 2" O.D. Flange		Type 63 Pop Flange		

Stem, Mounting and Collar Material	Polysulfone, Noryl®
Max Length (L_0)	20 inches (50 cm) Tolerance of $L_0 = \pm 1/16"$ (2 mm)
Mounting Position	Vertical $\pm 30^\circ$ Inclination



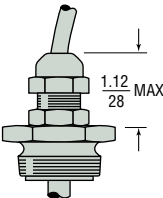
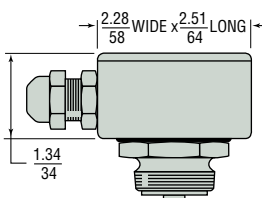
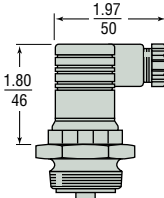
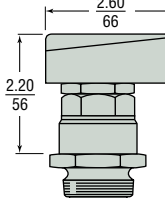
- Notes:
1. Type 71 mounting to be used with 3/4" diameter float only.
 2. Not recommended for pressure applications.

Dimensions expressed as: $\frac{\text{inches}}{\text{millimeters}}$

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2. Electrical Connections

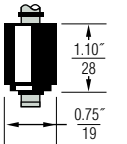
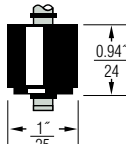
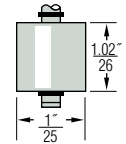
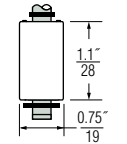
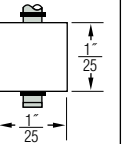
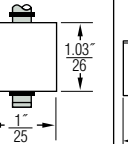
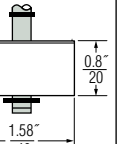
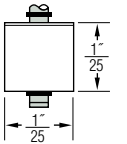
	Type 1 Leadwire	Type 2 Cable	Type 3 Liquid-Tight Cable	Type 4 Junction Box Assembly	Type 5 DIN43650 Plug	Type 6 DIN43651 Plug
						
Compatible Mounting Type(s)	All		42		42	42
Protection Rating	IP64		IP68	IP65		
Extended Leads	#22 AWG PVC Wire, 24" (610mm) Min.	#22 AWG PVC Jacketed Cable, 24" (610mm) Min.		Terminal Box (7 Terminals)	3 Poles	6 Poles
Max. Number of Levels						
Group I	4				2	4
Group II	2				1	2

* Not CSA Approved

** Not UL or CSA Listed

3. Float Types

A single float type is selected for use at all actuation points.

Float Material	Buna N		Polysulfone	Polypropylene				PVDF
	3/4"	1"		Solid Foamed		Hollow – 20% Glass Filled		1"
Compatible Mounting Types	11, 21, 22, 31, 32, 33, 41, 42, 51, 61, 63, 71	11, 21, 22, 31, 32, 33, 41, 42, 51, 61, 63	11, 21, 22, 31, 32, 33, 41, 42, 51, 61, 63	11, 21, 22, 31, 32, 33, 41, 42, 51, 61, 63, 71	11, 21, 22, 31, 32, 33, 41, 42, 51, 61, 63	11, 21, 22, 31, 32, 33, 41, 42, 51, 61, 63	11, 21, 31, 33, 41, 51	11, 21, 22, 31, 32, 33, 41, 42, 51, 61, 63
Float Dimensions								
Part Number	187553	39049	39005	197732	119455	145730	239292	174515
Float Material Suitable for...	Oil, Fuels		Water-based Liquids	Broad Chemical Use		Low Specific Gravity Liquids		Highest Temperature
Operating Temperature ¹	Water: to 180°F (80°C)		-40°F to +221°F (-40°C to +105°C)	-40°F to +212°F (-40°C to +100°C)		-40°F to +221°F (-40°C to +105°C)		-40°F to +250°F (-40°C to +121°C)
	Oil: to 221°F (105°C)	Oil: -40°F to +221°F (-40°C to +105°C)						
Pressure, psi (bar) Max. ²	300 (21)	250 (17)	50 (3.5)	100 (6.9)	150 (10)	50 (3.5)	100 (7)	50 (3.5)
Min. Media Specific Gravity	0.70	0.50	0.75	0.95	0.90	0.60	0.37	0.86

Notes:

1. Operating temperature range based on float ratings.

2. When used with mounting Type 21, 32 or 22 only; Mounting Type 61, and 63 are not recommended for pressure applications. Pressures are derated with increasing temperature above 70°F

Dimensions expressed as: $\frac{\text{inches}}{\text{millimeters}}$

4. 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 4 Actuation Levels.

Group II Wiring: 1 or 2 Actuation Levels.

Switch (SPST, N.O. or N.C.): 10/20/50/100 VA.

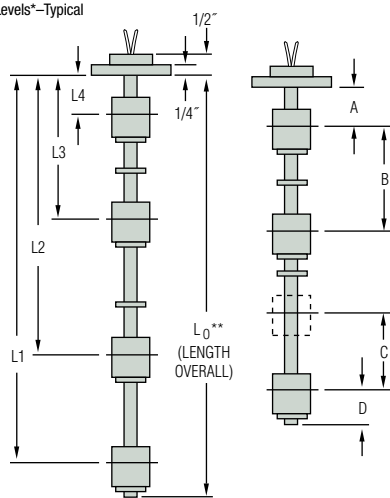
Approvals: LS-300 Series switches are U.L. Recognized – File No. E45168; CSA Listed – 30200.

Notes:

- Units with 50 and 100 VA switches are not U.L. Recognized or CSA Listed.
- Other wiring options available. Consult factory.
- Consult Factory for load information.

6. Actuation Level Dimensions

Actuation Levels—Typical



* Actuation level distances and L_0 (overall unit length) are measured from inner surfaces of mounting plug or flange. See mounting types on Page B-3 for L_0 reference point.

** Length Overall (L_0) = L_1 + Dimension D. See Mounting Types for Maximum Length values.

5. Wiring Group

Electrical Connection	Group 1	Group 2
Lead Wire (*)		
Cable (*)		

*Pin correlation of plug connectors shown in parenthesis.

Switch actuation levels are determined following the guidelines below.

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.

Float Type	Dimensions			
	A	B	C	D
Buna N – 0.75" (P/N 187553)	11/16" (17 mm)	1-7/16" (11.1 mm)	1/8" (3 mm) Minimum	7/8" (22 mm)
Buna N – 1" (P/N 39049)	.69" (18 mm)	1.5" (38 mm)		.81" (21 mm)
Polysulfone (P/N 39005)	.56" (14 mm)			0.95" (24 mm)
Solid P.P. – 0.75" (P/N 197732)	0.5" (13 mm)			1.19" (30 mm)
Solid P.P. – 0.97" (P/N 119455)	0.43" (11 mm)			1.13" (29 mm)
Hollow P.P. – 1" (P/N 145730)	0.62" (16 mm)			0.88" (22 mm)
Hollow P.P. – 1.58" (P/N 239292)	0.63" (16 mm)	1.70" (43 mm)		0.98" (25 mm)
PVDF (P/N 174515)	0.63" (16 mm)	1.5" (38 mm)		1.13" (29 mm)

Notes:

- Actuation levels are calibrated on ascending fluid level with water, specific gravity 1.0, as the calibrating fluid, unless otherwise specified.
- Tolerance on actuation levels is $\pm 1/8"$ (3 mm).

3800 Series – Pressure Transmitter

- ▶ FM and ATEX Approvals for Hazardous Locations
- ▶ 0 to 10,000 PSI (0 to 689 bar)
- ▶ Field Adjustable – 5:1 Turndown
- ▶ Compact, 316 Stainless Steel, Hermetically Sealed Enclosure
- ▶ 17-4 Stainless Steel Sensor, No O-Ring
- ▶ Dual Seal Approval
- ▶ Flush Mount Option Available

The 3800 Pressure Transmitter is a compact loop-powered (4-20 mA) transmitter, with a low power 1-5 VDC option also available. Its rugged construction makes cost of ownership low and it carries a three-year warranty. The 3800 Pressure Transmitter is suitable for hazardous locations and hostile environments. It meets applications where dependable, continuous monitoring is preferred. Zero and span are field adjusted via Gems calibration kit with USB communication cable.

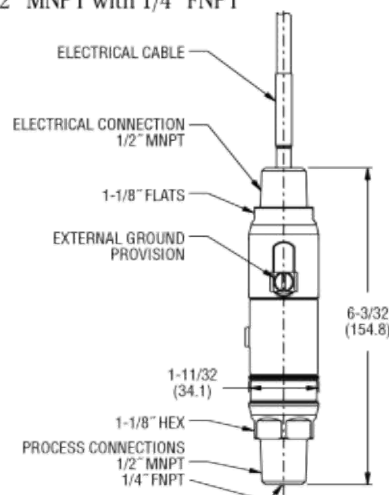
Specifications

Pressure Range	0 to 10,000 psi
Over Pressure	
0-100 psi	3x FSPR
Up to 10,000 psi	2x FSPR
Burst Pressure	
0-100 thru 0-250 psi	40x FSPR
0-500 thru 0-1,000 psi	20x FSPR
0-2,500 psi	10x FSPR
0-5,000 psi	8x FSPR
0-10,000 psi	4x FSPR
Performance	
Long Term Stability	≤±0.5% URL/year
Accuracy	±0.25% URL (BFSL) Linearity, Hysteresis and Repeatability
Response Time	≤5 ms
Turndown	5:1 (2:1 for 100 psi range)
Temperature Ranges	
Compensated	-40°F to +176°F (-40°C to +80°C)
Ambient	-40°F to +176°F (-40°C to +80°C)
Process	-40°F to +194°F (-40°C to +90°C)
Storage	-40°F to +194°F (-40°C to +90°C)
Electrical	
Supply Voltage	8-30 VDC
Output	4-20 mA or 1-5 VDC (27 mW ± 5 mW @ 9 VDC)
Loop Resistance	800 Ohms @ 24 VDC
Circuit Protection	Reverse polarity and EMI/RFI protected
Connection	
Conduit Size	1/2" MNPT
Termination	18 AWG shielded cable, 6-feet (1.8 m)
Mechanical Configuration	
Wetted Parts	17-4 PH Stainless Steel
Enclosure	316 Stainless Steel (CF8M)
Approvals	FM, ATEX, CE
Weight	1.8 lbs. (0.8 kg)

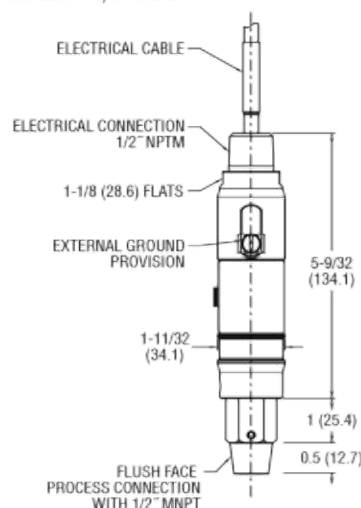


Dimensions

1/2" MNPT with 1/4" FNPT



Flush Mount – 1/2" MNPT



inch
(mm)

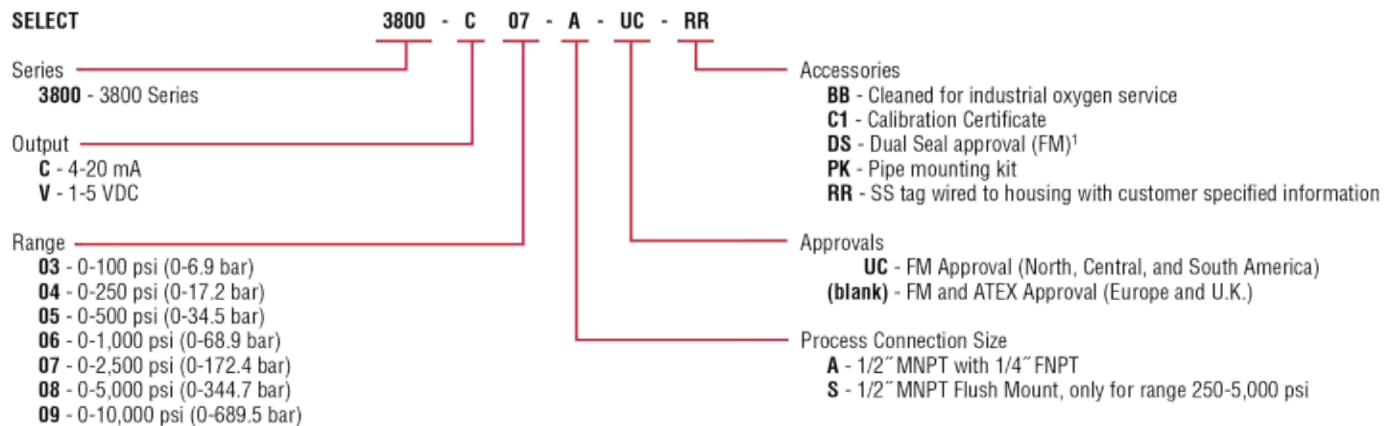
Agency Approvals

Approved*	Safety Method	Approval
FM (U.S. and Canada)	Explosion Proof Hazardous Locations	Class I, II, III; Division 1 Groups A-G; T5; Type 4X
	Non-incendive	Class I, II, III; Division 2 Groups A-G; T5; Type 4X
ATEX	Flameproof	II 2 G Ex d IIC T5 IP 66

* Product holds a Canadian Registration Number (CRN) in all provinces.

How to Order

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



Note:

1. Dual Seal version is not hermetically sealed.

For field adjustability, a Calibration Kit is required. Calibration Kit includes hardware and software. Contact Gems for additional information. P/N 9231503

3820 Series – Pressure Transmitter with 30V Switching

- Combines Continuous Output with Adjustable Set Point Switch
- FM and ATEX Approvals for Hazardous Locations
- Field Adjustable – 5:1 Turndown
- Compact, 316 Stainless Steel, Hermetically Sealed Enclosure
- Stainless Steel Sensor, No O-Ring
- Dual Seal Approval
- Flush Mount Option Available

The 3820 Pressure Transmitter is a compact loop-powered (4-20 mA) transmitter, with a low power 1-5 VDC option also available. These are the same as our 3800 Series with the addition of an integrated 30V/120mA switch. The switch setpoint is specified at time of order for factory setting, yet may be also field adjusted using the Gems Calibration Kit (that will also adjust the zero and span points of the transmitter). 3820 Series Pressure Transmitters are suitable for hazardous locations and hostile environments, and are ideal for applications where dependable, continuous monitoring is required. A rugged construction makes cost of ownership low and they carry a three-year warranty.

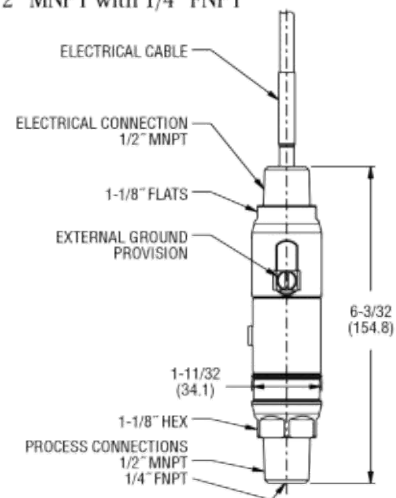
Specifications

Pressure Range	0 to 10,000 psi
Over Pressure	
0-100 psi	3x FSPR
Up to 10,000 psi	2x FSPR
Primary Switch Output	
Accuracy	±2% URL
Type	Normally Open Solid-State Relay
Electrical Rating	30V, 120 mA
Temperature Effect	±2% URL/100°F (38°C) @ -40°F to +176°F (-40°C to +80°C)
Burst Pressure	
0-100 thru 0-250 psi	40x FSPR
0-500 thru 0-1,000 psi	20x FSPR
0-2,500 psi	10x FSPR
0-5,000 psi	8x FSPR
0-10,000 psi	4x FSPR
Continuous Output	
Long Term Stability	≤±0.5% URL/year
Accuracy	±0.25% URL (BFSL) Linearity, Hysteresis and Repeatability
Response Time	≤5 ms
Turndown	5:1 (2:1 for 100 psi range)
Temperature Ranges	
Compensated	-40°F to +176°F (-40°C to +80°C)
Ambient	-40°F to +176°F (-40°C to +80°C)
Process	-40°F to +194°F (-40°C to +90°C)
Storage	-40°F to +194°F (-40°C to +90°C)
Electrical	
Supply Voltage	8-30 VDC
Output	4-20 mA or 1-5 VDC (27 mW ± 5 mW @ 9 VDC)
Loop Resistance	800 Ohms @ 24 VDC
Circuit Protection	Reverse polarity and EMI/RFI protected
Connection	
Conduit Size	1/2" MNPT
Termination	18 AWG shielded cable, 6-feet (1.8 m)
Mechanical Configuration	
Wetted Parts	17-4 PH Stainless Steel
Enclosure	316 Stainless Steel (CF8M)
Approvals	FM, ATEX, CE
Weight	1.8 lbs. (0.8 kg)

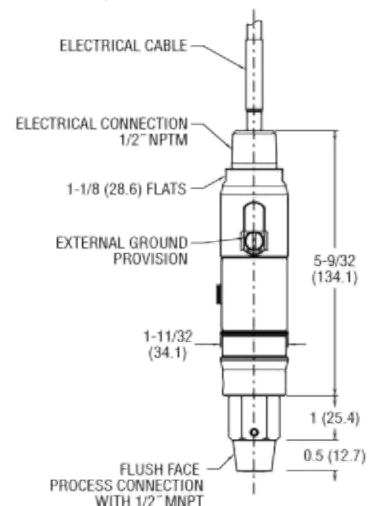


Dimensions

1/2" MNPT with 1/4" FNPT



Flush Mount – 1/2" MNPT

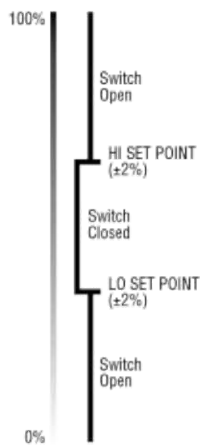


inch
(mm)

Switch Operation

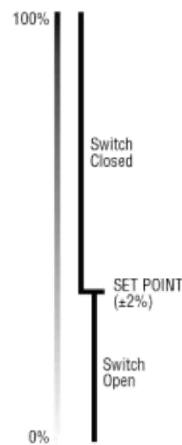
Window Mode (WM)

Switch is closed when the process pressure is within the user selected range (LO and HI set points), and open when the pressure is above or below the range.



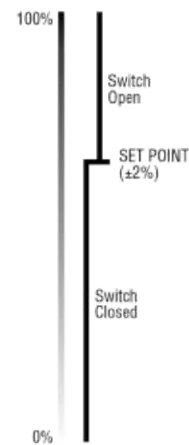
Close on Rise/Open on Fall (CR)

Switch is open when the process pressure is below the user selected set point and closed when the pressure is above that set point.



Open on Rise/Close on Fall (OR)

Switch is closed when the process pressure is below the user selected set point and open when the pressure is above that set point.



Agency Approvals

Approved*	Safety Method	Approval
FM (U.S. and Canada)	Explosion Proof Hazardous Locations	Class I, II, III; Division 1 Groups A-G; T5; Type 4X
	Non-incendive	Class I, II, III; Division 2 Groups A-G; T5; Type 4X
ATEX	Flameproof	II 2 G Ex d IIC T5 IP 66

* Product holds a Canadian Registration Number (CRN) in all provinces.

How to Order

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

SELECT	3820 - C 07 - A - UC - RR - FS - WM	
Series	3820 - 3820 Series	Switch Operation
Output	C - 4-20 mA V - 1-5 VDC	WM - Window Mode CR - Close on Rise/Open on Fall OR - Open on Rise/Close on Fall
Range	03 - 0-100 psi (0-6.9 bar) 04 - 0-250 psi (0-17.2 bar) 05 - 0-500 psi (0-34.5 bar) 06 - 0-1,000 psi (0-68.9 bar) 07 - 0-2,500 psi (0-172.4 bar) 08 - 0-5,000 psi (0-344.7 bar) 09 - 0-10,000 psi (0-689.5 bar)	Fixed Set Point FS - Specify set point (in PSI or BAR, see example) ¹ Example: FS60PSI for 60 PSI or FS3BAR for 3 BAR
Process Connection Size	A - 1/2" MNPT with 1/4" FNPT S - 1/2" MNPT Flush Mount, only for range 250-5,000 psi	Accessories BB - Cleaned for industrial oxygen service C1 - Calibration Certificate DS - Dual Seal approval (FM) ² PK - Pipe mounting kit RR - SS tag wired to housing with customer specified information
		Approvals UC - FM Approval (North, Central, and South America) (blank) - FM and ATEX Approval (Europe and U.K.)

Note:

- Set Point must be within your Pressure Range.
- Dual Seal version is not hermetically sealed.

For field adjustability, a Calibration Kit is required. Calibration Kit includes hardware and software. Contact Gems for additional information. P/N 9231503

General Purpose ELS –1100 Series Satisfies Most Applications

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

Specifications

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

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



Dimensions

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

How To Order

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

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

⚡ — Stock Items.

Intrinsically-Safe Versions

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

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

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-33.



ELS-950 Series

Rugged Electro-Optic Level Sensors

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

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

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

Specifications

Materials	
Housing	Polysulfone (Contact Gems for alternative material types)
Prism	Polysulfone
O-Ring	Fluorocarbon (1/4-18 NPSM - None)
Electronics	Over-molded TPE
Max. Operating Pressure	0 to 250 psi (0 to 17 bar)
Operating Temperature*	-40°F to +230°F (-40°C to 110°C)
Current Consumptions (No Load)	
5 VDC	4 mA No Load
12 VDC	10mA No Load
Output	Sink 40 mA max., up to 30 VDC
Repeatability	±1 mm
Lead Wires	3× TPE Insulated; 22 AWG
Approvals	CE, UL file No. E108913 IP66/67 Rating ROHS Compliant

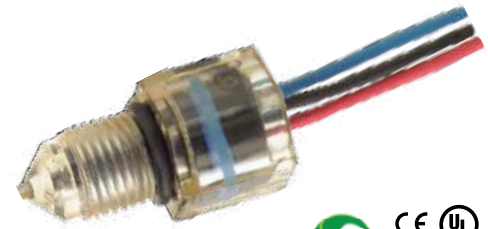
* These switches are not for use in freezing liquids or steam/high condensation environments. Contact Gems for alternative solutions.

How To Order

Specify Part Number based on Input and Output Condition required.

Input Power	Actuation Condition	Lead Wire Length	Mounting Type		
			1/4-18 NPSM	1/2-20 UNF-2B*	M12 × 1 – 8g*
5 VDC ±10%	Wet	6"	224504 ⚡	224501 ⚡	224508 ⚡
		2 m	—	—	226549
	Dry	6"	—	—	224509
		2 m	—	—	226550
12 VDC ±10%	Wet	6"	224506 ⚡	—	224510 ⚡
		2 m	—	—	226551
	Dry	6"	—	—	224511 ⚡
		—	—	—	—

* Supplied with standard fluorocarbon o-ring.
⚡ Stock items.

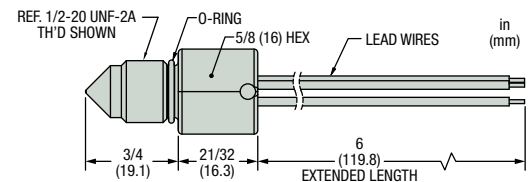


File No. E108913

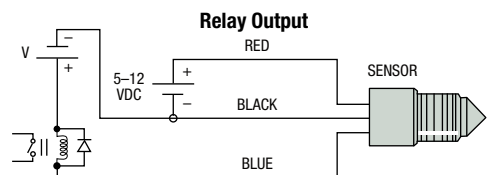
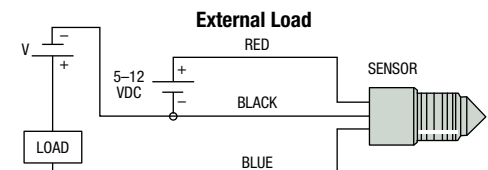
Typical Applications

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

Dimensions



Wiring Diagrams

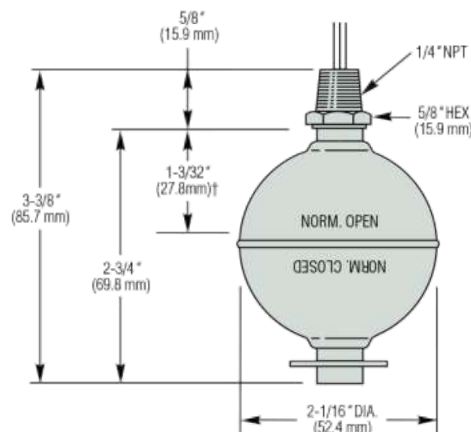


Large Size – Alloys

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

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

Dimensions



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

Common Specifications

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

Approvals: LS-1950 Series switches are U.L. Recognized – File No. E45168 and are CSA Listed - File No. 30200

RoHS – In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

(Part No. 79999 is U.L. Recognized RoHS Compliant only).

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

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

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

Notes

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

2. UL Resistive Rated

⚡ – Stock Items.



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

Large Size – Alloys

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

Excellent stability for general use in oils and water.

LS-1800 Series –
Buna N Float



LS-1800 Series –
Teflon® Float



LS-1900 Series –
Buna N Float



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

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

Dimensions

LS-1800 Series		LS-1900 Series
Buna N Float	Teflon® Float	Buna N Float

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

Common Specifications

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

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

RoHS – In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

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

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

Material				Min. Liquid Sp. Gr.	Operating Temperature	Pressure, PSI, Max.	Switch* SPST	Part Number
Series Number	Stem and Mounting	Float	Other Wetted					
LS-1800	Brass	Buna N	316 Stainless Steel, Hysol	.75	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA	01801 ⚡
		Buna N		.75			100 VA**	35651 ⚡
	316 Stainless Steel	Buna N		.65	-40°F to +250°F (-40°C to +121°C)	300	20 VA	01807 ⚡
		Teflon®		.65			100 VA**	35657 ⚡
LS-1900	Brass	Buna N	316 Stainless Steel, Hysol	.55	Water: to 180°F (82°C) Oil: -40°F to +230°F (-40°C to +110°C)	150	20 VA, N.O.	01811 ⚡
		Buna N		.55			20 VA	01901 ⚡
	316 Stainless Steel	Buna N		.55			100 VA***	35676 ⚡
		Buna N		.55			20 VA	01907 ⚡
							100 VA	35682 ⚡

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

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

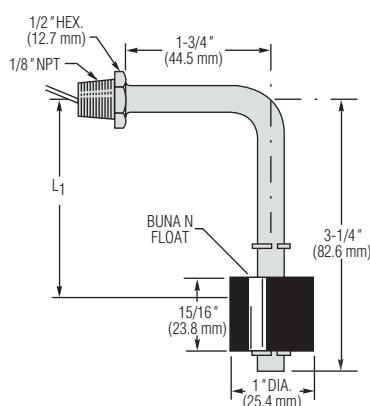
**LS-1800 100 VA switches are not U.L. Recognized.

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

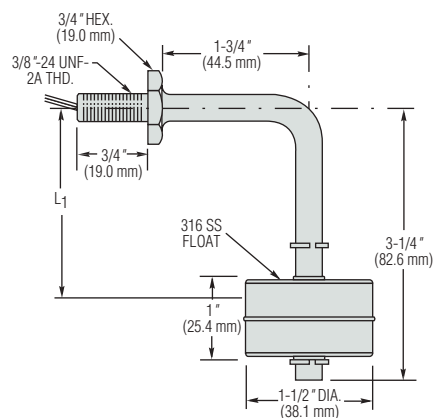
These units perform in liquids with specific gravities as low as .45; switches protrude into tank less than 3 inches.

Dimensions

Type I – 1/8" NPT



Type II – 3/8-24" Thread



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

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

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

Common Specifications

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

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

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

Mounting Attitude: Vertical ± 30°.

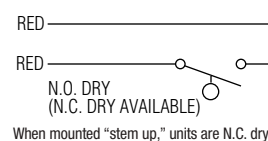
Other Wetted Materials: Float Stop is Beryllium Copper or PH-15-7-MO Stainless Steel.

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

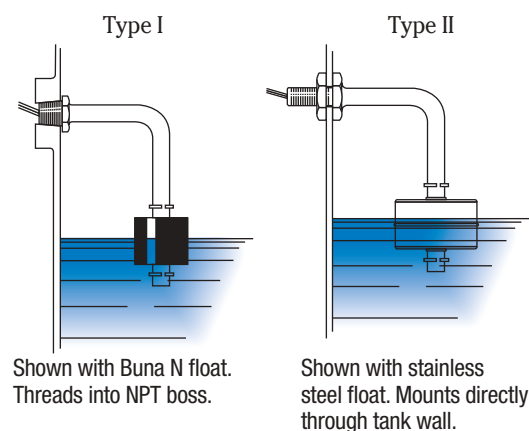


Type II version shown.

Typical Wiring Diagram



Typical Installation



Shown with Buna N float. Threads into NPT boss.

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

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

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

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

⚡ – Stock Items.

FS-927 Series – Small Design for Tight Instrumentation Packages

Flow Rate Settings: 0.10 GPM to 1.50 GPM

Port Size: 1/4" NPT

Primary Construction Material: Brass, Stainless Steel

Setting Type: Fixed

Measuring only 1" x 2-3/4", these compact switches are ideal for use where space is at a premium. Designed for use with water and oil, these switches are suitable for high volume OEM applications. They are ideal for coolant or lubricant flow monitoring in portable equipment and many other applications with space constraints.

Specifications

Wetted Materials	
Housing and Piston	Brass, Stainless Steel
Spring	316 Stainless Steel
Other Wetted Parts	Stainless Steel
Operating Pressure, Maximum	1000 PSIG (69 bar)
Operating Temperature	-20°F to +200°F (-29°C to +93.3°C)
Set Point Accuracy	±15%
Set Point Differential	20% Maximum
Switch*	SPST, 20 VA
Inlet/Outlet Ports	1/4" NPT
Electrical Termination	No. 18 AWG, 24" L., PVC Lead Wires

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

How To Order – Standard Models

Specify Part Number based on flow setting and switch operation.

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).

Flow Settings GPM	Part Numbers		
	Brass		Stainless Steel
	Normally Open @ No Flow	Normally Closed @ No Flow	Normally Open
0.10	70820 ⚡	70826	26969
0.25	70821 ⚡	70827	26970
0.50	70822 ⚡	70828	26971
0.75	70823	70829	26972
1.00	70824 ⚡	70830	26973
1.50	70825	70831	26974

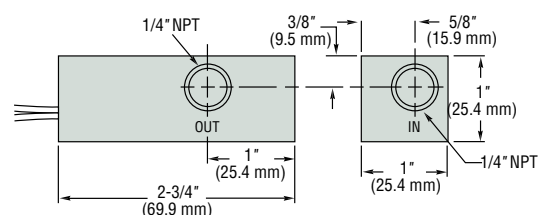
Notes:

- Flow settings are calibrated using water @ +70°F on increasing flow, with units in a vertical position (lead wires up).
- Care should be taken by specifiers to ensure fluid compatibility with the above listed wetted materials.
- Use of 50 micron filtration is recommended.

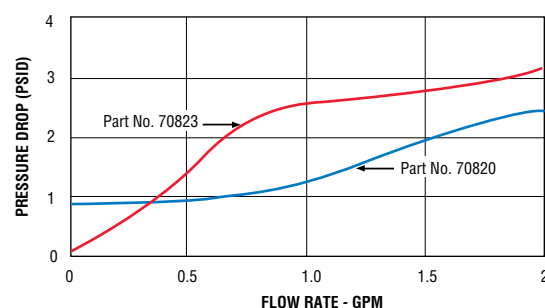
⚡ – Stock Items.



Dimensions



Pressure Drop – Typical



Tests conducted with units in vertical position (lead wires up) with water at +70°F (21°C).

CP Series Control Panels Standard Level Control System Electrical Panels

- ▶ NEMA-1 Enclosure – General Purpose
- ▶ NEMA-4 Enclosure – Water Resistant
- ▶ NEMA-4X Enclosure – Corrosion and Water Resistant
- ▶ Optional Equipment – Visual Alarms, High & Low Audible/Silent Alarms, Hand-off Auto Switches

When it comes to control panels, Gems Sensors can satisfy most requirements with our new family of CP Series Panels. These standard models were specifically designed around our most popular panel types. These industrial control panels interface with level and flow switches, Warrick conductance probes and a variety of sensors and are factory set for pump up/pump down. Gems can provide the panel and sensors you need for intrinsically safe and non-intrinsically safe environments. With each control panel, Gems provides electrical and mechanical drawings along with installation and operations manuals.

Specifications

Contact Design	SPST
Contact Rating (120 VAC)	10 amp Resistive
Primary Voltage	120 VAC (+10%/-15%) 50/60 Hz
Temperature	-40°F to +150°F (-40°C to +65°C) Ambient
Enclosure Type	NEMA 1, NEMA 4, NEMA 4X Fiberglass
Approvals	U.L. 508A File # E100709; U.L. 698A File # E120178 (Series 67 control only)

How to Order

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

	CP	XX	XX	X	X	X	1	X	X
Control Relay									
16 Series 16M; 67 Series 67									
Panel Function									
A1 Simplex Pump Down; A2 Simplex Pump Up; B1 Duplex Pump Down w/Alternation; B2 Duplex Pump Up w/Alternation; S1 Solenoid Valve Drain; S2 Solenoid Valve Fill									
Visual Alarms									
A None; B High Level; C Low Level; D High & Low Level									
Optional Features									
0 None; 1 Hand-Off Auto Switches; 2 Running/Valve Open Lights; 3 Both Options 1 & 2									
Alarm Options									
A None; B Audible/Visual/Contacts									
Input Voltage									
1 120 VAC									
Control Sensitivity									
C 26K ohms direct; M 26K ohms inverse; D 50K ohms direct; N 50K ohms inverse									
Enclosure Type									
1 NEMA 1 (indoor); 4 NEMA 4 (indoor/outdoor); 4X NEMA 4X Fiberglass (indoor/outdoor)									



Single-function standard panel



Applications

- Simplex Pump Up/Down
- Duplex Pump Up/Down
- Pump Alternation
- Valve Fill & Drain

See Our Interstitial Tank Monitoring Products on page A-22.



AG Series

- ▶ MOPD: 1000 PSI (69 Bar)
- ▶ C_v Range: 0.019 to 0.300 (K_v Range: 0.016 to 0.256)
- ▶ 7 Watts

The AG Series gives you a highly adaptable design for practically all applications requiring flow between C_v 0.019 and 0.300 (K_v 0.016 to 0.259). This robust 2- or 3-way miniature solenoid utilizes a stainless steel body to resist corrosion for most acids, alkaline solutions, and harsh environments. Available in numerous port configurations, orifice sizes, and material combinations, the AG Series is a highly flexible valve that fulfills the requirements for most applications.

Typical Applications

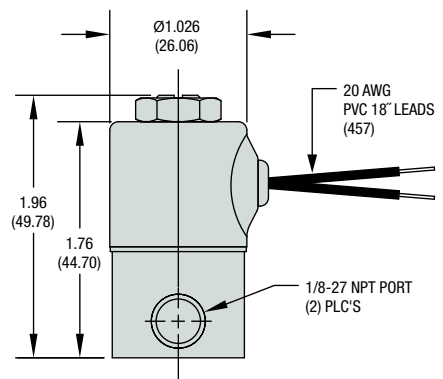
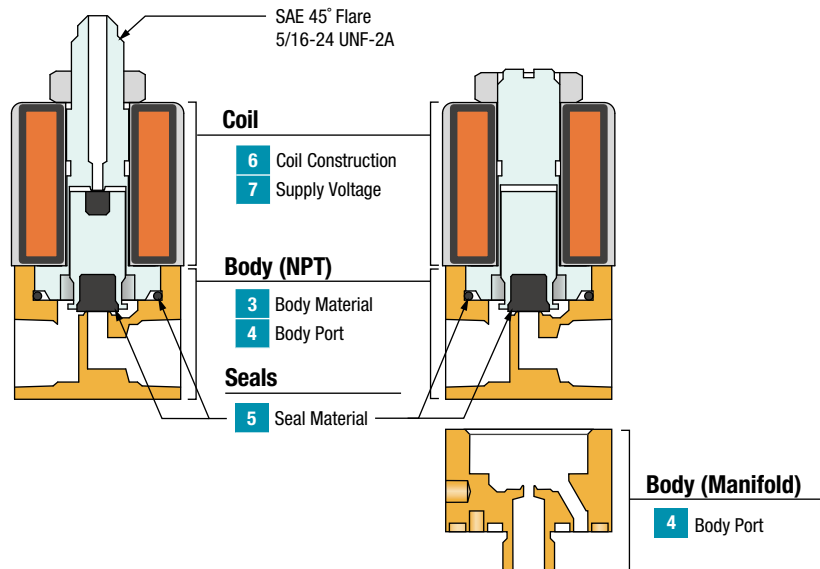
Stainless Steel Bodies:

- Medical Equipment
- Laboratory Equipment
- Food Processing Equipment

Reference

3-Way Valve

2-Way Valve



Example Shown

Part Number: AG2022-01LC-B-G1-203
From How to Order example below.

How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

AG	20	22	-	01	LC	-	B	-	G1	-	203
Series	1	2	-	3	4	-	5	-	6	-	7
	Function	MOPD		Body Material	Body Port		Seal Material		Coil Construction		Supply Voltage

Product Description from Example Shown Above:

AG2022-01LC-B-G1-203

AG2022 = AG Series with 2-Way Normally Closed Valve **Function**; 100 MOPD

-01LC = 303 Stainless Steel **Body Material**; 1/8" NPT Female **Body Port**

-B = Nitrile (Buna-N) **Seal Material** (Plunger Seal and Internal O-Ring)

-G1 = Grommet Housing, Tape-Wrapped (Class B) **Coil Construction**

-203 = 12 VDC **Supply Voltage**

AG Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

AG			-			-		-			-	
Series	1	2		3	4		5		6		7	

1 + 2 Valve Function & Maximum Operating Pressure Differential

Valve Function	Code	MOPD		C _v		K _v		Orifice			
		psig	bar	Body	Stop	Body	Stop	Body		Stop	
								inches	mm	inches	mm
2-WAY Normally Closed	2001	1000	69	0.020	—	0.017	—	1/32	0.79	—	—
	2004	500	34	0.035	—	0.030	—	3/64	1.19	—	—
	2007	300	21	0.065	—	0.055	—	1/16	1.59	—	—
	2011	200	14	0.090	—	0.077	—	5/64	1.98	—	—
	2014	175	12	0.155	—	0.132	—	3/32	2.38	—	—
	2022	100	6.9	0.240	—	0.205	—	1/8	3.18	—	—
	2029	50	3.4	0.300	—	0.256	—	5/32	3.97	—	—
3-WAY Normally Closed	3111	200	14	0.019	0.019	0.016	0.016	1/32	0.79	1/32	0.79
	3117	150	10	0.040	0.040	0.034	0.034	3/64	1.19	3/64	1.19
	3122	100	6.9	0.070	0.040	0.060	0.034	1/16	1.59	3/64	1.19
	3126	75	5.2	0.070	0.070	0.060	0.060	1/16	1.59	1/16	1.59
	3129	50	3.4	0.170	0.040	0.145	0.034	3/32	2.38	3/64	1.19
3-WAY Normally Open	3217	150	10	0.019	0.019	0.016	0.016	1/32	0.79	1/32	0.79
	3222	100	6.9	0.040	0.040	0.034	0.034	3/64	1.19	3/64	1.19
	3223	90	6.2	0.070	0.040	0.060	0.034	1/16	1.59	3/64	1.19
	3226	75	5.2	0.070	0.070	0.060	0.060	1/16	1.59	1/16	1.59
	3229	50	3.4	0.170	0.040	0.145	0.034	3/32	2.38	3/64	1.19
3-WAY Multi Purpose	3320	125	8.6	0.019	0.019	0.016	0.016	1/32	0.79	1/32	0.79
	3322	100	6.9	0.040	0.040	0.034	0.034	3/64	1.19	3/64	1.19
	3323	90	6.2	0.070	0.040	0.060	0.034	1/16	1.59	3/64	1.19
	3326	75	5.2	0.070	0.070	0.060	0.060	1/16	1.59	1/16	1.59
	3334	25	1.7	0.170	0.040	0.145	0.034	3/32	2.38	3/64	1.19
3-WAY Directional Control	3410	225	16	0.019	0.019	0.016	0.016	1/32	0.79	1/32	0.79
	3417	150	10	0.040	0.040	0.034	0.034	3/64	1.19	3/64	1.19
	3422	100	6.9	0.070	0.040	0.060	0.034	1/16	1.59	3/64	1.19
	3426	75	5.2	0.070	0.070	0.060	0.060	1/16	1.59	1/16	1.59
	3429	50	3.4	0.155	0.040	0.132	0.034	3/32	2.38	3/64	1.19

3 Body Material

- 01 303 Stainless Steel
- 03 Brass
- 05 316 Stainless Steel
- XX No Body
- (4) Body Port OB only

4 Body Port

- LC 1/8" NPT Female
- MM Manifold Mount (1/4"-28 Stud)
- OB Omit Body (operator only)*
- (3) Body Material XX only

5 Seal Material

- B Nitrile
- E EPR
- V Viton®

6 Coil Construction

- G1 Grommet Housing, Tape-Wrapped (Class B) Lead Wires
- G5 Grommet Housing, Epoxy Encapsulated (Class B) Lead Wires

7 Supply Voltages

- AC Voltage - Copper shading ring standard
- 111 120/60 VAC
- DC Voltage
- 203 12 VDC
- 204 24 VDC

* Contact Gems for the operator orifice drawings

AG Series – Additional Component Details & Dimensions

1 Valve Function

Flow Schematics

Flow Key

Blocked Flow

Free Flow

O/S = Over Seat

U/S = Under Seat

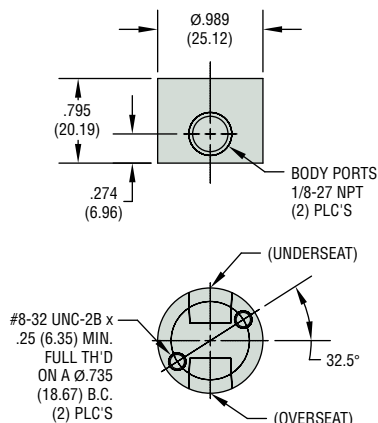
Valve Type	De-Energized	Energized
2-Way Normally Closed		
3-Way Normally Closed		
3-Way Normally Open		
3-Way Multi Purpose		
3-Way Directional Control		

AG Series – Additional Component Details & Dimensions, cont.

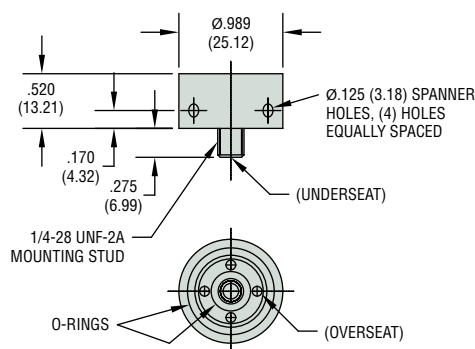
4 Body Port

Note: Contact Gems for the operator orifice drawings

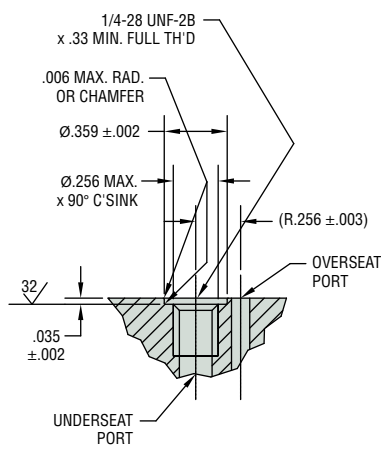
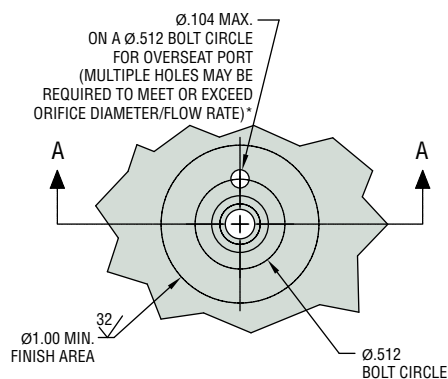
1/8" NPT Port (LC)



Manifold Mount 1/4"-28 Stud Body (MM)



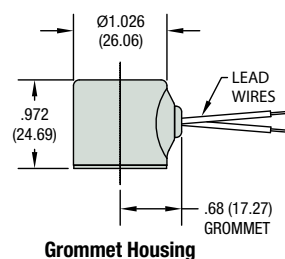
Manifold Preparation



* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

SECTION A-A

6 Coil Construction



31CA Series and 32CA Heavy Duty Series CSA Non-Incendive Industrial Pressure Transmitters

For OEMs that need non-incendive pressure sensors with consistent high levels of performance, reliability and stability, the 31/32CA Series sputtered thin film units offer an unbeatable price performance ratio in a small package size. They feature all stainless steel wetted parts, a broad selection of electrical and pressure connections and a wide choice of electrical outputs.

Our manufacturing process includes the latest automated equipment, producing consistent sensor performance.

Additionally the 32CA Series transmitters feature a thicker diaphragm and a pressure restrictor to withstand the rigors of cavitation or extreme pressure spikes, delivering years of reliable and stable performance in pulsating applications.

The compact construction of both these series makes them ideal for installation where space is at a premium.

Specifications

Performance	
Long Term Drift	0.2% FS/YR (non-cumulative)
Accuracy	0.25% FS
Thermal Error	
31CS	±1.5% max, ±1% typical / 212°F (100°C)
32CS	±2% max
Operating & Compensated Temperatures	
	-40°F to +176°F (-40°C to +80°C)
Zero Tolerance, Max.	0.5% of span
Span Tolerance, Max.	0.5% of span
Fatigue Life	Designed for more than 100 M cycles
Mechanical Configuration	
Pressure Port	See under "How to Order," last page
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See under "How to Order," last page
Enclosure	IP67 (IP65 for electrical code G)
Vibration	BSEN 60068-2-6 (FC) Sine (20G) BSEN 60068-2-64 (FH) Random (14.1 Grms)
Shock	BSEN 60068-2-27 (Ea) (50G, 11ms)
Approvals	CSA Certified Non-Incendive for use in: Class I, Division 2, Groups A, B, C, and D T4 Single Seal Approval Fully RoHS Compliant
Weight	1.8 to 5.3 ounces (50-150 grams). Configuration dependant

EMC Specifications

Emissions Tests: EN61326-1:2006 and EN61326-2-3:2006

EN55011:2007	Radiated Emissions:	30-230MHz 30dB µV/M @10M 230-1000MHz 37dB µV/M @10M
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Immunity Tests: EN61326-1:2006 and EN61326-2-3:2006

EN61000-4-2:2009	Electrostatic Discharge:	±4Kv contact ±8Kv air
EN61000-4-3:2006	Radiated Immunity:	10V/M 80-1000MHz 3V/M 1400-2000MHz 1V/M 2000-2700MHz
EN61000-4-4:2004	Fast Transients:	±0.25, 0.5, 1Kv
EN61000-4-6:2007	Conducted Immunity:	3V 0.15 to 80MHz 80% 1KHz modulation



Integral Connector Versions



Individual Specifications

Voltage	
Output (3-wire)	0V min. to 10V max. See under "How to Order," last page
Supply Voltage	1 Volt above full scale with minimum supply of 8V; maximum 30V @ 4.5 mA
Source and Sinks	2 mA
Current	
Output (2-wire)	4-20 mA
Supply Voltage	8-24 Volts measured at the input to the transducer terminals
Maximum Loop Resistance	(Supply Voltage – 8) x 50ohms See Graph
Ratiometric	
Output	0.5 to 4.5V (Source and sink 2mA)
Supply Voltage	5 Vdc ±10% @ 4.5mA

Pressure Capability

Pressure Range PSI (Bar)	Proof Pressure (x Full Scale)		Burst Pressure (x Full Scale)	
	31CA	32CA	31CA	32CA
100-300 (7-20)	3.00 x FS	3.00 x FS	40 x FS	
500-1,500 (40-100)	2.00 x FS		20 x FS	
2,000-6,000 (140-400)			10 x FS	
10,000 (700)			> 60,000 PSI (4,000 bar)	
15,000 (1,000)	2.50 x FS			
25,000 (1,800)	1.70 x FS			
30,000 (2,200)	1.40 x FS	—		

Pressure Ports

NPT and SAE Dimensions in Inches. Metric and BSP Dimensions in MM.

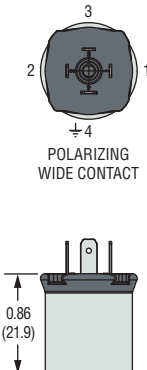
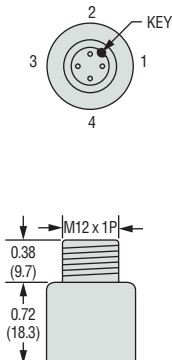
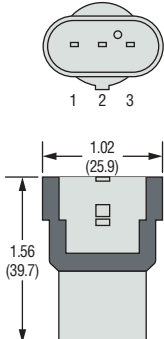
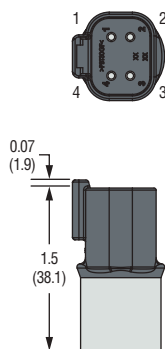
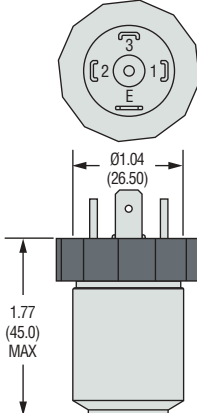
Fitting Code	08 = 1/8~27 NPT	4D = 1/8~27 NPT Dryseal	02 = 1/4~18 NPT	0E = 1/4~18 NPT Internal
Torque	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*
Fitting Code	4C = 1/4~18 NPT Dryseal	4N = 3/8~24 UNF	1J = 7/16~20 UNF	04 = 7/16~20 UNF with 37° Flare
Torque	2-3 TFFT*	18-20 NM	18-20 NM	15-16 NM
Fitting Code	1G = SAE 4 Female 7/16" Schraeder	1P = 9/16~18 "Heavy Duty"	6B = Autoclave F250C	01 = G1/4~19 A
Torque	18-20 NM	18-20 NM	18-20 NM	30-35 NM
Fitting Code	05 = G1/4~ 19 A Integral Face-Seal	0L = M12 x 1.5	2T = M12x1.5 HP Metal Washer Seal	4J = M14 x 1.5
Torque	30-35 NM	28-30 NM	30-35 NM	30-35 NM

*NPT Threads 2-3 turns from finger tight. Wrench tighten 2-3 turns.

General Notes:

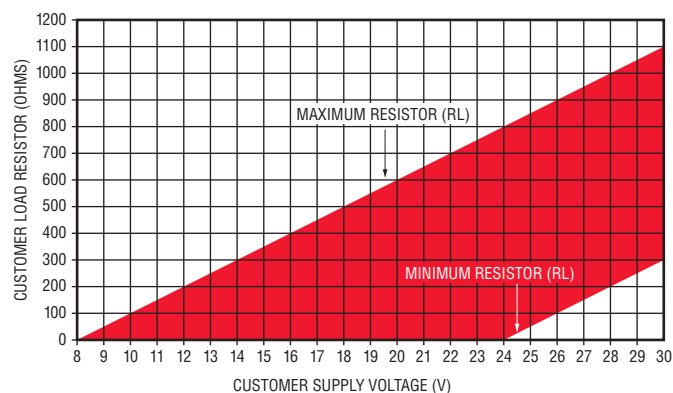
- The diameter of all cans is 19 mm (0.748")
- Hex is 22 mm (0.866") Across Flats (A/F) for deep socket mounting

Electrical Connector

DIN 9.4 mm			M12 x 1P		Amp Superseal 1.5		Deutsch DT04-4P		DIN 43650A	
										
Code R			Code E		Code 6		Code 8		Code G	
Pin #	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode
1	V _{supply}	Supply	V _{supply}	Supply	V _{out}	No Connect	Ground	Return	V _{supply}	Supply
2	Ground	Return	V _{out}	No Connect	Ground	Return	V _{supply}	Supply	Ground	Return
3	V _{out}	No Connect	Ground	Return	V _{supply}	Supply	No Connect	No Connect	V _{out}	No Connect
4	No Connect	No Connect	No Connect	No Connect	—	—	V _{out}	No Connect	No Connect	No Connect

* This pin is used for temperature sensing output when this option is utilized. Otherwise, the pin is used for PE.

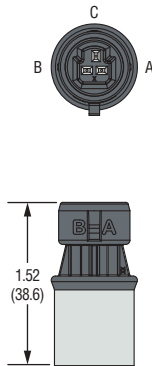
Current Output Mode (Load Resistor Range)



Minimum Resistor Value = $50 \cdot (+V - 24)$ for $+V > 24V$

Maximum Resistor Value = $50 \cdot (+V - 8)$ for $+V > 8V$

Packard MetriPack

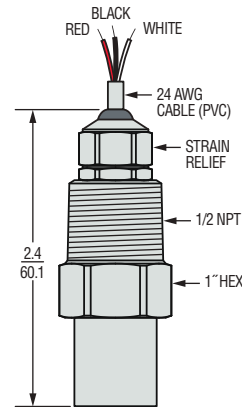


Code 9

Pin ID	Voltage Mode	Current Mode
A	Ground	Return
B	V_{supply}	Supply
C	V_{out}	No Connect
E	—	—

Cable-Out Types

1/2" Conduit Connection



Code 3

Wire Color	Voltage Mode	Current Mode
Red	Supply	Supply
Black	Ground	Return
White	V_{out}	No Connect

How to Order

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

Series	31CA / 32CA - Pressure Transducer			31CA	B	200PG	02	R	R	01	Cable Length (For electrical connection 3 only)
Output	B - 4-20 mA N - 0.5-4.5 V T - 0.5-4.5 V Ratiometric			C - 1-6 V R - 0-5 V ¹	H - 1-5 V S - 0-10 V ¹						00 - No Cable 03 - 3 meters 10 - 10 meters 01 - 1 meter 04 - 4 meters 02 - 2 meters 05 - 5 meters
Pressure Range - psi	100PG - 0-100 psiG 150PG - 0-150 psiG 200PG - 0-200 psiG 300PG - 0-300 psiG 500PG - 0-500 psiG 600PG - 0-600 psiG 750PG - 0-750 psiG			10CPG - 0-1,000 psiG 15CPS - 0-1,500 psiS 20CPS - 0-2,000 psiS 25CPS - 0-2,500 psiS 30CPS - 0-3,000 psiS 35CPS - 0-3,500 psiS 40CPS - 0-4,000 psiS 50CPS - 0-5,000 psiS 60CPS - 0-6,000 psiS 75CPS - 0-7,500 psiS	10KPS = 0-10,000 psiS 15KPS - 0-15,000 psiS ² 20KPS - 0-20,000 psiS ² 25KPS - 0-25,000 psiS ²					Optional Restrictor (32CA only) R - Restrictor 0 - No Restrictor	
Pressure Range - bar	0007G - 0-7 barG 0010G - 0-10 barG 0016G - 0-16 barG 0025G - 0-25 barG 0040G - 0-40 barG 0060G - 0-60 barG 0100S - 0-100 barS			0160S - 0-160 barS 0250S - 0-250 barS 0400S - 0-400 barS 0600S - 0-600 barS	1000S - 1,000 barS ² 1600S - 1,600 barS ²						Electrical Connection ⁴ E - M12 x 1P (4-Pin) G - Large DIN R - Industrial DIN 9.4 mm (alternate pin out) 3 - 1/2" NPT Male Conduit 6 - Amp - Superseal 1.5 Series 8 - Deutsch DT04-4P 9 - Packard MetriPack
											Pressure Port ³ 08 - 1/8-27 NPT External 02 - 1/4-18 NPT External 04 - 7/16-20 External (SAE #4, J514) 0E - 1/4"-18 NPT Internal 1G - Schrader SAE #4, 7/16" Internal 1J - 7/16-20 External (SAE #4, J1926-2) 1P - SAE 6 (9/16"-18 UNF 2A) 4C - 1/4-18 NPTF External (Dryseal) 4D - 1/8-27 NPTF External (Dryseal)

Notes:

- For use with pull-up or pull-down resistors, contact factory.
- Ranges 15,000 psi (1,000 bar) and above available with -2T pressure port only.
- Pressure ports **0E**, **6B**, and **1G** are not available with the -R Restrictor option.
- For electrical code **3**, specify cable length in meters.

Visual Indicators for Potable Water – RFI-PW Type

FDA-compliant molded nylon and epoxy RFI-Type RotorFlow® sensor for compatibility with potable water applications. Flow rate is estimated, or simply confirmed by viewing the speed of the turning, high visibility blue rotor. Either port may be used for incoming flow, and bayonet mounting lens is easily removed for quick cleanout. RFI-PW Potable Water RotorFlow® sensors are easy to see, easy to install and easy to afford for potable water applications.

Typical Applications

- Water Purification/Dispensing Systems • Chemical Injection Systems

Specifications

Wetted Materials	
Body	316 Stainless Steel or Polypropylene (Hydrolytically Stable, Glass Reinforced)
Rotor Pin	Ceramic
Rotor	Molded Nylon/FDA Epoxy
Lens	Polysulfone
O-Ring	EPDM
Low Flow Adaptor	Glass Reinforced Polypropylene
Operating Pressure,	
Stainless Steel Body	100 PSIG (7 bar) @212°F (100°C) 200 PSIG (13.8 bar) Max. @ 70°F (21°C)
Polypropylene Body	100 PSIG (6.9 bar) at 70°F (21°C), 40 PSI (2.8 bar) Max. @ 180°F (82°C)
Operating Temperature,	
Stainless Steel Body	-20°F to 212°F (-29°C to 100°C)
Polypropylene Body	-20°F to 180°F (-29°C to 82°C)

Operating Principle

1. As liquid passes through the RotorFlow® body, the rotor spins at a rate proportional to flow.
2. RotorFlow® Indicators may be mounted with flow entering either port. At low flow rates, performance is optimized by positioning ports at the top of the unit, in a horizontal plane.

How To Order

Specify Part Number based on desired body material and port size.

Body Material	Port Size NPT	Flow Ranges – GPM		Flow Ranges – LPM		Part Number
		Low*	Standard	Low*	Standard	
Polypropylene	.25"	0.1 to 1.0	0.5 to 5.0	0.1 to 1.0	1.9 to 18.9	198282
	.50"	1.5 to 12.0	4.0 to 20.0	5.7 to 45.4	15.1 to 75.7	198283
Stainless Steel	.50"	1.5 to 12.0	4.0 to 20.0	5.7 to 45.4	15.1 to 75.7	203684
	.75"	—	5.0 to 30.0	—	18.9 to 113.6	203685
	1.00"	—	8.0 to 60.0	—	30.2 to 227.1	203686

* With use of Low Flow Adaptor supplied. See Page F-8 for more information.

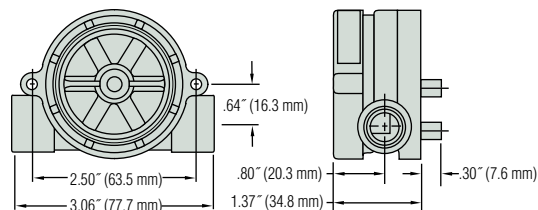


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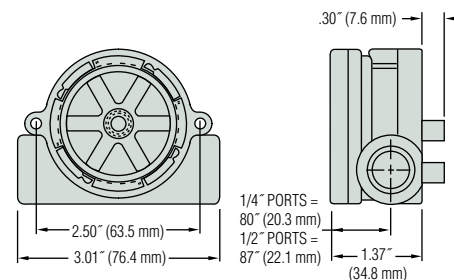


Dimensions

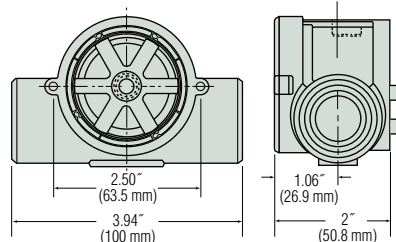
Polypropylene Bodies



Stainless Steel Bodies - .50" Ports



Stainless Steel Bodies – .75" and 1.00" Ports



High Visibility

Blue Rotor

FDA-compliant molded nylon and epoxy RotorFlow® indicator for compatibility with potable water applications.



G & GH Series – Subminiature

- ▶ MOPD: 250 PSI (17 Bar)
- ▶ C_v Range: 0.018 to 0.070 (K_v Range: 0.015 to 0.054)
- ▶ 0.65 Watts or 2 Watts

This extremely versatile 2- or 3-way sub-miniature valve gives you the option of choosing the highly durable stainless steel or the lightweight corrosion resistant acetal body, to meet your overall design parameters. Select stainless steel or Delrin®, and other materials available to resist corrosion in most acids and alkaline solutions, or pick acetal for a tough and heat resistant metal substitute to meet your weight and chemical inert requirements.

Typical Applications

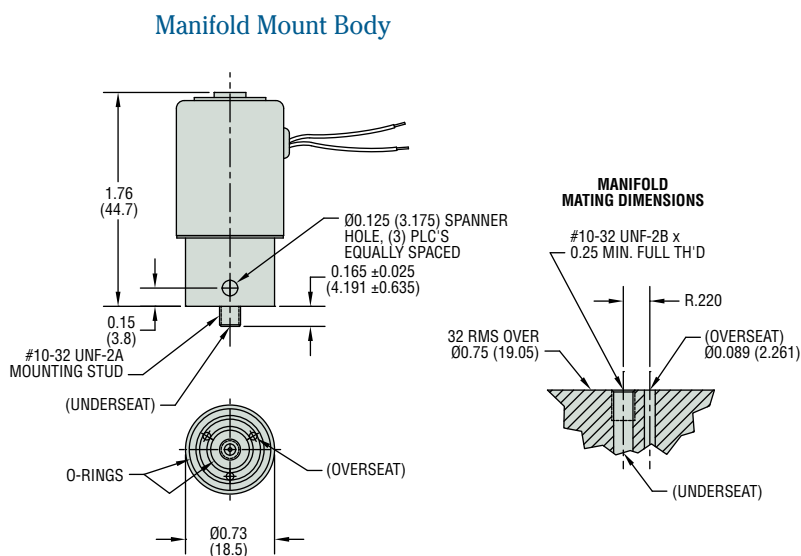
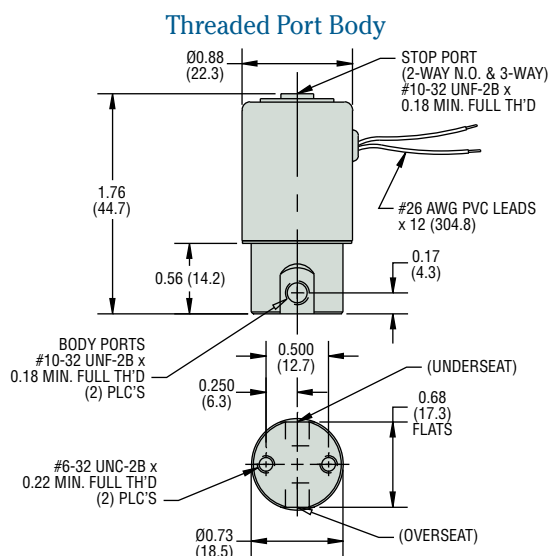
Stainless Steel Bodies:

- Hospital Equipment
- Laboratory Equipment
- Air Sampling Systems

Acetal Bodies:

- Water Purification Systems
- Analytical Equipment

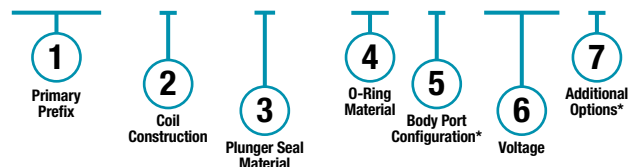
Dimensions



How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

G2214 - 5 - E - EO - 5VDC



* Blank entry indicates a "Standard" selection
(#10-32 straight thread ports, in this case).

Example:

G2214-5-E-EO-5VDC

G-Series 303 Stainless Steel 2-Way N.O. solenoid valve, with tape-wrapped, Class-B, with 12" (30.48cm) long lead-wires, encapsulated coil with 0.110" (2.79mm) spade terminals, EPR plunger seal, EPR o-ring, #10-32 straight thread ports, operating at 5 VDC.



Part Prefix Table ①

	Power Rating	Orifice				MOPD		C _v		K _v		① Primary Prefix
		Body		Stop		psig	bar	Body	Stop	Body	Stop	303 Stainless Steel ¹
		inches	mm	inches	mm							
2-WAY N.C.	0.65W	0.030	0.762	—	—	125	8.6	0.015	0.018	—	—	G2012
		0.040	1.016	—	—	70	4.8	0.020	0.023	—	—	G2013
		0.055	1.397	—	—	40	2.8	0.032	0.038	—	—	G2014
		0.078	1.981	—	—	20	1.4	0.054	0.063	—	—	G2015
	2W	0.030	0.762	—	—	250	17	0.015	0.018	—	—	GH2012
		0.040	1.016	—	—	175	12	0.020	0.023	—	—	GH2013
		0.055	1.397	—	—	100	6.9	0.032	0.038	—	—	GH2014
		0.078	1.981	—	—	50	3.4	0.054	0.063	—	—	GH2015
2-WAY N.O.	0.65W	—	—	0.030	0.762	125	8.6	—	—	0.018	0.015	G2212
		—	—	0.040	1.016	70	4.8	—	—	0.023	0.020	G2213
		—	—	0.055	1.397	40	2.8	—	—	0.038	0.032	G2214
		—	—	0.078	1.981	20	1.4	—	—	0.057	0.049	G2215
	2W	—	—	0.030	0.762	200	14	—	—	0.018	0.015	GH2212
		—	—	0.040	1.016	150	10	—	—	0.023	0.020	GH2213
		—	—	0.055	1.397	100	6.9	—	—	0.038	0.032	GH2214
		—	—	0.078	1.981	50	3.4	—	—	0.057	0.049	GH2215
3-WAY N.C.	0.65W	0.030	0.762	0.030	0.762	125	8.6	0.018	0.015	0.0153	0.018	G3112
		0.040	1.016	0.040	1.016	70	4.8	0.023	0.020	0.01955	0.023	G3113
		0.055	1.397	0.055	1.397	40	2.8	0.038	0.032	0.0323	0.038	G3114
		0.078	1.981	0.078	1.981	20	1.4	0.063	0.054	0.04845	0.057	G3115
	2W	0.030	0.762	0.030	0.762	200	14	0.018	0.015	0.01955	0.023	GH3112
		0.040	1.016	0.040	1.016	150	10	0.023	0.020	0.01955	0.023	GH3113
		0.055	1.397	0.055	1.397	100	6.9	0.038	0.032	0.0323	0.038	GH3114
		0.078	1.981	0.078	1.981	50	3.4	0.063	0.054	0.04845	0.057	GH3115
3-WAY N.O.	0.65W	0.030	0.762	0.030	0.762	125	8.6	0.015	0.018	0.018	0.015	G3212
		0.040	1.016	0.040	1.016	70	4.8	0.020	0.023	0.023	0.020	G3213
		0.055	1.397	0.055	1.397	40	2.8	0.032	0.038	0.038	0.032	G3214
		0.078	1.981	0.078	1.981	20	1.4	0.048	0.057	0.057	0.049	G3215
	2W	0.030	0.762	0.030	0.762	175	12	0.015	0.018	0.018	0.015	GH3212
		0.040	1.016	0.040	1.016	150	10	0.020	0.023	0.023	0.020	GH3213
		0.055	1.397	0.055	1.397	80	5.5	0.032	0.038	0.038	0.032	GH3214
		0.078	1.981	0.078	1.981	40	2.8	0.048	0.057	0.057	0.049	GH3215
3-WAY Multi Purpose	0.65W	0.030	0.762	0.030	0.762	80	5.5	0.015	0.018	0.018	0.015	G3312
		0.040	1.016	0.040	1.016	40	2.8	0.020	0.023	0.023	0.020	G3313
		0.055	1.397	0.055	1.397	20	1.4	0.031	0.036	0.029	0.024	G3314
		0.078	1.981	0.078	1.981	10	0.7	0.054	0.063	0.053	0.045	G3315
	2W	0.030	0.762	0.030	0.762	110	7.6	0.015	0.018	0.018	0.015	GH3312
		0.040	1.016	0.040	1.016	85	5.9	0.020	0.023	0.023	0.020	GH3313
		0.055	1.397	0.055	1.397	50	3.4	0.031	0.036	0.029	0.024	GH3314
		0.078	1.981	0.078	1.981	25	1.7	0.054	0.063	0.057	0.049	GH3315
3-WAY Directional Control	0.65W	0.030	0.762	0.030	0.762	135	9.3	0.015	0.018	0.018	0.015	G3412
		0.040	1.016	0.040	1.016	80	5.5	0.020	0.023	0.023	0.020	G3413
		0.055	1.397	0.055	1.397	45	3.1	0.025	0.029	0.029	0.024	G3414
		0.078	1.981	0.078	1.981	20	1.4	0.054	0.063	0.055	0.046	G3415
	2W	0.030	0.762	0.030	0.762	190	13	0.015	0.018	0.018	0.015	GH3412
		0.040	1.016	0.040	1.016	165	11	0.020	0.023	0.020	0.017	GH3413
		0.055	1.397	0.055	1.397	80	5.5	0.032	0.038	0.038	0.032	GH3414
		0.078	1.981	0.078	1.981	40	2.8	0.054	0.063	0.063	0.053	GH3415

2 Coil Construction

(blank) = Tape-wrapped, Class B (130°C), with 12" (30.5cm) lead wires*

W = Lead-wires, non-standard length (specify in inches)

10 = Externally rectified coil for AC voltages

(2 watt and lead wires only)

1 = Encapsulated coil, Class B (130°C), lead wires

5 = Encapsulated coil, Class B (130°C), .110" spade terminals

3 Plunger Seal Material

(blank) = Viton®*

NB = Nitrile

E = EPR

N = Neoprene

4 O-Ring Material

(blank) = Viton®*

NBO = Nitrile

EO = EPR

NO = Neoprene

5 Body Port Configuration

(blank) = #10-32 straight thread ports*

LC = 1/8"-27 NPT ports (2-way valves only)

BM = M5 x 0.8 ports

MM = Manifold mount with #10-32 threaded stud†

MM2 = Manifold mount with M5 x 0.8 threaded stud†

6 Voltage

VDC = DC (specify voltage)

VAC = AC Rectified 2-watt only (specify voltage)

7 Additional Options

OC = Cleaned for oxygen use

TP = PTFE coated plunger

VAC = Vacuum application – 0 to 29.5" Hg (0 to 1000 mBar)

* Standard selection; will be used unless otherwise specified. Standard selections are not referenced in final part number.

Notes

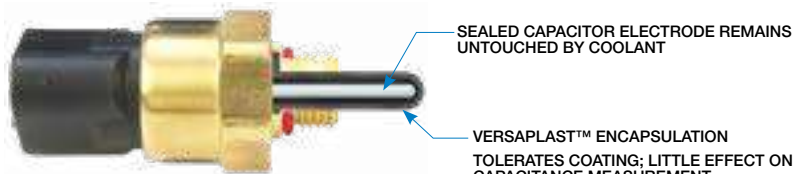
1. Use prefixes from this column if you plan to select a Body Port Configuration other than the #10-32 straight thread ports.

† Teflon® o-ring not suitable for manifold mount.

CAP-300 Series – Capacitive Level Sensor

- ▶ Durable sealed design – IP67
- ▶ Developed for the most rugged aqueous applications
- ▶ Tolerates coolant coating
- ▶ Small size – 2" (51 mm) long
- ▶ Available in Stainless Steel for Food & Beverage Applications

The CAP-300 capacitive level sensor is one of our most durable and reliable point level sensors. The versatile CAP-300 is the ideal OEM solution for power generation equipment, off-highway vehicles, generators, Food & Beverage, Medical, Rail and HVAC applications, and excels in coolant monitoring. With nearly zero maintenance, the sensor mounts in any position, is compact, tolerates coating, remains reliable even in standby mode, and is compatible with temperatures up to 257°F (125°C). For use where sloshing occurs, or the reservoir's attitude changes frequently, Gems offers a variety of actuation delays.



Specifications

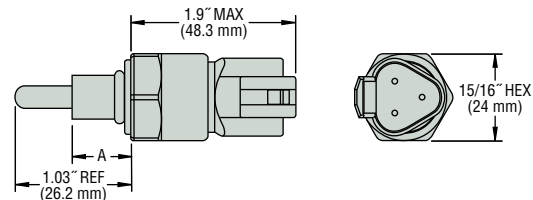
Mountings	1/4" NPT, 1/2"-20 per SAE J1926-3, M12x1.0-8g, M12x1.5 ISO 6149-3, 1/2" NPT
Materials	
Housing	Brass or 316L Stainless Steel
O-Ring	EPDM
Probe Tip	Versaplast™
Operating Pressure	Up to 100 PSIG
Operating Temperature	
Common	-40°F to +257°F (-40°C to +125°C)
Cable Versions	-4°F to +158°F (-20°C to +70°C)
Supply Voltage	9 to 32 VDC
Current Consumption	15mA max. (no load)
Output	Open collector, sinking or sourcing output, 9-32 VDC, 30mA max.
Electrical Termination	3-pin Deutsch, 18 AWG Type SXL flying leads or 18 AWG PVC Cable
Sensing Element Length	1.03" (26.2mm) Max. (including thread length)
Approvals	CE, IP67, RoHS

For NSF certified product options, contact Gems.

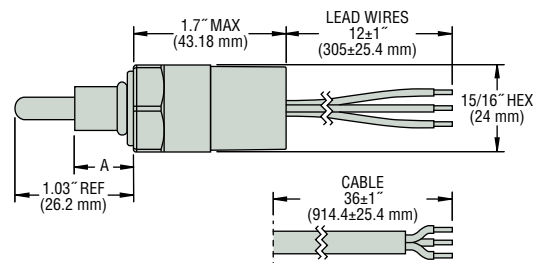


Dimensions

Deutsch® Connector



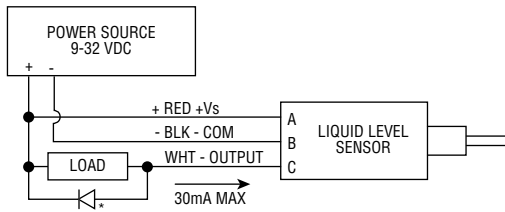
Lead Wires or Cable



		A DIM. REF.	EPDM O-Ring
Thread Sizes	1/2"-20	0.43" (10.9 mm)	3-905
	M12x1-8g	0.54" (13.5 mm)	2-110
	M12x1.5	0.53" (15.2 mm)	9.3 x 2.2 mm
	1/4"-18NPT	0.62" (15.7 mm)	None
	1/2"-14NPT	0.62" (15.7 mm)	None

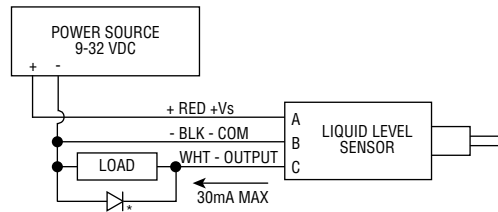
Wiring Diagram

Sinking



* For inductive loads, use diode suppression.

Sourcing



How To Order

Select a Part Number based on mounting type, connection and actuation condition.

Actuation Condition	Electrical Connection	Thread Sizes						
		Brass					316L Stainless Steel	
		1/4"-18 NPT (male)	1/2"-20 per SAE J1926-3	M12x1.5 Stud End Per ISO6149-3	M12x1.0-8g	1/2"-14 NPT (male)	1/4"-18 NPT (male)	1/2"-14 NPT (male)
Wet Sink	Integral 3-pin Deutsch® DT04-3P Connector	240640	240700	240800	240900	242970	244510	244540
	12" 18 AWG SXL Flying Leads	240660	240720	240820	240920	242975	244515	244545
	36" PVC Cable	240680	240740	240840	240940	242980	244520	244550
Dry Sink	Integral 3-pin Deutsch® DT04-3P Connector	240650	240710	240810	240910	242985	244525	244555
	12" 18 AWG SXL Flying Leads	240670	240730	240830	240930	242990	244530	244560
	36" PVC Cable	240690	240750	240850	240950	242995	244535	244565
Wet Source	Integral 3-pin Deutsch® DT04-3P Connector	240645	240705	240805	240905	242971	244511	244541
	12" 18 AWG SXL Flying Leads	240665	240725	240825	240925	242976	244516	244546
	36" PVC Cable	240685	240745	240845	240945	242981	244521	244551
Dry Source	Integral 3-pin Deutsch® DT04-3P Connector	240655	240715	240815	240915	242986	244526	244556
	12" 18 AWG SXL Flying Leads	240675	240735	240835	240935	242991	244531	244561
	36" PVC Cable	240695	240755	240855	240955	242996	244536	244566

Optional Delay

Delays are useful when the liquid being sensed is subject to frequent sloshing or the reservoir's attitude changes significantly. For low quantities, Gems offers a 5- and 10-second delay ($\pm 1/2$ second). Gems will customize the delay up to 99 seconds for large volume OEM applications. Please call Gems for more information.

SureSite® Visual Liquid Level Indicators

...the safe alternative to cloudy, breakable sight glasses.

High Visibility—Brilliantly colored flags are easy to read, even at great distances. The indicator is isolated from the measured media; therefore, SureSite Indicators can be used where sight glasses are not even a consideration.

Durability—Stainless steel, PVC, CPVC, PVDF, Hastelloy or other exotic housings, whatever the media requirements, provide years of maintenance-free service.

Environmentally Safe—Monitored liquid is contained inside a pressure-tight housing.

Efficient—Continuous level indication without external power.

Electronic Control—Attach optional point level switches and/or continuous level transmitters to extend capabilities beyond those of a simple sight glass.

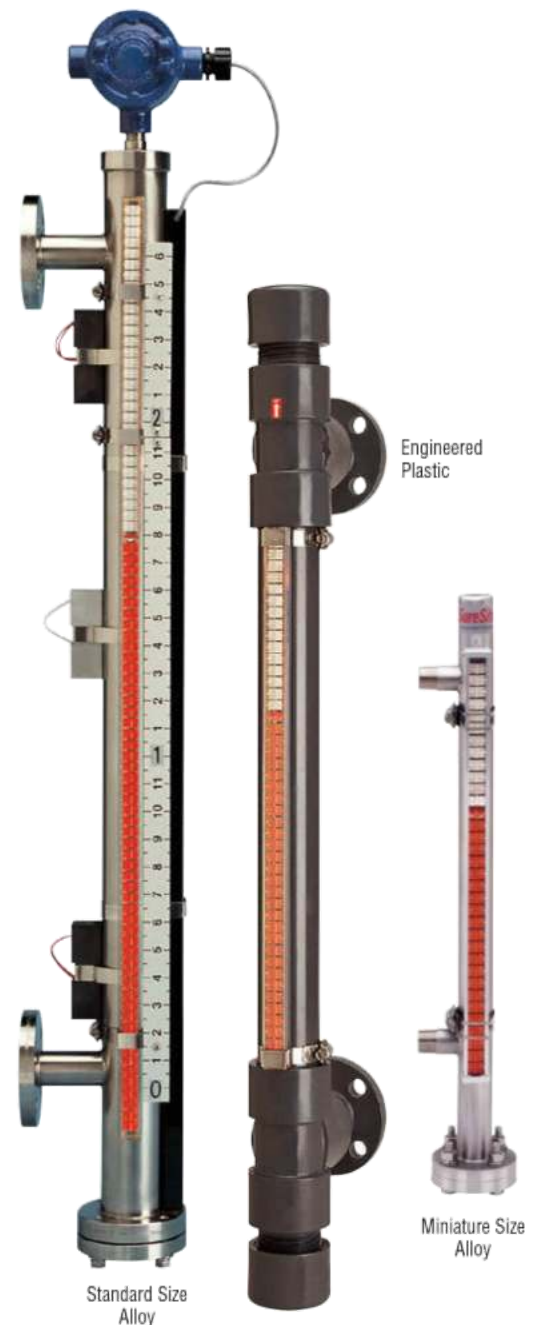
- Low Maintenance—No glass to break, durable housings
- OSHA Friendly—Accident incidence reduction
- Reduced Workload—Quick and easy viewing shortens monitoring chores
- EPA Friendly—Fewer seals and no glass protect against spillage
- Multi-Purpose—Not single purpose as with sightglasses; can replace simple tank gauging systems as a complete level gauge package

When Gems Sensors & Controls introduced SureSite® Liquid Level Indicators almost 30 years ago, no one had seen anything like them... sightglasses were the standard in liquid level indication. Well, we are happy to say that since that time SureSite Indicators have retired more sightglasses than we can count! Our success has spawned many imitators, but there is still only one SureSite Indicator with its many exclusive features, and more importantly there is no manufacturer so uniquely capable as Gems to be your sensor supplier.

Fifty years of experience has taught us which technologies and product characteristics will provide the most effective solutions to your requirements. And our engineering resources have long been helping customers solve their most challenging application problems. So, there is a good chance we've already dealt with the design criteria you are working on. If you don't see materials or configurations in the following pages to suit your needs, please give Gems a call for custom application assistance.

Gems Serves the OEM and End User

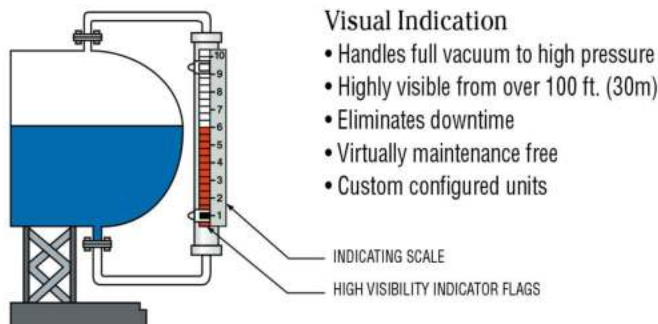
Gems welcomes any size order...whether a single unit or 100 units or more. Gems commitment is to meet your most stringent requirements of price, delivery and quality.



Contents	Page Start
Specifying and Ordering.....	D-3
Alloy Versions	
Miniature Size	D-4
Standard Size.....	D-7
High Performance SureSite.....	D-10
Engineered Plastic Version	D-13
Optional Transmitters.....	D-16
Optional Switch Modules.....	D-18
Optional Indicating Scale.....	D-18

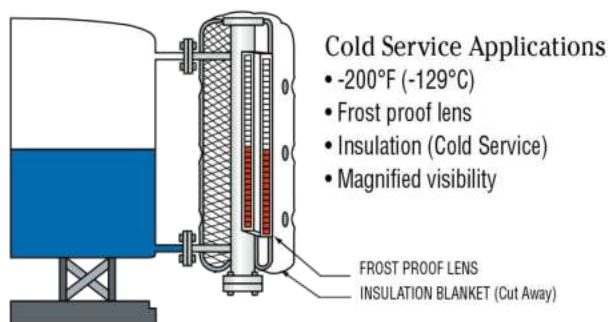
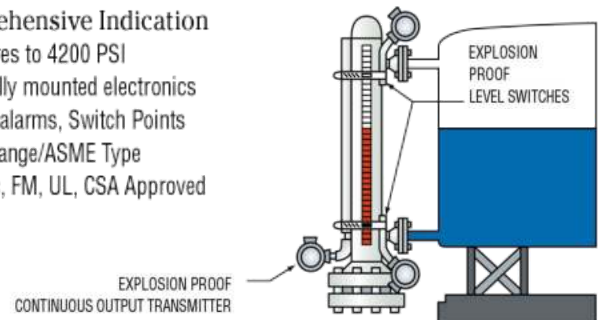
SureSite® Visual Liquid Level Indicators

Simply the Most Versatile Liquid Level Monitoring System Available ...
and Tough Enough For All Kinds of Applications!



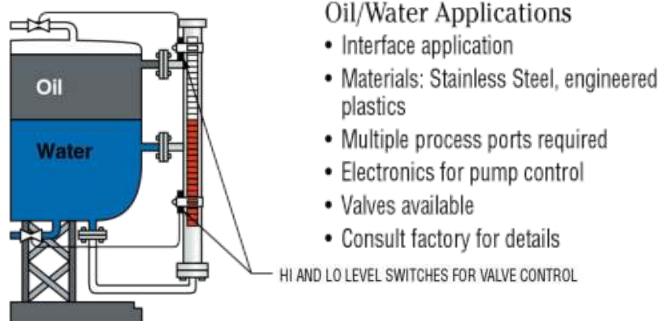
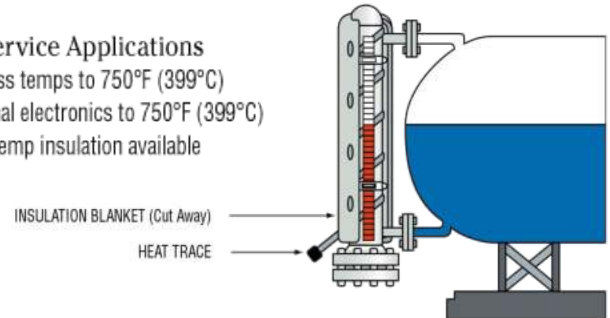
Comprehensive Indication

- Pressures to 4200 PSI
- Externally mounted electronics
- Hi/Low alarms, Switch Points
- ANSI Flange/ASME Type
- Cenelec, FM, UL, CSA Approved



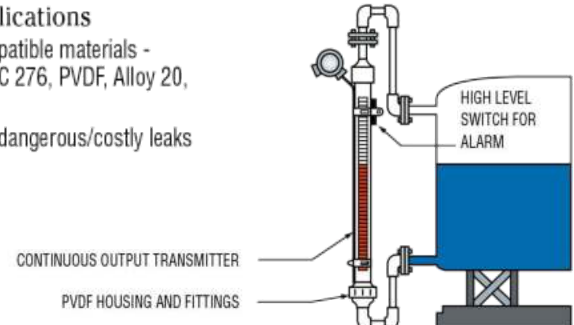
Hot Service Applications

- Process temps to 750°F (399°C)
- External electronics to 750°F (399°C)
- High temp insulation available



Acid Applications

- Fluid compatible materials - Hastelloy C 276, PVDF, Alloy 20, Titanium
- Eliminate dangerous/costly leaks



Top mount units available. Contact factory for details.

Versatile Design

The SureSite Indicators described on the following pages represent only "basic designs." An infinite variety of configurations can be derived, custom built to your exact dimensions and application specifications on existing or new tank designs.

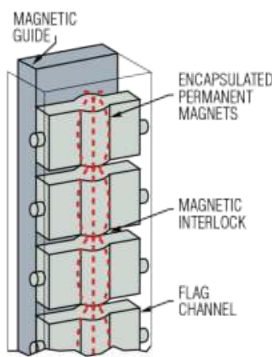


SureSite Indicators Are Superior To Other Magnetic Type Indicators. Here's Why:

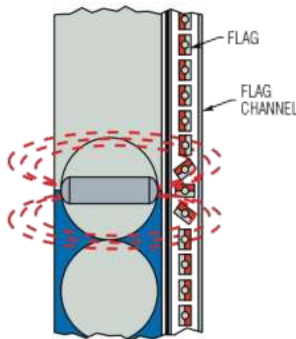
It begins with a patented Flag Assembly and integrated Magnetic Guide

Many magnetic flag type indicators look the same, but look closer and you'll see they are not made the same. SureSite® Indicators are unique. They incorporate a patented design and special features that provide the ultimate in performance and reliable operation.

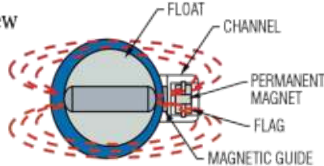
Flag Channel Assembly (partial close-up)



Profile View



Top View



- A permanent magnet, encapsulated into each flag, forms a secure magnetic interlock with adjacent flags. Proper alignment is assured, and is unaffected by shock, vibration, surges or rapid level changes.
- A Magnetic Guide (a SureSite exclusive) enables the use of a more powerful bar magnet in the float assembly. The guide is integrated into the flag channel, so regardless of positioning, the bar magnet within the float is always aligned for optimum performance and exactness.
- A powerful, permanent bar magnet lies in a horizontal position within the float. This preferred attitude directs the flux density of the magnetic field toward the flags. Flag rotation is positive and reliable.
- Float capability to handle liquid specific gravity range as low as 0.40.

SureSite® Indicators in the Process...

Many applications require high temperature/pressure capabilities, or strict adherence to industry standards such as

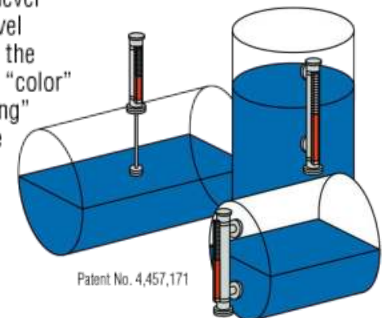
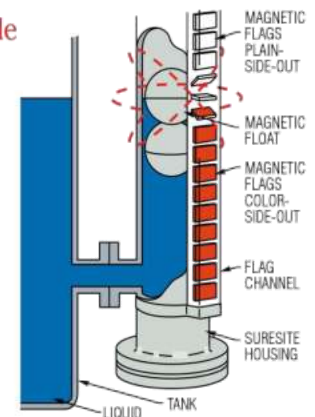
- ASME
- CENELEC
- CSA
- FM
- UL

Gems High Performance SureSite Indicators are manufactured to fill these requirements. See pages D-10 and D-11.



Operating Principle

As liquid level rises, a magnet-equipped float within the unit inverts the magnetic flags in the external indicator to "color-side-out." The flags remain magnetically interlocked in a column until again inverted to "contrasting-side-out" by the float as liquid level falls. Liquid level is indicated by the junction of the "color" and "contrasting" portions of the column.



Patent No. 4,457,171

Ordering SureSite® Indicators

Order online or use our quick and easy OrderIt! Forms.

1. To specify this product, start by photocopying the appropriate OrderIt! PRODUCT CHECK LIST located on pages D-6, D-9, D-12, and D-15.
2. Next, using the product information supplied in this section, check off the boxes and fill in the blanks of the OrderIt! Check List to specify your desired product configuration. Accurate answers to each question will assure correct fit and function of your custom built product. Note: Use a separate Check List for each unique configuration.
3. To obtain a priced quotation, fax your completed OrderIt! Check List to Gems at **860-747-4244** or fax it to the Sales Partner nearest you. You can now configure and request quotes directly online at www.gemssensors.com. All of our Sales Partner locations, along with their fax numbers, are conveniently located on the Web at www.gemssensors.com.
4. To order your CUSTOM product, either place your order over the phone with one of our representatives, or use the OrderIt! method. Just photocopy the appropriate OrderIt! PRODUCT CHECK LIST (D-6, D-9, D-12, and/or D-15). Accurately complete all of the purchasing information that we'll need to process your order and fax it. These forms will provide us with the shipping and billing information we need, along with any prices or delivery dates quoted.

Alloy Versions—Miniature Size

- ▶ Lengths to over 20 feet (6.1 meters)
- ▶ 316 Stainless Steel construction
- ▶ Pressures to 400 PSI (27 bar) – Temperature to 400°F (204°C)

Use these Mini SureSite Indicators where space is tight—they feature a diameter of only 1-1/4"! They can replace existing, antiquated sightglasses for excellent external, visual liquid level indication. Mini SureSite Indicators are ideal for use with clean, low viscosity liquids.

Typical Applications

- Pharmaceuticals • Medical Equipment • Food and Beverages
- Semiconductor Manufacturing • Boilers

1. Mounting Configuration Types

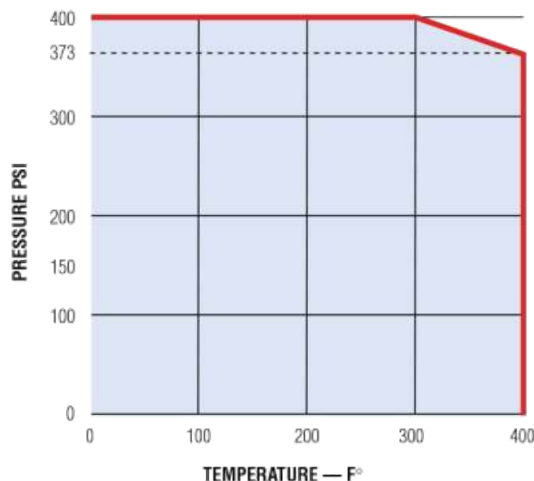
	Type AM	Type BM	Type CM	Type DM
	Top and Bottom Process Connections	Side and Side Process Connections	Top and Side Process Connections	Side and Bottom Process Connections
L = Length of Visual Indication				
Typical Lengths*	C to C = L + 7.72" (196 mm)	C to C = L	C to C = L + 3" (76 mm)	C to C = L + 5" (127 mm)
Flag Material	Plastic (300°F/148.9°C) or Aluminum (400°F/204°C)			
Length of Indication (Uninterrupted)	240" (610 cm)			

*Dimensions vary due to connections, material and specific gravity.

Note: Additional materials, floats, connections and manufacturing techniques are available to extend lengths and operational capabilities. Please contact Gems if the parameters above do not meet your requirements.

Miniature SureSite Performance

Gems configures Miniature SureSite Indicators, using various materials and fittings, to perform within the Pressure/Temperature parameters specified in the chart at right. Consult the factory with pressure/temperature requirements that fall outside the parameters shown here.



Note: SureSite Indicators are available for temperatures as low as -200°F (-129°C)


ORDER IT!

Ordering is Easy! See Page D-6.
Easy online ordering too!



2. Connection Codes

(See complete descriptions below)

		Blind		NPT				Flange		Weld	
				Fixed		Removable					
		Fixed	Removable	Female	Male	Female	Male	Fixed	Removable	Socket Butt	Removable Butt
TOP  T	Standard Connections	T1	T10	T2	T3	T11	T12	T19	T20	T18	T13
	Sanitary Connections							T7	T8		
SIDE  Sa											
SIDE  Sb											
BOTTOM  B	Standard Connections	B1	B10	B2	B3	B11	B12	B19	B20	B18	B13
	Sanitary Connections							B7	B8		

— Connection Codes and Materials background-shaded in this color are stocked by Gems. Select these connections where possible to obtain the most economical SureSite Indicators with a prompt 3-day delivery.

Note: Gems recommends a removable top and/or bottom connection for float access.

Connection Code Descriptions

Please provide all connections when completing the Order!! Product Check List (located on the following page).

Note: Before selecting your connections, consider incorporating your vent and drain requirements.

T & B (Top and Bottom)

- | | |
|---|---------------------|
| T/B 1. Welded cap | Sa & Sb (Sides) |
| T/B 2. Welded cap with FNPT | S1. No connection |
| T/B 3. Welded cap with MNPT | S2. MNPT nipple |
| T/B 7. Sanitary flange | S3. FNPT coupling |
| T/B 8. Sanitary flange with mating blind flange | S4. ANSI flange |
| T/B 10. Standard fixed flange/mating blind flange | S5. Sanitary flange |
| T/B 11. Standard fixed flange/mating FNPT reducing flange | S6. Buttweld nipple |
| T/B 12. Standard fixed flange/mating flange with MNPT nipple | |
| T/B 13. Standard fixed flange/mating flange with butt weld nipple | |
| T/B 18. Welded cap with butt weld nipple | |
| T/B 19. Welded cap with ANSI flange | |
| T/B 20. Standard fixed flange/mating reducing flange spool with ANSI flange | |



Need it quick? Choose materials and components with the color shading for 3-Day manufacturing and shipping. See the Product Configurator section at www.gemssensors.com for further details.

Accessories – Pages D-16 to D-18

Make more of your SureSite® Indicator with the productivity-enhancing accessories found at the end of this section.

- **Indicating Scales**
Add graduations to your flag indication.
- **Switch Modules**
Control pumps, valves, alarms, etc. Mount externally on housing for infinite positioning.
- **Continuous Output Transmitters**
Signal conditioned for compatibility with most electronic instruments to 300°F (149°C).

Performance Notes:

- As an option **either** the Switch Modules or Transmitter can be used on a Miniature SureSite Indicator - **Not Both**.
- Minimum specific gravity is 0.7.
- Standard O-ring seal material is Viton®. Others available upon request.
- Electropolished Outer Diameter (OD) and/or Inner Diameter (ID) housings available upon request.

Standard Alloy Versions – Standard Size

- ▶ Temperatures to 750°F (399°C)
- ▶ Pressures to 700 PSI (48 bar)

Rugged, welded construction makes these 2-1/2" (63.5 mm) diameter design, alloy SureSite Indicators dependable over a long service life indoors and out.

1. Mounting Configuration Types

To choose the best configuration for your application, focus on the process connections (connections where the liquid typically enters/leaves the SureSite).

	Type AA	Type BA	Type CA	Type DA
	Top and Bottom Process Connections	Side and Side Process Connections	Top and Side Process Connections	Side and Bottom Process Connections
L = Length of Visual Indication				
Typical Lengths*	C to C = L + 10-1/4" (260.4 mm)	C to C = L	C to C = L + 3-3/4" (95.2 mm)	C to C = L + 6-1/2" (165.1 mm)
Flag Material	Plastic (300°F/148.9°C) or Aluminum (750°F/399°C)			
Length of Indication (Uninterrupted)	240" (610 cm)			
Minimum Specific Gravity	0.39			

* Dimensions vary due to connections, material and specific gravity.

Note: Additional materials, floats, connections and manufacturing techniques are available to extend lengths and operational capabilities. Please contact GEMS Sensors if the parameters above do not meet your requirements.

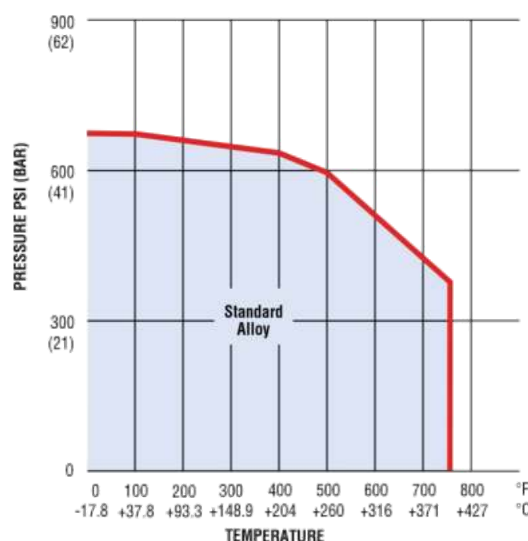
2. Material

Housing and Float: 316 Stainless Steel
Pressure/Temperature performance parameters for alloy SureSite versions are specified in the chart at right. Please consult the factory with temperature/pressure requirements that fall outside the parameters shown here.

= Stock Material (Best economy and delivery).

Materials		Code
Housing	Float	
316L Stainless Steel	316L Stainless Steel	2
Carpenter 20	Hastelloy C276	3*
Hastelloy C276	Hastelloy C276	4*

* Consult factory for pressure/temperature capabilities.



Note: SureSite Indicators are available for temperatures as low as -200°F (-129°C).

ORDER IT!

Ordering is Easy! See Page D-9.

Easy online ordering too!



Type BA Shown

3. Connection Codes

(See complete descriptions below)

(See complete descriptions below)

TOP

T

SIDE







Sa




SIDE

Sb








BOTTOM

B

Blind		NPT				Flange	
		Fixed		Removable		Fixed	Removable
Fixed	Removable	Female	Male	Female	Male	Fixed	Removable
 T1	 T2	 T3	 T5	 T6	 T8	 T9	 T10

Blind	NPT		Flange
	Male	Female	
 S1	 S2	 S3	 S4

—Connection Codes and Material background-shaded in this color are stocked by Gems. Select the connections where possible to obtain the most economical SureSite Indicators with a promised 3-day delivery.

Blind		NPT				Flange	
		Fixed		Removable		Fixed	Removable
Fixed	Removable	Female	Male	Female	Male	Fixed	Removable
 B1	 B2	 B3	 B5	 B6	 B8	 B9	 B10

— Connection Codes and Materials background-shaded in this color are stocked by Gems. Select these connections where possible to obtain the most economical SureSite Indicators with a prompt 3-day delivery.

Connection Code Descriptions

Please provide all connections when completing the Order! Product Check List (located on the following page).

Note: Before selecting your connections, consider incorporating your vent and drain requirements.

T & B (Top and Bottom)

- T/B 1. Welded pipe cap
- T/B 2. Standard fixed flange/blind mating flange
- T/B 3. Welded pipe cap w/FNPT
- T/B 5. Welded pipe cap w/MNPT nipple
- T/B 6. Standard fixed flange/mating FNPT reducing flange
- T/B 8. Standard fixed flange/mating flange with MNPT nipple
- T/B 9. Welded pipe cap with ANSI flange
- T/B 10. Standard fixed flange/mating reducing flange spool

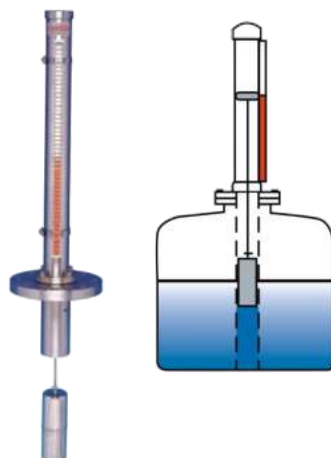
Sa & Sb Sides

- S1. No connection
- S2. MNPT nipple
- S3. FNPT coupling
- S4. ANSI flange



Top Mount Units

When it's not practical to access the side of a tank for liquid monitoring, look to SureSite Top Mount Indicators for the solution. Please consult with the factory for these specially configured indicators **1-800-378-1600**.



Need it quick? Choose materials and components with the color shading for 3-Day manufacturing and shipping. See the Product Configurator section at www.gemssensors.com for further details.

Accessories – Pages D-16 to D-18

Make more of your SureSite® Indicator with the productivity-enhancing accessories found at the end of this section.

- **Indicating Scales**
Add graduations to your flag indication.
- **Switch Modules**
Control pumps, valves, alarms, etc. Mount externally on housing for infinite positioning.
- **Continuous Output Transmitters**
Signal conditioned for compatibility with most electronic instruments to 300°F (149°C).

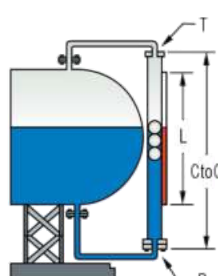
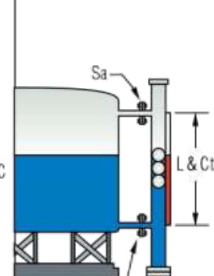
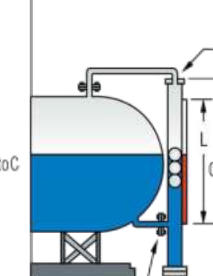
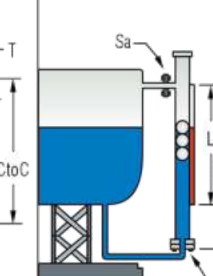
High Performance Versions – Standard Size

- ▶ Designed to meet the requirements of ASME B31.3 "normal" fluid service*
- ▶ Temperatures to 750°F (399°C)
- ▶ Pressures to 4200 PSI (290 bar)

For your most demanding applications, these SureSite® Indicators feature ANSI flanges and fittings and construction to rigorous ASME standards. You can't specify a better visual level indicator.

1. Mounting Configuration Types

To choose the best configuration for your application, focus on the process connections (connections where the liquid typically enters/leaves the SureSite).

	Type AA	Type BA	Type CA	Type DA
	Top and Bottom Process Connections	Side and Side Process Connections	Top and Side Process Connections	Side and Bottom Process Connections
				
Typical Lengths†	C to C = L + 10-1/4" (260.4 mm)	C to C = L	C to C = L + 3-3/4" (95.2 mm)	C to C = L + 6-1/2" (165.1 mm)
Flag Material	Plastic (300°F/148.9°C) or Aluminum (750°F/399°C)			
Length of Indication (Uninterrupted)	240" (610 cm)			
Minimum Specific Gravity	0.39			

† Dimensions vary due to connections, material and specific gravity.

2. Material

Select desired material from those tabulated below. Mark the Code Number on your OrderIt! Check List. The pressure/temperature performance parameters are specified in the chart at right. Consult the factory with pressure/temperature requirements that fall outside the parameters shown here. These units are manufactured in Schedule 40, 80 or 160 pipe accordingly.

 = Stock Material (Best economy and delivery).

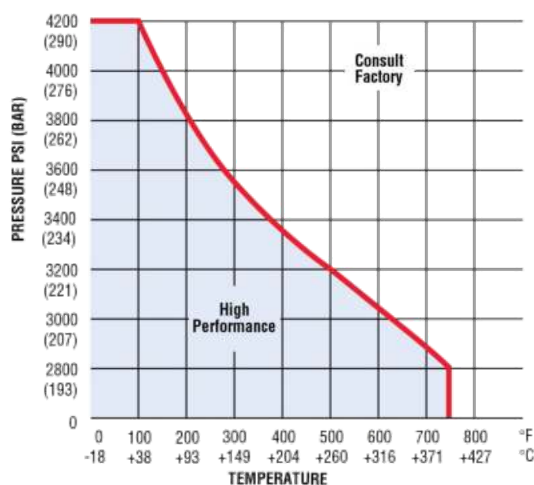
Materials		Code
Housing	Float	
316L Stainless Steel	316L Stainless Steel 600 psi –	2
316L Stainless Steel	Titanium (Ti-6Al-4V) 600 psi+	9

Note: Additional materials, floats, connections and manufacturing techniques are available to extend lengths and operational capabilities. Please contact Gems if the parameters above do not meet your requirements.

*Units requiring ASME certification must be specified at time of request.

ORDERIT!

Ordering is Easy! See Page D-12.
Easy online ordering too!



- All connections comprised of ANSI fittings** (See complete descriptions below)

Engineered Plastics Versions – Standard Size

- ▶ Temperatures to 280°F (139°C)
- ▶ Pressures to 150 PSI (10.3 Bar)
- ▶ Up to 19 feet (5.8 meters) of continuous visual indication

The 2" Schedule 80 pipe design is ideal for use on chemical storage tanks, or with almost any liquid where temperature and pressure requirements are moderate. All SureSite Indicators feature the same patented flag and guide assemblies used on our alloy versions, so you can be assured of excellent visibility and long-life reliability.

1. Mounting Configuration Types

To choose the best configuration for your application, focus on the process connections (connections where the liquid typically enters/leaves the SureSite).

	Type AP Top and Bottom Process Connections	Type BP Side and Side Process Connections	Type CP Top and Side Process Connections	Type DP Side and Bottom Process Connections
L = Length of Visual Indication				
Typical Lengths*	C to C = L + 11" (279 mm) Overall Length = C to C	C to C = L + 8" (203 mm) Overall Length = C to C + 11" (279 mm)	C to C = L + 9.5" (241 mm) Overall Length = C to C + 5-1/2" (140 mm)	C to C = L + 9.5" (241 mm) Overall Length = C to C + 5-1/2" (140 mm)
Flag Indicator Material	Plastic			
Length of Indication, Max.	228" (579 cm)			

* Dimensional data varies due to connections, material and specific gravity.

Note: Additional materials, floats, connections and manufacturing techniques are available to extend lengths and operational capabilities. Please contact GEMS Sensors if the parameters above do not meet your requirements.



Type BP Shown

LEVEL INDICATORS – VISUAL

2. Material

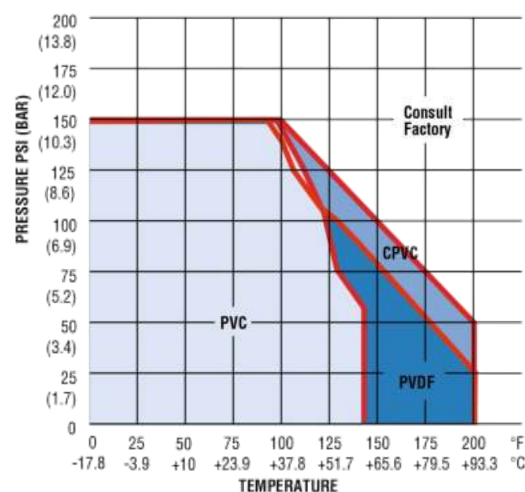
Select desired material from those tabulated below. Mark the Code Number on your Order! Check List. The pressure/temperature performance parameters are specified in the charts at right. Consult the factory with pressure/temperature requirements that fall outside the parameters shown here.

Materials	Code
Housing & Float	
PVC	1
Clear PVC Housing/ PVC Float	1A*
CPVC	2
PVDF	4

* 2" Schedule 40 pipe












= Stock Material
(Best economy and delivery).






Pressure/Temperature Performance














3. Connection Codes

(See complete descriptions below)

TOP 	Blind		NPT						Flange	
			Fixed		Removable				Fixed	Removable
	Fixed	Removable	Female	Male	Male		Female			
	 T1	 T2	 T3	 T4	 T5	 T6	 T7	 T9	 T10	 T11

SIDE 	Blind		NPT		Flange
			Male	Female	
	Fixed	Removable			
	 S1	 S2	 S3	 S4	

— Connection Codes and Materials background-shaded in this color are stocked by Gems. Select these connections where possible to obtain the most economical SureSite Indicators.

BOTTOM 	Blind		NPT						Flange	
			Fixed		Removable				Fixed	Removable
	Fixed	Removable	Female	Male	Male		Female			
	 B1	 B2	 B3	 B4	 B5	 B6	 B7	 B9	 B10	 B11

Connection Code Descriptions

Please provide all connections when completing the Order! Product Check List.

Note: Before selecting your connections, consider incorporating your vent and drain requirements.

T & B (Top and Bottom)

- T/B 1. Welded cap
- T/B 2. Threaded cap (PVC/CPVC only)
- T/B 3. Fixed flange/blind mating flange
- T/B 4. Welded coupling/FNPT
- T/B 5. Welded coupling/MNPT
- T/B 6. Threaded union/MNPT
- T/B 7. Fixed flange/mating flange MNPT
- T/B 9. Fixed flange/mating flange/FNPT
- T/B 10. Welded coupling flange
- T/B 11. Threaded union flange

Sa & Sb (Sides)

- S1 – Blind–No Connection
- S2 – MNPT nipple
- S3 – FNPT coupling
- S4 – ANSI flange

Accessories – Pages D-16 to D-18

Make more of your SureSite® Indicator with the productivity-enhancing accessories found at the end of this section.

- **Indicating Scales**
Add graduations to your flag indication.
- **Switch Modules**
Control pumps, valves, alarms, etc. Mount externally on housing for infinite positioning.
- **Continuous Output Transmitters**
Signal conditioned for compatibility with most electronic instruments.




Continuous Electrical Output Transmitters for all SureSite Indicators

Broaden the SureSite Indicator's capabilities; add one of these transmitters. You can have visual indication and a continuous electrical output too without additional tank penetrations. Use them to know what's in your tank remotely, send the signal to your controller, schedule your next inventory.

These transmitters are compatible with the readout displays at the end of this Section (D-28 to D-30) or can interface directly to your equipment by specifying the appropriate output.

Select your transmitter preference on the SureSite Product Check List (pages D-6, D-9, D-12 and D-15).



Low Temperature Transmitter	Explosion-Proof Transmitter	Explosion-Proof / High Temperature Transmitter
		
Plastic and Standard Alloy Units	Mini Alloys	Standard Alloy and High Performance Alloy Units
+300°F (149°C)	+300°F (149°C)	+750°F (399°C)
Polysulfone	316 Stainless Steel	
Cable	Junction Box (Ferralloy Iron)	
3/8" (9.5 mm)		
3/8" (9.5 mm)		

Signal Conditioned Modules

Gems offers a variety of electrical Junction Boxes with built-in Signal Conditioners to increase the versatility of SureSite Indicators. Voltage outputs available:

- 0-5VDC
- 0-10VDC
- 0-12 VDC

Current output available:

- 4-20mA (loop powered)

Electrical specifications and ordering information for these units are found on Page D-17. Junction boxes with terminal blocks are also on Page D-17.

Intrinsic Safety



Operation is intrinsically safe when transmitters are properly connected with a Gems, or other appropriate, zener barrier in Section L.

Signal Conditioning Modules, 0-5 VDC, 0-12 VDC and 4-20 mA Outputs

Provide signal conditioning as an integral part of the SureSite® Level Indicators

- ▶ Stem Mounted
- ▶ J-Box Enclosed
- ▶ Panel Mounted

Gems signal conditioners provide outputs for direct connection to a wide range of instrumentation. They are ideal for large, multi-tank complexes. Units with 4-20 mA outputs are particularly well suited for instrumentation control loops. No intermediate receiver is required.

Specifications (Not included in table below)



Operating Temperature	+5°F to +160°F (-15°C to +71°C)
Storage Temperature	-40°F to +212°F (-40°C to +100°C)
Output Temperature Coefficient (% of full scale, max.)	±0.00388%/°F (±0.007%/°C)
4-20 mA Types	To within ±1% of 16 mA

Excitation Required for Transmitters using 4-20 mA Signal Conditioners

The minimum excitation required for operation of transmitters with 4-20 mA, DC signal converters (See chart at right) can be determined for a given total loop resistance from the graph shown. (Total loop resistance = the sum of the DC termination resistance plus loop resistance.) For optimum operation, which is a function of source voltage (+V_A) and total loop resistance, the source voltage value used should be above the minimum load line for the related loop resistance.

How To Order

Select Part Number based on Output Signal desired and SureSite Indicator being used.

Electrical Termination Method	Output Signal	Input Voltage	Module Part Numbers For:	
			SureSite Low Temperature	SureSite High Temperature
 Junction Box	0-5 VDC	8-24 VDC	86156	52536
	0-12 VDC	15-30 VDC	85997	52537
	4-20 mA	10-40 VDC	86158	152800
 Panel Mount with Plug-In Base	4-20 mA	10-40 VDC	112300 ⚡	112300 ⚡

⚡ = Stock item



J-Box Enclosure

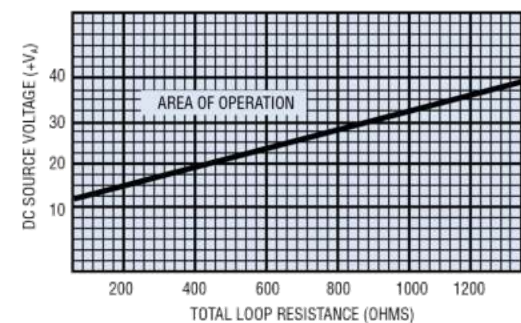


Panel Mounted (Plug Base)

Power Supply Module

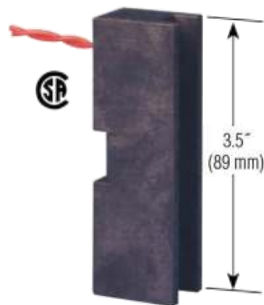
Input Power	Part Number
115 VAC, 60 Hz	52560
230 VAC, 60 Hz	52570

Operates on 115 VAC or 230 VAC inputs to supply a regulated 24 VDC to the signal conditioned transmitter where external VDC power is not available. Maximum Load: 70 mA.



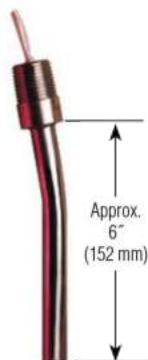
Switch Modules Provide High-, Low- or Intermediate-Level Alarms or Control Logic

Standard Switch Modules



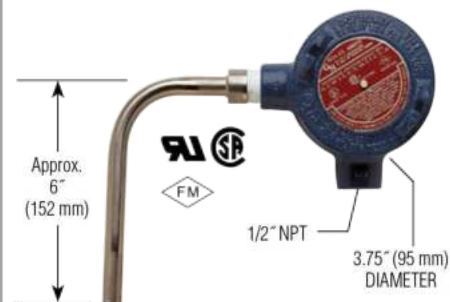
- CSA Approved
- Includes Stainless Steel Mounting Clamp
- Polysulfone Housing
- Withstands Temperatures to 300°F (148.9°C)
- Connection: 1/4" FNPT

High Temperature Switch Module



- Withstands Temperatures of 750°F (399°C)
- 316 Stainless Steel Construction
- 1/2" MNPT Conn.
- Includes Stainless Steel Mounting Clamp

Explosion-Proof Switch Module



- UL, CSA, FM Approved
- Withstands Temperatures of 750°F (399°C)
- J-Box Terminated
- Stainless Steel Construction
- Includes Stainless Steel Mounting Clamp

Switch Logic (All Models)

	Lead Wires Up	Switch closes on rising level and remains closed until opened by falling level.
	Lead Wires Down	Switch opens on rising level and remains open until closed by falling level.



For Intrinsic Safety... These switch modules can be rendered intrinsically safe with the use of GEMS SAFE-PAKS® and Zener Barriers. See Section L.

How To Order

Switch modules can be added to any SureSite Indicator at any time. Specify the Part Number and quantity of switches desired on Product Check List.

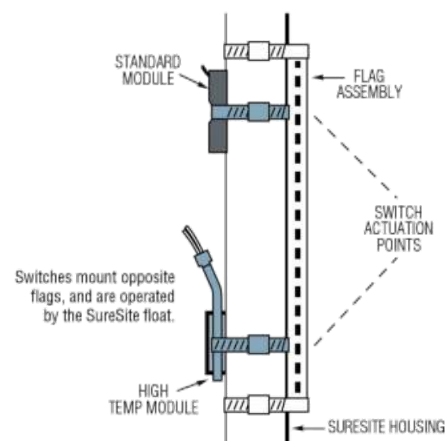
Switch Type		Rating*	Part Numbers – Based on SureSite Version		
			Alloy & ASME SureSite	Mini SureSite	Plastic SureSite
Standard	SPST	20VA	86435	86567	80469
Hi-Temp	SPST	20VA	83150	83150-M	83150-P
	SPDT	20VA	84320	84320-M	84320-P
Explosion-Proof	SPST	20VA	83130	83130-M	83130-P
	SPDT	20VA	84330	84330-M	84330-P
	DPDT, 120 VAC	10A	83100	83100-M	83100-P
	DDTD, 24 VDC	10A	83110	83110-M	83110-P

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

⚡ = Stock item

Mounting

Switches mount opposite flags (180°) and may be positioned next to each other for multiple actuation requirements.



Indicating Scales

These optional stainless steel indicating scales provide a numerical readout of the liquid level in addition to the flag indication. They mount alongside the flag assembly for easy viewing.

- Available in 1.5" and 3" wide versions.
- Markings: Feet and Inches
Inches
Metric (Decameter, centimeter, millimeter)

Custom marked graduations such as gallons, liters or percentage available.



LED Transmitter Versions – Miniature Size

- ▶ LED indicators ideal in low or no ambient light
- ▶ Integral transmitter with choice of signal conditioned output
- ▶ Lengths to 10 feet (3 meters)
- ▶ Pressures to 400 PSI (27 bar) – Temperature to 300°F (149°C)

These Mini SureSite Indicators excel where zero and low ambient light make visual indicators difficult to read. These mini indicators feature all the benefits of a SureSite, like safe and durable stainless steel process fluid containment, while combining a continuous output transmitter with a bright LED channel.

The LED indicator assembly integrates a continuous level transmitter reducing overall footprint. A variety of signal conditioners provide the output you require. Forget the flashlights and squinting required to view antiquated sightglasses.

Typical Applications

- Pharmaceuticals • Medical Equipment • Food and Beverages
- Marine • Rail • Boilers

Specifications

Indication Length	5" to 120" (13 to 305 cm) in 0.5" (13 mm) increments
Media	Waters, Coolants, Light Oils, Diesel, Hydraulics
Specific Gravity	Minimum 0.8 SG to 1.2 SG
Materials	
Chamber Housing	316/316L Stainless Steel
Float	316/316L Stainless Steel
Shroud	Polycarbonate
O-Ring (Wetted)	Viton®, unless otherwise specified
J-Box Enclosure	Die cast Aluminum
Reliability and Durability	Expected 10 year service life
Performance	
Resolution	3/8" (9.5 mm)
Accuracy	±1/2" (13 mm)
Output Signal	4-20 mA to within ±3% of full scale
Temperature Ranges	
Process	-40°F to +300°F (-40°C to +149°C)
Ambient	-40°F to +160°F (-40°C to +71°C)
Operating Pressure	Vacuum to 400 psig (27.6 bar)
Environmental	Enclosure: NEMA 4X IP65 (Water Resistant)
Input Power	20 to 28VDC, @100mA. Consult Factory for other voltages
Outputs	4-20 mA continuous current loop (3 wire) 0-5 V continuous (3 wire) 0-10 V continuous (3 wire)
Mechanical Interface	Custom configured for tank (per mini SureSite offering), 1/2" NPT to junction box
Mounting Orientation	
Unit Positions	AM-L, BM-L, CM-L, DM-L
Shroud Position	See Selection Guide; Step 2 for Codes
Calibration	Field Adjustment Null and Span/Factory Calibrated

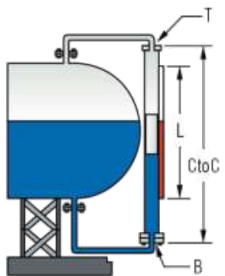
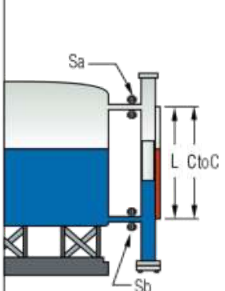
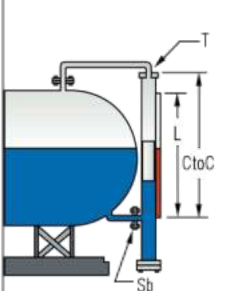
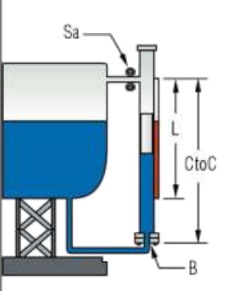


1. Mounting Configuration Type

Based on process connection locations.

L = Length of Visual Indication

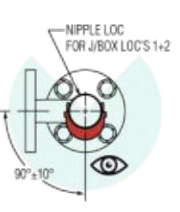
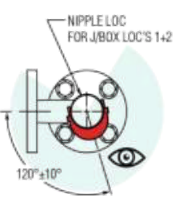
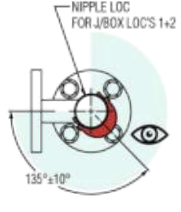
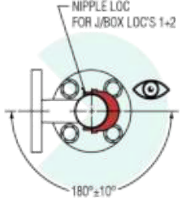
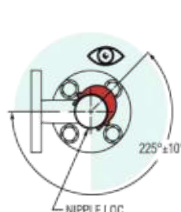
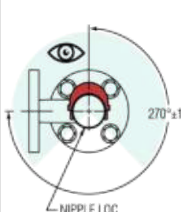
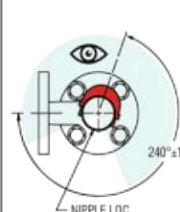
C to C = Length between process connections.*
Gems will aid in determining this value.

Type AM-L	Type BM-L	Type CM-L	Type DM-L
Top and Bottom Process Connections	Side and Side Process Connections	Top and Side Process Connections	Side and Bottom Process Connections
			
Typical Lengths*	C to C = L + 9.5" (241 mm)	C to C = L	C to C = L + 6" (152 mm)
Length of Indication (Uninterrupted)	120" (305 cm), Maximum		

* Formula provided is for approximation only. Final dimensions will vary due to connections type, position, cable or junction box location, and specific gravity of process liquid. Gems will confirm final dimensions before manufacturing.

2. LED Transmitter Assembly Location


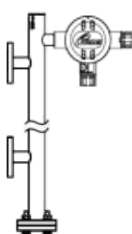
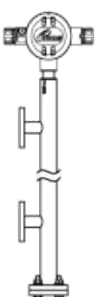
Position relative to process connection location. All illustration views are from the top. Codes with "+" indicate views when 3/4" side ports are used.

Transmitter Assembly Location Code						
A	A+	B	C	D	E	E+
						

Approximate angle of view - 270°

3. J-Box Location

Drawings are typical, and for reference only. Final, specific locations are determined at time of manufacture.

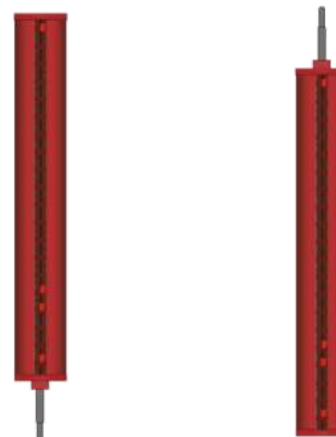
J-Box Location Code		
1 Side Mount Below Bottom Port	2 Side Mount Above Top Port	3* Top Mount
		

* Requires a Blind Fixed Top Connection. See Connection Code T1 in the chart on next page.

LED Assembly Cable Egress














For J-Box Location 1, LED Transmitter Assembly cable will egress from the bottom of the assembly.

For J-Box Locations 2 and 3, the cable will egress from the top of the assembly.



4. Connection Codes

(See complete descriptions below)

		Blind		NPT				Flange		Weld	
				Fixed		Removable		Fixed	Removable	Socket Butt	Removable Butt
		Fixed	Removable	Female	Male	Female	Male				
TOP		T1	T10	T2	T3	T11	T12	T19	T20	T18	T13
											
SIDE											
SIDE											
BOTTOM											

— Connection Codes and Materials background-shaded in this color are stocked by Gems. Select these connections where possible to obtain the most economical SureSite Indicators with prompt delivery.

Note: Gems recommends a removable top and/or bottom connection for float access.

Connection Code Descriptions

Please provide all connections when completing the **OrderIt!** Product Check List (located on the following page).

Note: Before selecting your connections, consider incorporating your vent and drain requirements.

T & B (Top and Bottom)

- T/B 1. Welded cap
 T/B 2. Welded cap with FNPT
 T/B 3. Welded cap with MNPT
 T/B 7. Sanitary flange
 T/B 8. Sanitary flange with mating blind flange
 T/B 10. Standard fixed flange/mating blind flange
 T/B 11. Standard fixed flange/mating FNPT reducing flange

- T/B 12. Standard fixed flange/mating flange with MNPT nipple
 T/B 13. Standard fixed flange/mating flange with butt weld nipple
 T/B 18. Welded cap with butt weld nipple
 T/B 19. Welded cap with ANSI flange
 T/B 20. Standard fixed flange/mating reducing flange spool with ANSI flange

Sa & Sb (Sides)

- S1. No connection
 S2. MNPT nipple
 S3. FNPT coupling
 S4. ANSI flange
 S5. Sanitary flange
 S6. Buttweld nipple

5. Signal Conditioner Assemblies

Gems signal conditioners provide outputs for direct connection to a wide range of instrumentation. They are ideal for large, multi-tank complexes. Units with 4-20 mA outputs are particularly well suited for instrumentation control loops. Consult LED SureSite Installation, Operation and Maintenance bulletin.



DIPTAPE Visual Level Indicators – Manually Operated

These manually-operated indicators are compact and completely self-contained. They need no electricity to provide continuous indication of liquid level in storage tanks and vessels. DIPTAPE Indicators are ideal for quick, periodic readouts that are accurate to 1/16 inch or 1 mm; especially in remote areas where power is unavailable, or undesirable. Only the float and stem contact the liquid, so the readout tape is always clean and readable.

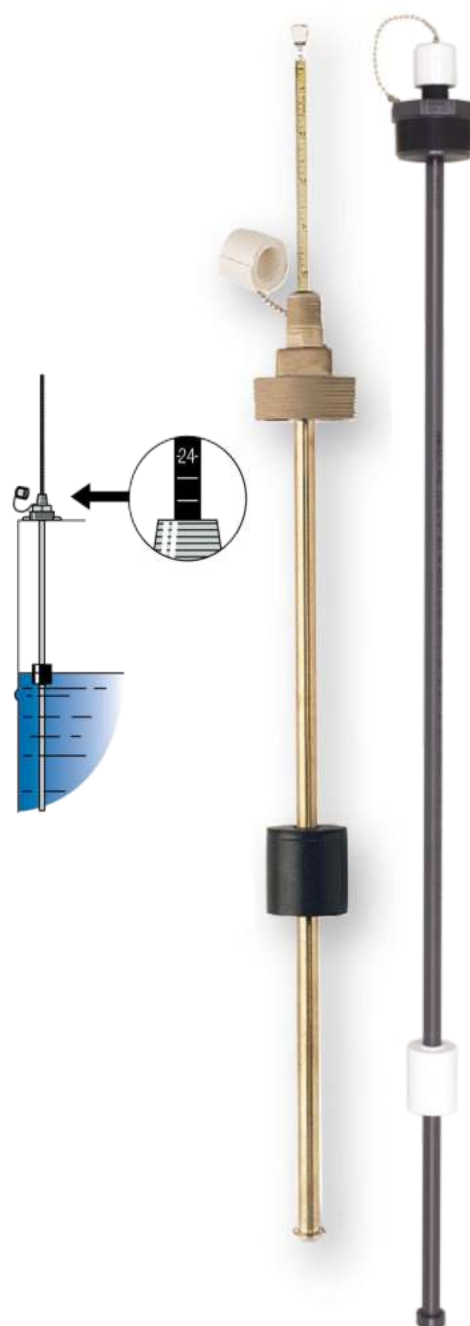
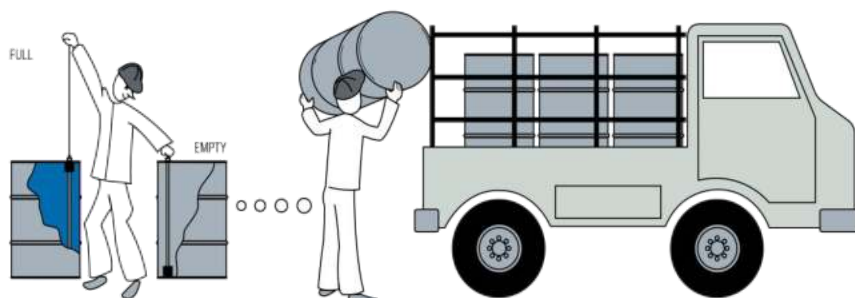
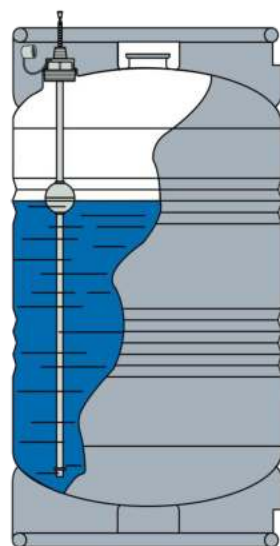
Custom-configurable DIPTAPE Indicators described on the following pages are available in a broad range of materials and mounting types in lengths to six feet (1.8 m). For lengths six to ten feet, consult factory.

General Operating Principle

A magnet-equipped float moves with liquid level along the unit stem, inside the storage vessel. Level readout is obtained by simply removing the protective cap atop the unit and lifting the calibrated indicator (within the unit) until magnetic interlock with the float is felt. The indicator is held at this point and level is read where the calibration aligns with the top of the mounting. The indicator is then lowered back inside the unit for storage and is protected by the screw type cap when not in use.

Typical Application

Refillable, portable chemical tanks are monitored and exchanged when empty. DIPTAPE Indicators maintain a “closed” system on tanks or drums containing environmentally hazardous liquids and vapors. Plus, their rugged construction stands up to the rigors of transportation.



Contents	Page Start
All-PVC Versions	D-24
Engineered Plastic Versions	D-25
Alloy Versions	D-26

All-PVC Versions Are Economical for Light Duty

ORDER IT!

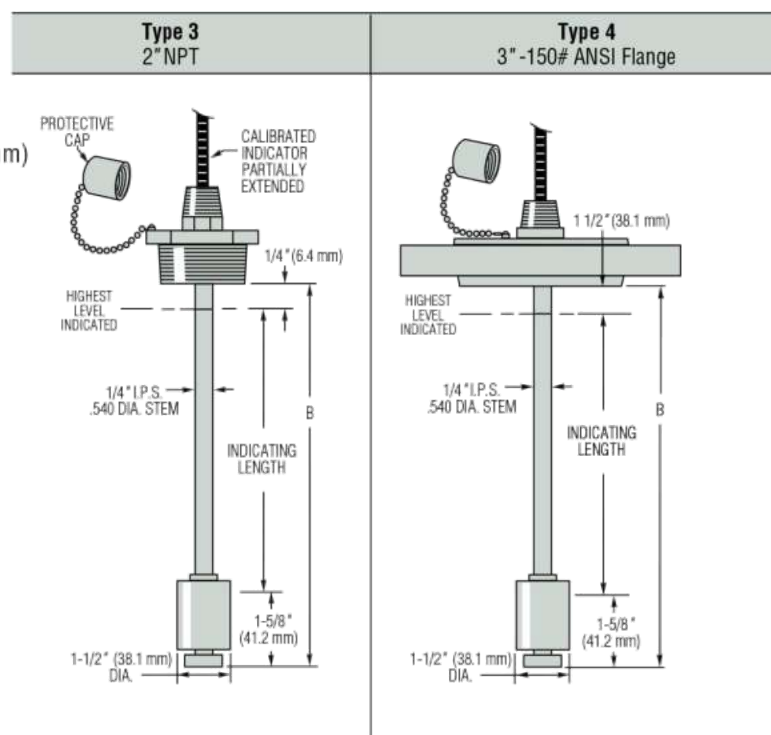
Ordering is Easy! See Page D-27.
Easy online ordering too!

- ▶ Temperatures to 140°F (60°C)
- ▶ Pressures to 15 PSI (1 bar) Max.

Ideal for chemical storage tanks, our all-PVC DIPTAPE Indicators provide one of your best values for liquid level monitoring. These light duty versions are recommended for use in calm liquids and ambient temperature and pressure levels. See Engineered Plastic versions on the next page for enhanced performance characteristics.

1. Mounting Types

"B" Dimension (Length Overall):
Indicating Length + 1-7/8" (47.6 mm)



Stem, Float and Mounting Material	PVC
Min. Liquid Specific Gravity	0.65
Operating Temperatures	0°F to +140°F (-17.7°C to 60°C)
Operating Pressure, Max.	15 psi (1 bar)
Indicating Length*	6" to 72" (15.2 cm to 182.9 cm)
Std. Indication Markings	1/16" or 1 mm increments

*For longer lengths, please consult factory.

Ordering Is Easy

1. To specify DIPTAPE Level Indicators, start by photocopying the OrderIt! Product Check List located on Page D-27.
2. Use the product information in this section to make your selections on the Check List. Please use a separate Check List for each unique configuration.
3. Fax your completed OrderIt! Check List to Gems for a price quotation.
Fax: 860-747-4244

Engineered Plastic Versions Offer Best Chemical Resistance

ORDER IT!
Ordering is Easy! See Page D-27.
Easy online ordering too!

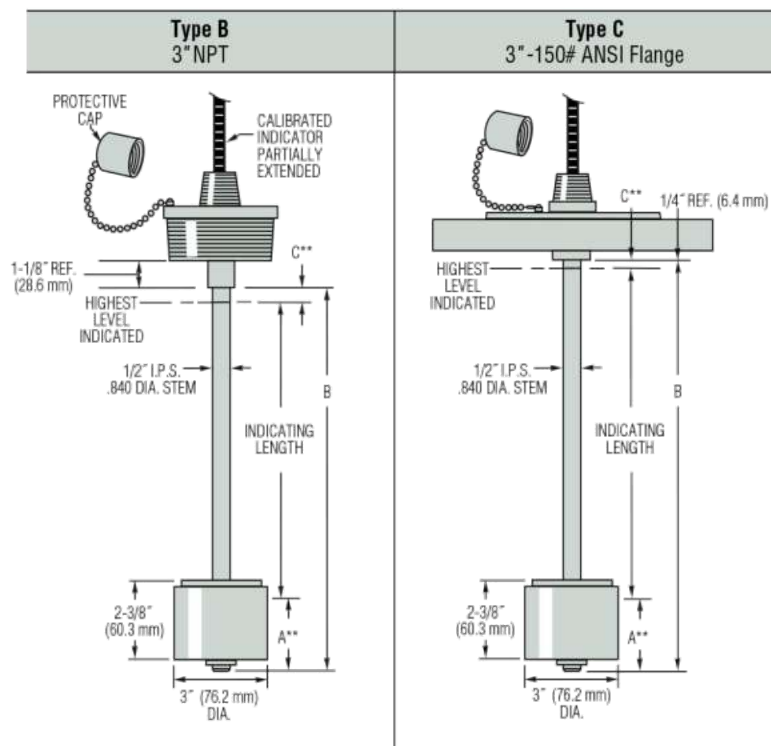
- ▶ Temperatures to 140°F (60°C)
- ▶ Pressures to 50 PSI (3.4 bar)

With a choice of three highly resistive, engineered plastic materials, large floats and 1/2 inch IPS stems, these DIPTAPE Indicators provide rugged durability in almost any chemical tank. For higher temperature and pressure capability, review the alloy versions on next page.

1. Mounting Types

"B" Dimension
(Length Overall):
Indicating Length + A + C

Note: Dimensions "A" and "C"
are dependent on float selected.
See Float Types below.



Stem and Mounting Material	PVC, PVDF or Polypropylene
Indicating Length*	6" to 72" (15.2 cm to 182.9 cm)
Std. Indication Markings	1/16" or 1 mm increments

*For longer lengths, please consult factory.

**Dimensions listed below, under "Float Types."

2. Float Types

Float Material	PVC	Polypropylene	PVDF
Part Number	71741	73742	73740
Min. Liquid Specific Gravity	0.65	0.46	0.83
Operating Temperatures	+40°F to +140°F (+4.4°C to +60°C)		
Operating Pressure, Max.	50 psi (3.4 bar)		
"A" Dimension (From Mounting Types)	1-3/4" (44.4 mm)	1-3/8" (34.9 mm)	2-3/16" (55.6 mm)
"C" Dimension (From Mounting Types)	15/16" (23.8 mm)	1-5/16" (33.3 mm)	1/2" (12.7 mm)


LEVEL INDICATORS - VISUAL

DIPTAPE™ Indicators – Alloy Versions

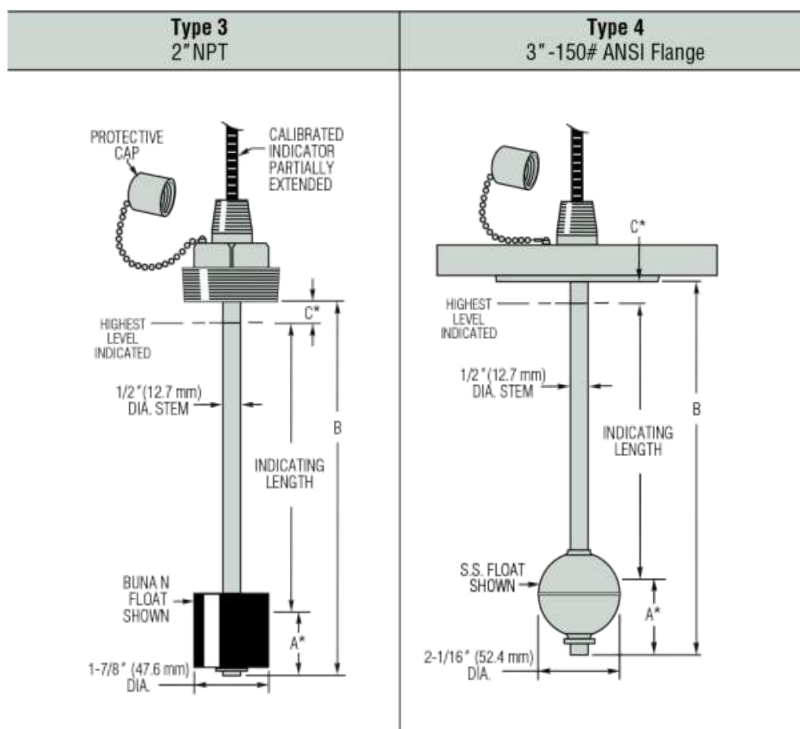
- ▶ Temperatures to 300°F (148°C)
- ▶ Pressures to 750 PSI (52 bar)

Rugged brass or stainless steel units are ideal for use in water and oils. Select these units for best temperature and pressure capabilities.

1. Mounting Types

"B" Dimension
(Length Overall):
Indicating Length + A + C

Note: Dimensions "C" and "A"
are dependent on float selected.
See Float Types below.



Stem and Mounting Material	Brass or 316 Stainless Steel	316 Stainless Steel Stem with Carbon Steel or 316 Stainless Steel Flange
Indicating Length**	6" to 72" (15.2 cm to 182.9 cm)	
Std. Indication Markings	1/16" or 1 mm increments	

* Dimensions listed below, under "Float Types."

** For longer lengths, please contact factory.

2. Float Types

	Buna N*	Stainless Steel	
Float Part Number	73710	73709	138935
Min. Liquid Specific Gravity	0.45	0.67	0.67
Operating Temperatures	Oil: -40°F to +230°F (-40°C to +110°C) Water: to 180°F (+82.2°C)	-40°F to +300°F (-40°C to +148.8°C)	-40°F to +220°F (-40°C to +104°C)
Operating Pressure, Max.	300 psi (21 bar) max. @ 77°F (25°C)	750 psi (52 bar) Mounting Type 3 150 psi (10 bar) Mounting Type 4	150 psi (10 bar)
"A" Dimension (From Mounting Types)	1-1/4" (31.7 mm)	1-3/8" (34.9 mm)	1" (25.4 mm)
"C" Dimension (From Mounting Types)	11/16" (17.5 mm)	3/4" (19.05 mm)	9/16" (14.3 mm)

* Other Wetted Material: Hysol.

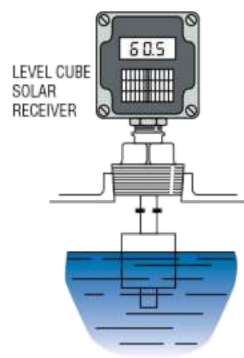
ORDER IT!

Ordering is Easy! See Page D-27.
Easy online ordering too!

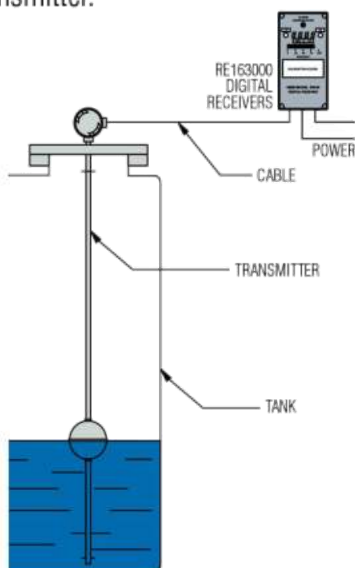


GEMS Receivers Tell You What Your Sensors Already Know

GEMS Receivers house a numerical digital readout, and all of the calibration adjustments for a complete Continuous Level Indication system. Those receivers designed for the XM-Series transmitters also include a power supply for the transmitter.



Level Cube with 1/2" NPT shown mounted directly on GEMS XM-Series Transmitter. Or, they may be mounted remotely, up to 100 feet from the transmitter.



3-Digit Level Cube Receivers



Digital Bargraph Receivers



These units feature a large 4-digit display and bright LED bargraph to visually clarify relative tank content level.

Selector Guide

The Selector Guide below lists standard GEMS Receivers and the transmitter series with which they are normally configured. GEMS doesn't stop, however, with the standard designs shown in this catalog. Our experienced engineering staff will custom design receivers to suit your application. Don't hesitate to contact us about your special requirements.

Receivers	Mounting*	Alarm	Operating Voltage	Compatible GEMS Products
3-Digit Level Cube Receivers	Wall or Transmitter	None	9V Battery, 9 VDC / 117 VAC, Solar	XM-Series (1/4" or 1/2" Resolution), and SureSite Transmitters
RE163000	Panel or Wall	2 Alarm	90-120 VAC, 20-50 VDC	All Continuous Transmitters, SureSite Transmitters, Pressure Transmitters

*Mounting Definitions:

Wall: Mounted **onto** a surface; i.e., wall, bulkhead, deck, etc.

Panel: Mounted **into**, and approximately flush with, a surface through a cutout.


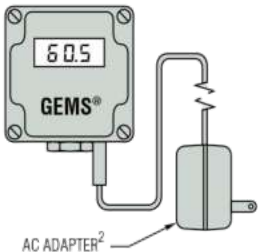

Transmitter: Mounted directly to the top of the transmitter.

3-Digit Level Cube Receivers

For use with GEMS Transmitters and SureSite® Transmitters.

These compact, low-cost Level Cubes provide accurate, continuous 3-digit readout of liquid level. The indicating range and decimal point location on the display are quickly and easily selectable with the readout plainly visible.

3 Power Choices with NPT or Cable Mounted

9-V Battery Powered	9 VDC/117 VAC Powered	Solar-Powered
		
Part Numbers: 118600—Cable Output 119250—1/2" NPT	Part Numbers: 118620—Cable Output 119270—1/2" NPT	Part Numbers: 118610—Cable Output 119260—1/2" NPT

Notes:

- 9-V Alkaline Battery Powered Units:** Two batteries (supplied) are snapped into terminals in Cube. On/Off switch available
- 9 VDC/117 VAC Powered Units:** Power is supplied from AC adapter. A plug, Part Number 119218, is available for use where 7-VDC power is supplied by customer. These units are not watertight.
- Solar-Powered Units:** Sunlight or a flashlight beam directed on a solar cell in the front cover is all that's needed to operate.

Specifications

Housing Material	Polycarbonate, NEMA-4X, watertight*
Cable Distance from Transmitter	100 feet, Max.
Operating Temperature	+23°F to 131°F (-5°C to +55°C)
Accuracy	± 2%

*Except for 9 VDC/117 VAC Powered Units which are not watertight.

How To Order – Standard Models

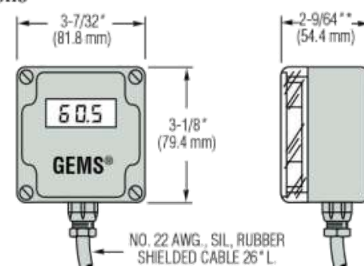
Style	Mounting	Part Number
9-V Battery	Cable Output	118600
	1/2" NPT	119250
9 VDC / 117 VAC	Cable Output	118620
	1/2" NPT	119270
Solar	Cable Output	118610
	1/2" NPT	119260

NPT or Cable Mounted



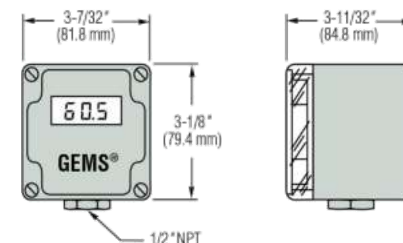
Dimensions

Cable Output Versions

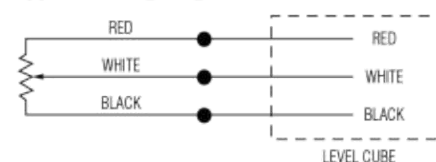


* P/N 118600 9-V Battery = 3-11/32" (84.8 mm) only.

1/2" NPT Versions



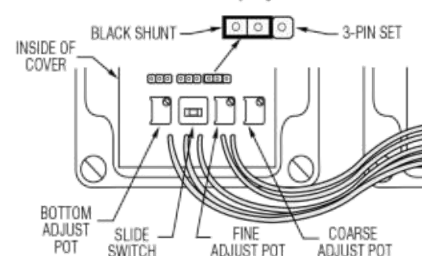
Typical Wiring Diagram



Note: For ullage indication, transpose red and black connections.

Easy to Adjust and Calibrate

Adjustments must be performed with cover removed (see illustration) and power applied. Results are observed on the front display.



To position decimal point: Place black shunt over left two pins of proper 3-pin set for desired decimal in display. For no decimal, place shunt over right two pins of any set.

Digital Bargraph Display Receivers - 163000 Series

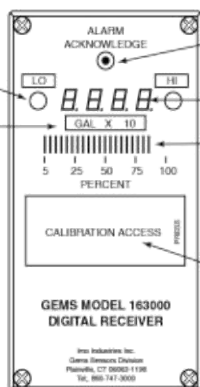
Gems Digital Bargraph Receivers improve the way you are able to visualize the data being received from your liquid level transmitters. These new receivers display liquid level information in digital numerals in conjunction with a 0-100% LED bargraph readout. The numeric portion is a 1/2" 4-digit display that provides detailed quantification of tank contents, while the bright LED bargraph represents the tank contents as a bar length relative to the percentage of fluid volume within the tank.

If you have a non-linear tank, such as a sphere or a cylinder laying on its side, these receivers are a blessing. They can be calibrated easily so that the digital and bargraph displays will indicate accurate content information for "odd" shape tanks. See "Linearization" below.

In addition to the dual visual displays, the Gems Bargraph Receiver features two independent alarms with adjustable time delays, 10 amp auxiliary dry contacts and easy user set-up. The receiver is available in component form for mounting into custom enclosures or panels, or housed within a NEMA 4X enclosure.

2 Independent Alarms with adjustable time delays. Labels are supplied and user applied.

Example of units measured: Gallons, Liters, Pounds, etc. Labels are supplied and user applied.



Touch to acknowledge alarm activation.

Large 4 Digit Numerical Display.

LED Bargraph represents percentage of tank contents.

Calibration conveniently accessible from front of panel (access plate is supplied loose in a cloth bag along with labels).

Linearization

Certain tanks, like a sphere or a cylinder laying on its side, are considered "Non-Linear" in terms of volume versus tank height. In these cases this receiver may be linearized according to your tank parameters so that the correct volume is displayed. Any units may be displayed by the receiver. Gallons, inches, tons, cubic inches, liters and etc.

The receiver uses a scheme where 9 points or 8 straight lines are used to calculate the numbers to be displayed. These 8 lines approximate the curve of the non-linear tank.

Examples of Non-Linear Display Values.

1. Gallons in a spherical tank.
2. Gallons in a cylindrical tank laying down.
3. Pounds of liquid in a spherical tank.
4. Cubic meters in a conical shaped tank.
5. Gallons in a non-linear shaped tank.

IMPORTANT: Customer must supply a sounding table, capacity curve and/or tank drawing for linearization of the digital bar graph display receiver.

Specification

Input Signal	4-20mA, Proportional Voltage*, Serial
Accuracy Over Given Range	± 1.0%
Operating Voltage	24VDC or 115VAC
Operating Temperature	32°F to 122°F (0°C to 50°C)
Alarm Contacts, Load	10Amp, Dry Contact
Digital Readout	0000 to 9999

* Proportional voltage as produced by the non-signal conditioned Gems Liquid Level Transmitters (Section H) and SureSite Transmitters (Section G).

Note: Customer alarms (High & Low) set upon request.

Panel Mounted Versions

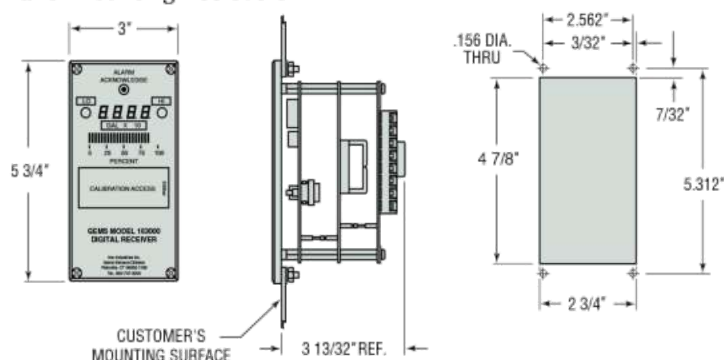


Enclosed Versions



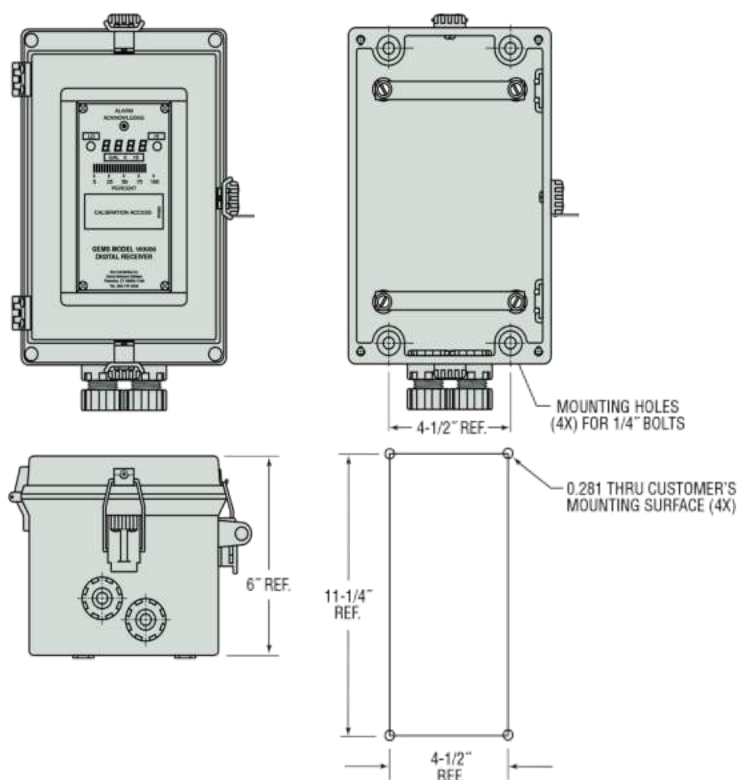
Dimensions

Panel Mounting Receivers

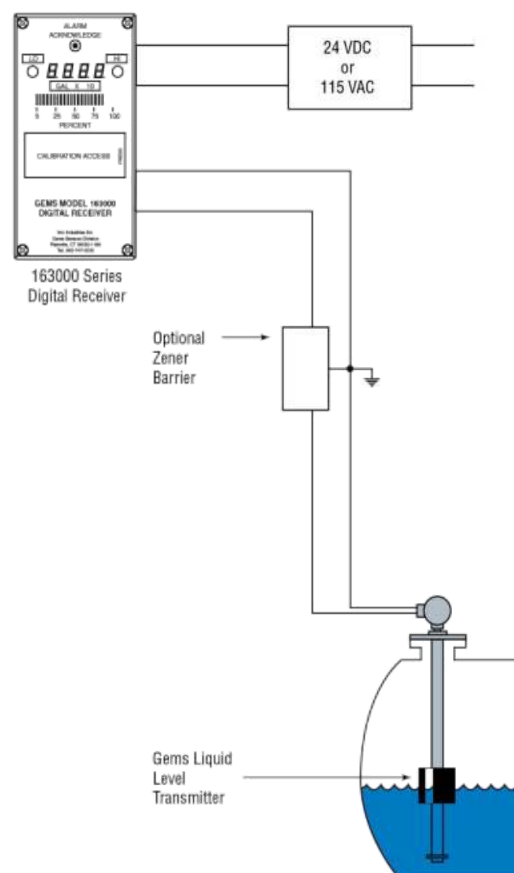


Static Sensitive.
Handling Precautions Required.

NEMA 4X Enclosed Receivers



Typical Installation



How To Order - Standard

Select receiver type by Part Number based on Input Power and Input/Output Signals required.

Input Power	Input/Output Signals		Part Number	
	Input	Output	Panel Mount	NEMA 4X Fiberglass Enclosed
24 VDC	Transmitter*	None	170680-0100	170690-0100
	Serial	None	170681-0100	170691-0100
	Transmitter*	4-20mA	170682-0100	170692-0100
	4-20mA	4-20mA	170683-0100	170693-0100
		None	170684-0100	170694-0100
115 VAC	Transmitter*	None	170685-0100	170695-0100
	Serial	None	170686-0100	170696-0100
	Transmitter*	4-20mA	170687-0100	170697-0100
	4-20mA	4-20mA	170688-0100	170698-0100
		None	170689-0100	170699-0100

* Proportional voltage as produced by the non-signal conditioned Gems Liquid Level Transmitters (Sections C) and SureSite Transmitters (Section D). When used in conjunction with RE-163000, no additional signal conditioning required.

PDTF Series – Temperature Switch

- ▶ 70°F to 285°F (20°C to 140°C)
- ▶ Withstands Acceleration to 8G
- ▶ Small Capillary for Harsh Applications

Gems PDTF Series is a factory set temperature switch for the protection of all types of internal combustion engines, pumps, compressors, gear boxes, hydraulic reservoirs, marine and industrial power plants. Model PDTF will withstand acceleration to 8G. Its compact and rugged construction allow it to be mounted in the toughest OEM applications. The PDTF utilizes a liquid-filled capillary to sense temperature changes. The liquid expands as the temperature increases, causing the capillary pressure to increase.

Specifications

Maximum Temperature	55°F (25°C) above Set Point
Switch	Resistive 5 Amp; Inductive 2 Amp @ 12/24 VDC and 125/250 VAC
Setting Tolerance	±6°F (±3°C)
Wetted Parts	
Housing	Zinc Plated Steel
Capillary	Brass
Electrical Termination	DIN 43650A IP65; Flying Leads IP65
Maximum Pressure	350 psi (25 bar)
Deadband	19°F (9°C) Average
Approvals	CE
Weight, Approximate	0.3 lbs. (0.14 kg)

How To Order

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

SELECT	PDTF	-100°F	-R	-8MNZ	-C	-FL18	-WF
1. Set Point Specify 70°F - 285°F (20°C - 140°C) in °F or °C							
2. Direction -R Rising; -F Falling							
3. Medium Connection -6M 3/8" NPT Male; -8M 1/2" NPT Male							
4. Circuit ¹ -C SPDT; -A SPST/NO; -B SPST/NC							
5. Electrical Termination -SP 1/4" Spade; -H DIN 43650A Male Half Only; -HC DIN 43650A 9mm Cable Clamp; -HN DIN 43650A 1/2" Conduit (Female); -FLXX Flying Leads – Specify 18" to 48" (18" Standard); -CABXX 18 AWG PVC Cable – Specify 36" to 120"; -FLSXX Flying Leads with PVC shrink tubing – Specify 18" to 48" (18" Standard);							
6. Options ² -WF Weather Pack Connector, Female; -WM Weather Pack Connector, Male; -DE Deutsch Connector, Male, DT04 Series							

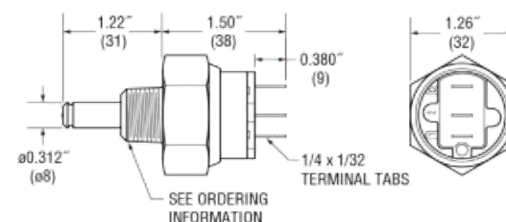
Notes:

1. Lead wires required on all selections except -C SPDT option.
2. Other Connectors Available. Consult Factory.

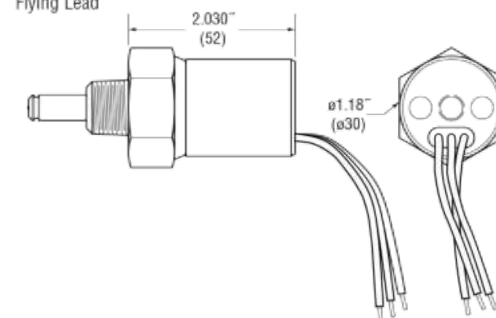


Dimensions

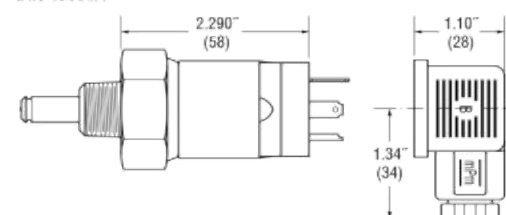
Spades



Flying Lead



DIN 43650A



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

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

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

Specifications

Performance	
Nominal Sensing Distance, Sn	0.118" (3mm)
Sensing Range	0-0.118" (0-3mm)
Repeat Accuracy - (% of Sn)	<10%
Hysteresis - (% of Sn)	<20%
Mechanical	
Enclosure Ratings	IP67, NEMA 1,3,4,6,13
Operating Temperature Range	-13°F to +158°F (-25°C to +70°C)
LED Signal Indicator	Yellow
Power On LED Indicator	Green
Potentiometer	Yes
Sensor Type	
Unshielded	L-Type, Non-Embeddable
Shielded	D-Type, Embeddable
Barrel Material	Delrin®
Termination	78.74" (2 meter), 3 Wire PVC
Shock	30g, 11ms
Vibration	55Hz, 1mm amplitude in all planes
Max. Pressure	150 psi (10.3 bar)
Electrical	
Supply Voltage	5-48 VDC
Continuous Switching Current	300 mA
Voltage Drop	<2 VDC
Current Consumption	<10 mA
Switching Frequency	100 Hz
Transient Protection	2kV, 1ms, 1 kOhm
Overload Protection	Yes
Short Circuit	Yes
Reverse Polarity Protection	Yes
Approvals	CE (Except at Frequency 803-805 MHz), RoHS

How To Order

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

Fluid Properties	Container Material	Wet/Dry Sink	Part Number
Water Based, Conductive (unshielded sensor)	Non-Metallic	Wet	230077
		Dry	230078
Non-Water Based, Not Conductive (shielded sensor)	Non-Metallic or Metallic	Wet	230082
		Dry	230083

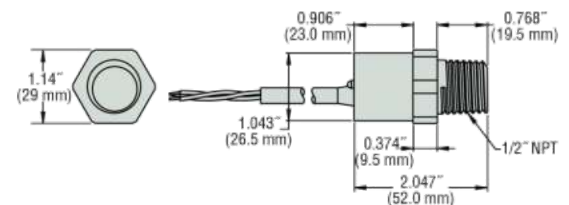


Typical Applications

Fluid Monitoring:

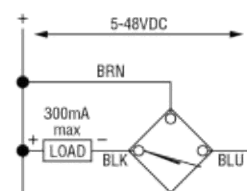
- Waste
- Reagents
- Diluent
- Detergent/Wash
- Coolant
- Printing Ink

Dimensions

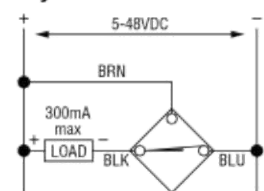


Wiring Diagram

Wet Sink



Dry Sink



5000 Series Low Pressure Transducer

- ▶ Submersible and General Purpose Models
- ▶ Stainless Steel Case Construction
- ▶ High Proof Pressures

The 5000 Series features a sturdy ceramic diaphragm that detects minute pressure variations, while withstanding large pressure spikes. The tough ceramic sensor is housed in a duplex stainless steel case to ensure performance in the most demanding applications, such as sea water.

Specifications

Input	
Pressure Range	0 to 415" wc (0 to 15psi)
Proof Pressure	30psi (≤ 80 "wc) 60psi (≤ 150 "wc); 100psi (>150 "wc)
Burst Pressure	45psi (≤ 28 "wc) 60psi (>28 "wc to 80"wc) 90psi (≤ 150 "wc); 145psi (>150 "wc)
Fatigue Life	10 million FS cycles
Performance	
Long Term Stability	0.25% span/annum
Accuracy	0.2% span max
Thermal Error	2% span max
Compensated Temperatures	-4°F to +140°F (-20°C to +60°C)
Operating Temperatures	
Process media	-40°F to +212°F (-40°C to +100°C)
Electrical code G & L	-15°F to +185°F (-25°C to +85°C)
Electrical code M & 3	-5°F to +120°F (-20°C to +50°C)
Zero Tolerance	1% span
Span Tolerance	1% span
Mounting Effects	0.25% span max
Response Time	5ms
Supply Voltage Sensitivity	0.01% span/volt
Mechanical Configuration	
Inconel Pressure Ports	(See Ordering Guide)
Wetted Parts	318 Duplex SS, Ceramic, Nitrile (Viton® Optional)
Electrical Connection	(See Ordering Guide)
Enclosure	Code M IP68 Submersible Code G IP65
Vibration	35g peak 5-2000 Hz, MIL STD 810, Method 514.2, Procedure I
Acceleration	100g, MIL STD 810C, Method 513.2, Procedure II
Approvals	CE, Lloyds Register, optional intrinsically safe EXII 1G; E Exia II BT4 (-20°C < T amb < 75°C)
Weight	330gms (excluding cable) (12oz)

Individual Specifications

Voltage Output units	
Output	(See Ordering Guide) (3-wire)
Supply Voltage (Vs)	9 to 35 VDC (8-35 VDC, 1-6 VDC Output)
Current Output Unit	
Output	4-20 mA (2 wire)
Supply Voltage (Vs)	9 to 35 VDC (ExII 1G 9-28 Vdc)
Max. Loop Resistance	(Vs-9) * 50 ohms



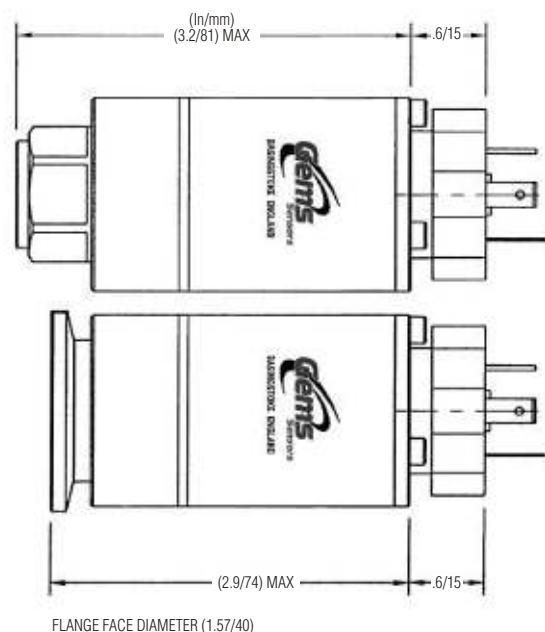
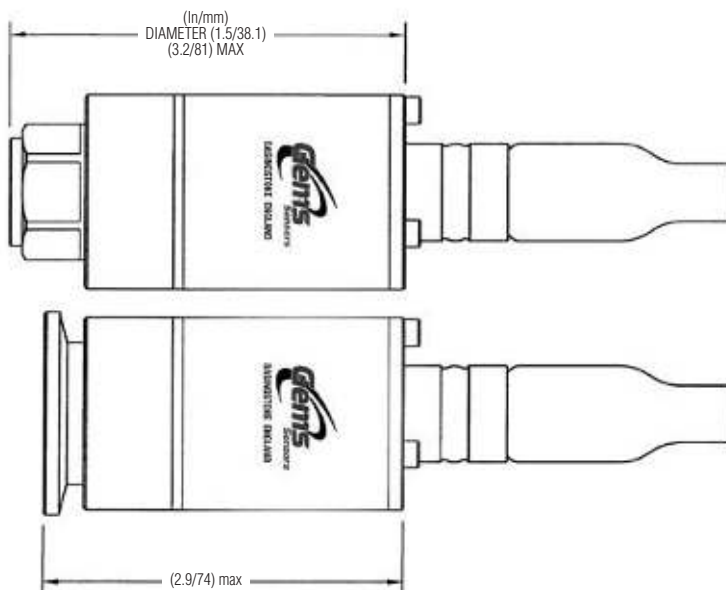
How to Order

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

SELECT

1. **5000** series
2. Output:
- B** 4–20 mA **C** 1–6 VDC **F** 0.1–5.1 VDC **H** 1–5 VDC
- J** 0.5–5.5 VDC **R** 0–5 VDC
3. Pressure Datum: **G** gauge
4. Pressure range code*
- M70** 10 to 28" wc, 25 to 70 mbar, 0.36 - 1 psi
- N20** 29 to 80" wc, 71 to 200 mbar, 1 - 3 psi
- N35** 81 to 150" wc, 201 to 350 mbar, 3 - 5 psi
- A10** 151 to 415" wc, 351 to 1000 mbar, 5 - 15 psi
5. **Pressure Connection**
- OK** G1/4 Internal
- AK** G 1/4 external
- MK** M14x1.5 external
- BK** 1/4 - 18 NPT external
- KK** 7/16 - 20unf - 3A external
- OF** Open Face, KF25 Flange
- Submersible Nose Cones { **19** Plastic Nose Cone
- { **29** Stainless Steel Nose Cone
6. Electrical Connection
- G** Fixed Plug to DIN 43650, Mating Connector Supplied
- L** M12 x 1 (5 pin)
- M** Immersible Cable Assembly, IP68
- 3** 1/2-14 NPT Conduit
7. Approvals
- 3** CE Marked
- B** Zenier
- G** Galvanic Intrinsically Safe
8. Cable Length
- 000** = No Cable
- 001** = 1 meter
- 999** = 999 meters
9. Static/Thermal Error Band
- A** 0.25%/2%
10. Specify Calibration (i.e @70" wc)
- A @XXX**

* specify range required at time of order
eg. 5000BGM700FM3001a@15"wc



PS98 - Solid-State Pressure Switch

- ▶ 0 to 6000 psi and 0 to 400 bar
- ▶ No Moving Parts—Highly Resistant to Shock and Vibration
- ▶ Ideal for Off-Highway, Mobile, Demanding Applications
- ▶ Long Cycle Life

Answering the demand for solid-state switches, Gems proudly offers the PS98. Built from our proven CVD and ASIC design, the PS98 Solid-State pressure switch offers greater accuracy in rough environments. This switch is an ideal alternative to electromechanical types when cycles exceed 50 cycles/minute and broad frequency response is needed. In addition to a modular design, a host of pressure ports and electrical connections are available. Switch and switch-back points are factory set per customer specification.

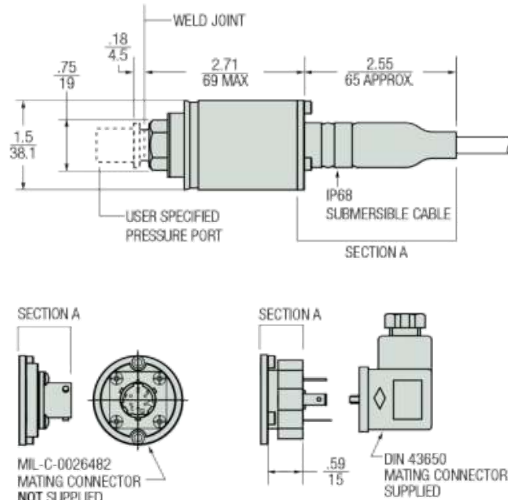
Specifications:

Operating Temperature	-40°F to +260°F (-40°C to +127°C)
Switch	Relay or Transistor
Repeatability*	.25% of Full Set point range @ 70°F (20°C)
Fatigue Life	Designed for more than 100 million FS cycles
Wetted Parts	
Diaphragm	17-4PH Stainless Steel
Fitting	316 Stainless Steel
Electrical Termination	DIN "G" IP65 10-6 MIL CONN "C" IP65 Submersible Cable "M" IP68
Supply Voltage (Vs)	24-72 VDC
Vibration	70g, peak to peak sinusoidal, 5 to 2000 Hz (Random Vibration: 20 to 2000 Hz @ approx. 20g Peak per MIL-STD-810E Method 514.4)
Acceleration	100g steady acceleration in any direction 0.032% FS/g for 1 bar (15 psi) range decreasing logarithmically to 0.0007% FS/g for 400 bar (6000 psi) range.
Shock	20g, 11 ms, per MIL-STD-810E Method 516.4 Procedure 1
Proof Pressure	2X Full Scale
Approvals	CE (limits switch voltage to 42 VDC)
Weight, Approximate	1.0 lbs. (0.45 kg)

* Repeatability and set point of units may change due to the effects of temperature.



Dimensions



How To Order

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

PS98 **-R** **-G15** **-02** **-G** **-A** **-150** **-125**

1
2
3
4
5
6
7

① Output

- R=Relay
- T=Transistor

② Pressure Range

Insert Pressure Range Code from Tables 1, below.

③ Pressure Port

- 08=1/8"-27 NPT External
- 02=1/4"-18 NPT External
- 0J=1/4" NPT External w/snubber
- 0E=1/4" NPT Internal
- 0H=1/2"-14 NPT External
- 04=7/16"-20 External (SAE #4, J514)
- 1P=9/16"-18 External (SAE #6, J1926-2)
- 1J=7/16"-20 External (SAE #4, J1926-2)
- 09=G1/8" Internal
- 01=G1/4" External
- 0A=R1/4" External

④ Electrical Termination

- G=Large DIN (Mating Connector Supplied)
- MXXX=IP68 Cable
(Specify length in meters; e.g. -M012)
- C=6-Pin Connector
(Mating Connector Supplied)

⑤ Circuit

- A=N.O.
- B=N.C.

⑥ Factory Set Point¹**⑦ Re-Set Point¹**

Note:

1. Set Points must be within Pressure Range selected in Step 2.

Accessories

PN	Description
557254	Mating Connector for -G
165835	Mating Connector for -C

Tables 1 — Pressure Range Codes

PSI Measurement

Pressure Range Code	Pressure Range (psi)
F15	0-15
F30	0-30
F60	0-60
G10	0-100
G15	0-150
G20	0-200
G30	0-300
G50	0-500
G60	0-600
H10	0-1000
H15	0-1500
H20	0-2000
H30	0-3000
H40	0-4000
H50	0-5000
H60	0-6000

Bar Measurement

Pressure Range Code	Pressure Range (bar)
A10	0-1
A16	0-1.6
A25	0-2.5
A40	0-4
A60	0-6
B10	0-10
B16	0-16
B25	0-25
B40	0-40
B60	0-60
C10	0-100
C16	0-160
C25	0-250
C40	0-400
—	—
—	—

FT-330 Series – NSF Certified

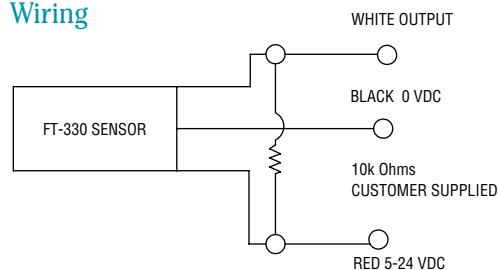
- ▶ High Accuracy: $\pm 2\%$ of reading
- ▶ High repeatability: $\pm 0.5\%$ of reading
- ▶ Overmolded electronics with integral cable strain reinforcement
- ▶ Measures flow rates from .2 to 4 GPM
- ▶ Lightweight plastic design for multiple mounting positions

The FT-330 is a highly accurate and repeatable, Hall Effect turbine flow sensor designed for low flow OEM applications. This low cost, NSF Certified, NSF/ANSI/CAN 61 flow sensor is ideal for water or beverage dispensing applications or any application with water based liquids. The 316SS shaft coupled with Delrin® bearings allows for accurate measurements during quick dispensing cycles. The sensor's standard power and output specifications make it easy to retrofit existing controllers.

Specifications

Materials	
Body	Glass Reinforced PPO (Noryl)
Turbine	PA Composite (Nylon)
Axle	316 Stainless Steel
Bearings	Delrin® (Polyoxymethylene, POM)
Inlet/Outlet Ports	3/8" NPT Male
Pressure	
Operating	200 PSIG
Burst	1000 PSIG
Operating Temperature	-4°F to 176°F (-20°C to 80°C)
Viscosity	32 to 81 SSU (1.8 to 16 Centistokes)
Recommended Filtration	< 50 Microns
Input Power	5 to 24 VDC @ 8mA
Output (Hz)	NPN Sinking Open Collector @ 25mA Maximum leakage current 10µA (5k to 30k Pull-Up Resistor Required)
Accuracy	$\pm 2\%$ of reading
Repeatability	$\pm 0.5\%$ of reading
Electrical Connection	3 ft PVC cable #22 AWG
Approvals	NSF Certified, NSF/ANSI/CAN 61, RoHS

Wiring



How To Order

Specify Part Number based on flow rate measuring capability.

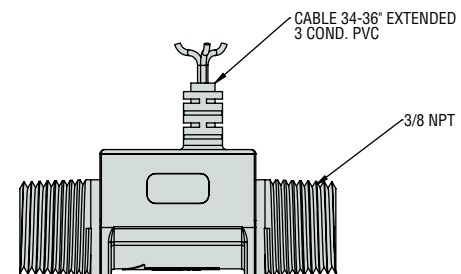
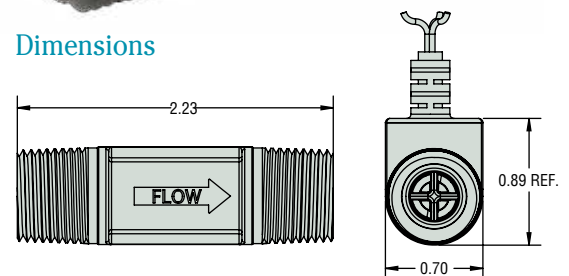
Flow Range		Frequency Out	Pulses Per Gallon	Pulses Per Liter	Part Number
GPM	LPM				
0.2 to 2	0.8 to 7.6	34 to 343 Hz	10,313	2724	226000 ⚡
0.4 to 4	1.5 to 15	29 to 343 Hz	4,994	1319	226100 ⚡

⚡ – Stock Items.

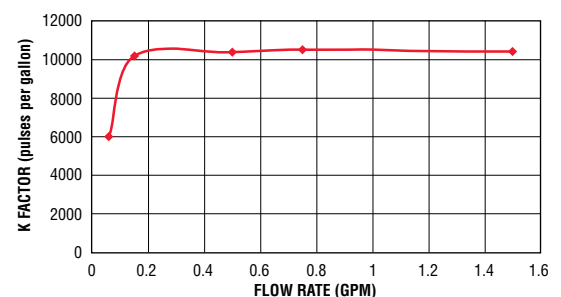


NSF approved

Dimensions

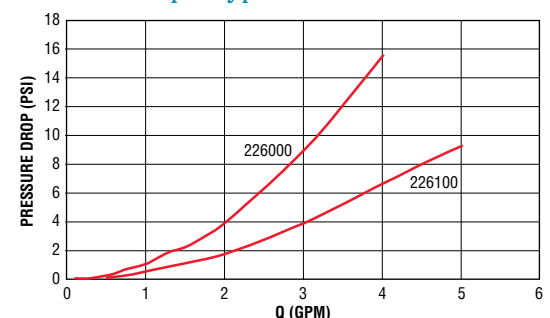


K-factor Chart* - Part Number 226000



* Consult factory for P/N 226100 K-factor chart

Pressure Drop—Typical



Flow Set Point Switching – RFS Types

- ▶ Combines visual confirmation of flow with dynamic, electronic switch operation
- ▶ Easy, adjustable switch point calibration: a local LED signals when set point is reached

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.

Typical Applications

Protect expensive electronic equipment from coolant flow failure on...

- Semiconductor Processing Equipment
- Lasers • Medical Equipment
- X-Ray and Other High Power Tubes
- Robotic Welding Equipment



File No. E45168



Specifications

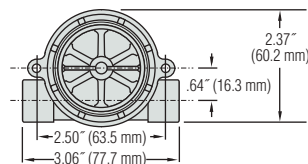
Wetted Materials	
Body	Brass, 316 Stainless Steel or Polypropylene (Hydrolytically Stable, Glass Reinforced)
Rotor Pin	Ceramic
Rotor	PPS Composite, Black
Lens	Polysulfone
O-Ring	Viton® (Alloy Bodies); Buna N (Polypropylene Body)
Low Flow Adaptor	Glass Reinforced Polypropylene
Operating Pressure, Maximum	
Brass or Stainless Steel Body	200 PSIG (13.8 bar) @ 70°F (21°C), 100 PSIG (6.9 bar) Max. @ 212°F (100°C) ¹
Polypropylene Body	100 PSIG (6.9 bar) @ 70°F (21°C), 40 PSI (2.8 bar) Max. @ 180°F (82°C)
Operating Temperature,	
Brass or Stainless Steel Body	-20°F to 212°F (-29°C to 100°C)
Polypropylene Body	-20°F to 180°F (-29°C to 82°C)
Electronics	150°F (65°C) Ambient
Viscosity, Maximum	200 SSU
Input Power	24 VDC or 115 VAC
Relay Contact Ratings (SPDT)	1 Amp, 24 VDC Resistive; 0.3 Amp, 110 VAC
Current Consumption	
24 VDC	No Load 20mA Load (Relay Energized) 35mA
115 VAC	45mA 95mA
Repeatability	2% Maximum Deviation
Set Point Accuracy (Factory Set)	± 5%
Set Point Differential	15% Maximum
Electrical Termination	20 AWG PVC-Jacketed, 24" Cable. Color Codes: Red = +VAC/VDC, Black = Ground, White = N.O. Contact, Brown = N.C. Contact, Green = Common

Note:

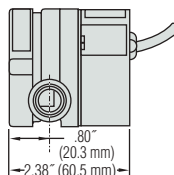
1. Optional pulsed output available with RFS. Consult factory.

Dimensions

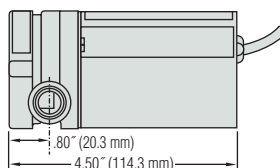
Polypropylene Bodies



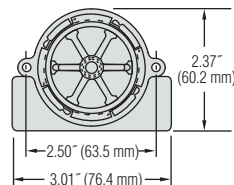
VDC



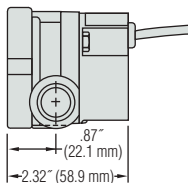
VAC



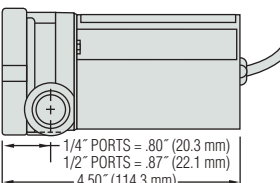
Brass and Stainless Steel Bodies - .25" and .50" Port



VDC

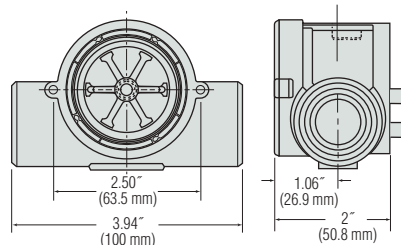


VAC

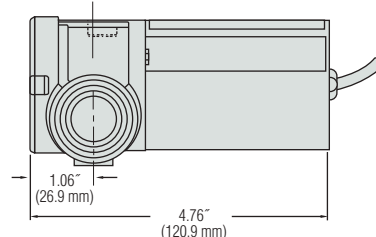


Brass and Stainless Steel Bodies - .75" and 1.00" Port

VDC



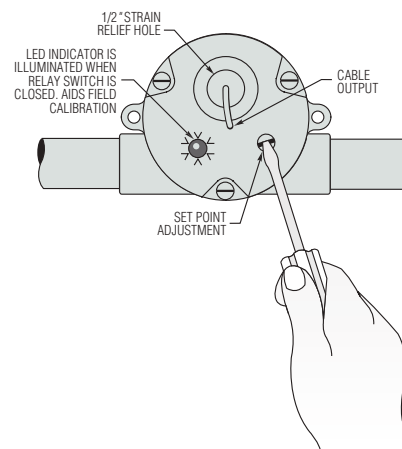
VAC



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

Specify Part Number based on desired body material, port size and input power rating.

Body Material	Port Size NPT	Flow Ranges – GPM		Input Power	Part Number
		Low Range*	Standard Range		
Polypropylene	.25"	0.1 to 1.0	0.5 to 5.0	24 VDC	155425 ⚡
				115 VAC	155876 ⚡
	.50"	1.5 to 12.0	4.0 to 20.0	24 VDC	155485 ⚡
				115 VAC	155886 ⚡
Brass	.25"	0.1 to 1.0	0.5 to 5.0	24 VDC	156265 ⚡
				115 VAC	156266 ⚡
	.50"	1.5 to 12.0	4.0 to 20.0	24 VDC	156268 ⚡
				115 VAC	156269 ⚡
	.75"	–	5.0 to 30.0	24 VDC	180395 ⚡
				115 VAC	180396 ⚡
	1.00"	–	8.0 to 60.0	24 VDC	181688 ⚡
				115 VAC	181689 ⚡
Stainless Steel	9/16-18**	0.1 to 1.0	0.5 to 5.0	24 VDC	165073 ⚡
				115 VAC	165074 ⚡
	.50"	1.5 to 12.0	4.0 to 20.0	24 VDC	165077 ⚡
				115 VAC	165078 ⚡
	.75"	–	5.0 to 30.0	24 VDC	181691 ⚡
				115 VAC	181692 ⚡
	1.00"	–	8.0 to 60.0	24 VDC	181693 ⚡
				115 VAC	181694 ⚡

* With use of Low Flow Adapter supplied. See Page F-8 for more information.

** Straight thread with O-ring seal.

⚡ – Stock Items.

Special Requirements:

GEMS caters to OEM needs with special configurations for potable water and enhanced chemical capabilities. Consult factory for further details.

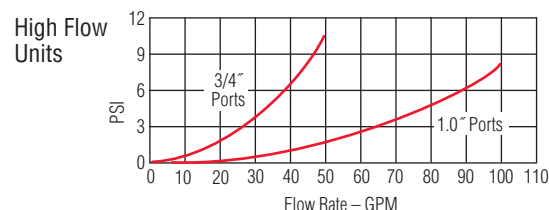
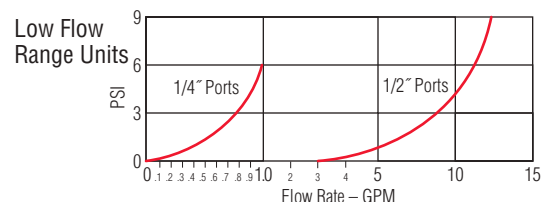
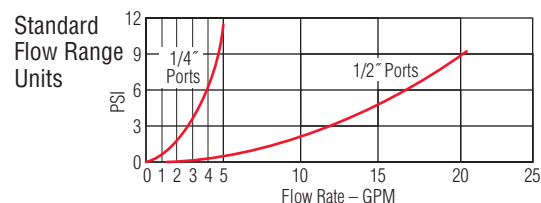
For higher pressure/temperature ratings, stainless face plates are available. Consult factory.

High Resolution Black Rotor

PPS composite. Each of the six rotor arms is magnetized. A PTFE loaded bushing ensures long life.



Pressure Drop-Typical



FS-400 Series – General Purpose, 90° Flow Path

- ▶ **Flow Rate Settings:** Fixed: 0.75 GPM to 10.0 GPM
Adjustable Version: 0.75 GPM to 14.0 GPM
- ▶ **Port Size:** 3/4-14 NPT
- ▶ **Primary Construction Material:** Bronze
- ▶ **Setting Type:** Fixed or Adjustable

Provides accurate flow detection in water and oil with 1% repeatability. Flow settings on the adjustable version can be easily changed without disassembly. A shuttle by-pass vane inside the housing is controlled externally using an ordinary flat-blade screwdriver. These switches are ruggedly constructed of non-corrosive materials and resist shock and vibration. Suitable for triggering alarms on interlocking shutdown circuitry when flow rate is improper to protect bearings, gears and cooling systems.

Specification

Wetted Materials	
Housing	Bronze
Shuttle	Delrin®
Spring	316 Stainless Steel
O-Ring	Viton®
Other Wetted Parts	Ceramic
Pressure Rating, Maximum	
Operating	400 psi (27.6 bar) @ 100°F (+37.8°C)
Proof	800 psi (55.2 bar) @ 100°F (+37.8°C)
Operating Temperature	-20°F to +180°F (-29°C to +82.2°C)
Repeatability	1% Maximum Deviation
Set Point Accuracy	±10%
Set Point Differential	15% Maximum
Switch*	SPDT, 20 VA
Inlet/Outlet Ports	3/4-14 NPT
Electrical Termination	No. 18 AWG, 24" L., Polymeric Lead Wires

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

How To Order – Standard Models

Specify Part Number based on flow settings for the FS-400 Series, based on flow setting range for the FS-400 Adjustable version.

FS-400 Series

NPT	Flow Setting GPM	Part Numbers
3/4-14	0.75	26440 ⚡
	1.5	26441
	2.0	26442
	2.5	26443
	5.0	26444
	7.5	26445
	10.0	26446

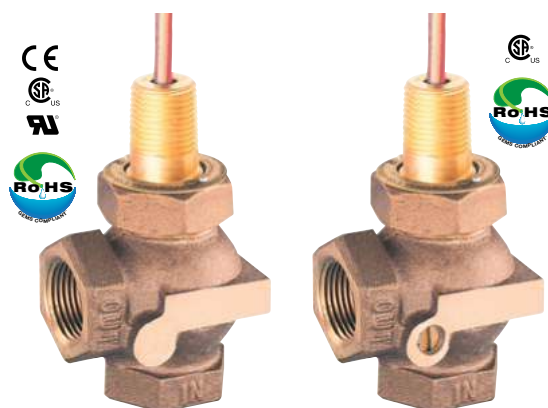
FS-400 Adjustable

NPT	Flow Setting GPM	Part Numbers
3/4-14	0.75-4.0	26600 ⚡
	2.0-8.0	26601 ⚡
	7.0-14.0	26602

Notes:

1. Flow settings for Fixed Version are calibrated using water at +70°F on increasing flow, with units in a vertical position (lead wires up). Temperature changes will slightly affect the flow settings listed.
2. Adjustable units that are set to customer specifications are subject to GEMS test stand accuracy.
3. Use of 150 micron filtration is recommended.
4. Minimum 5 PSI line pressure required.

⚡ Stock Items



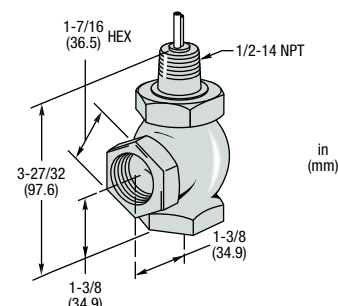
FS-400 Series

U.L. Recognized:
File No. E31926
CSA Listed:
LR30200 and LR22666

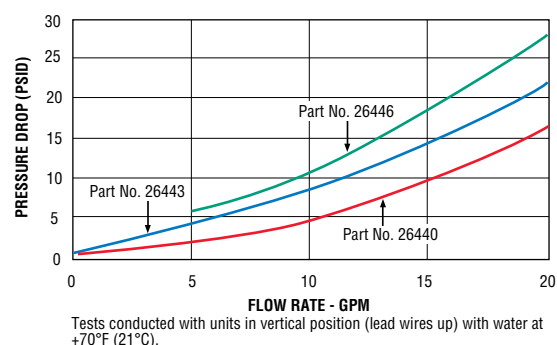
FS-400 Adjustable

CSA Listed:
File No. LR22666

Dimensions



Pressure Drop - Typical



Tests conducted with units in vertical position (lead wires up) with water at +70°F (21°C).

FS-400 switches are U.L. Approved for Class I, Division 2, Groups A, B, C, D hazardous areas.

U.L. Approved: File No. E183854

Series 26

Low Water Cutoff – Standoff Mount

- ▶ Meets CSD1 Requirements
- ▶ Non Powered Contacts
- ▶ Time Delays Available
- ▶ LED Monitoring
- ▶ Test Feature
- ▶ AC Current Minimizes Electrolysis
- ▶ Snap-Thru Standoff Mounting
- ▶ Compact Size
- ▶ Power Outage Feature
- ▶ U.L. "Limit Control"

Series 26 – General Purpose Control

Designed for boiler low-water cutoff protection. A snap-through standoff mounting device is available for Series 26 units. Optional Power Outage feature resets after nuisance outages. Optional reset button is used when device has been deactivated because of low water condition. Reset is functional only if water has returned to normal level. Optional Test Feature available allows LLCO circuit to be tested without draining the water level in the boiler. Built-in 3 second time delay is standard. Up to 90 seconds available for increasing and decreasing levels.

Specifications

Contact Design	1 N.O. & 1 N.C. (1 form C)
Contact Rating	10 amp Resistive 1/3 hp at 120, 240 VAC
Mode of Operation	Direct
Sensitivity	0-100K ohm, factory set
Primary Voltage	120 VAC, 240 VAC ¹ , 24 VAC, 208/240 VAC (+10%/-15%) 50/60 Hz
Secondary Voltage	12 VAC, 1.5 mA
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals¹	U.L. 353, U.L. 508 File # MP1430
Terminal Style	Spade connection
Options	Time Delays, Power Outage, Retrofit Plate, Test Feature, See page E-11 for descriptions

Notes:

1. 240 VAC and 208/240 VAC are not U.L. recognized

How to Order

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

	26	X	X	X	X	XX	XX
1. Series	26	X	X	X	X	XX	XX
2. Sensitivity	A 4.7K; B 10K; C 26K; D 50K; E 100K						
3. Supply Voltage	1 120 VAC; 2 240 VAC; 3 24 VAC; 8 208/240 VAC						
4. Standoff Style ¹	A 1/16" Panel; B 1/8" Panel; C Screw mount; D Retrofit						
5. Enclosure	0 None; 1 NEMA 1 ¹ ; 4 NEMA 4 ¹						
6. Option Package	See page E-11, Chart B for code letter						
7. Time Delay (decreasing level) Option	03-90 seconds; Blank 3 seconds						
8. Time Delay (increasing level) Option	00-90 seconds; Blank 0 seconds						

Notes:

1. Standoff Style **D** only.

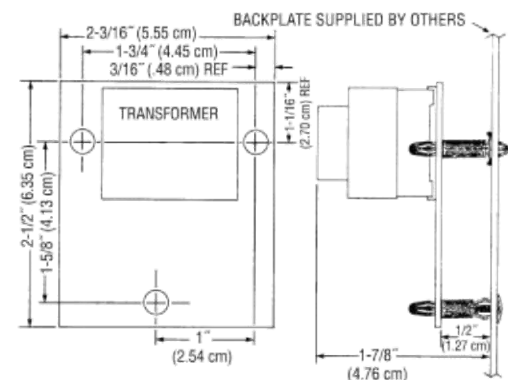
Socket Details and Option Availability are located on web site.



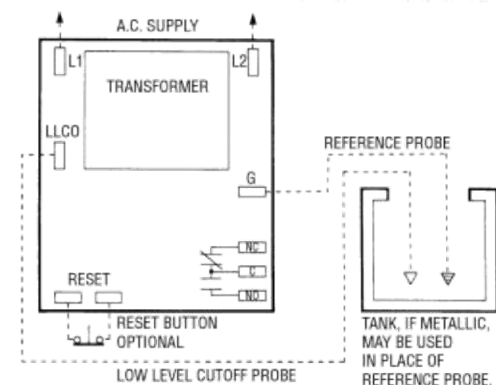
Applications

- Low-Water Cutoff
- Point Level
- Valve Control
- Single-Level Service
- Alarms
- Pump Control

Dimensions



Wiring



Series 16 – Open Circuit Board Controls

- ▶ Solid State Reliability
- ▶ Spade Terminals
- ▶ Time Delays Available
- ▶ U.L. "Motor Control"
- ▶ Optional Dirty Electrode Detection*
- ▶ AC Current Minimizes Electrolysis
- ▶ Compact Size
- ▶ Low-Voltage Sensor
- ▶ LED Monitoring

Series 16 – General Purpose Control

- New Microprocessor Design

Engineered for general purpose single-level or differential applications, these economy priced controls have spade terminals for easy wiring and provide sensitivities up to 1 million ohm/cm.

Series 16D – DPDT Load Contacts

Same features and specifications as Series 16, but these controls also have DPDT load contacts to eliminate the need for slave relays.



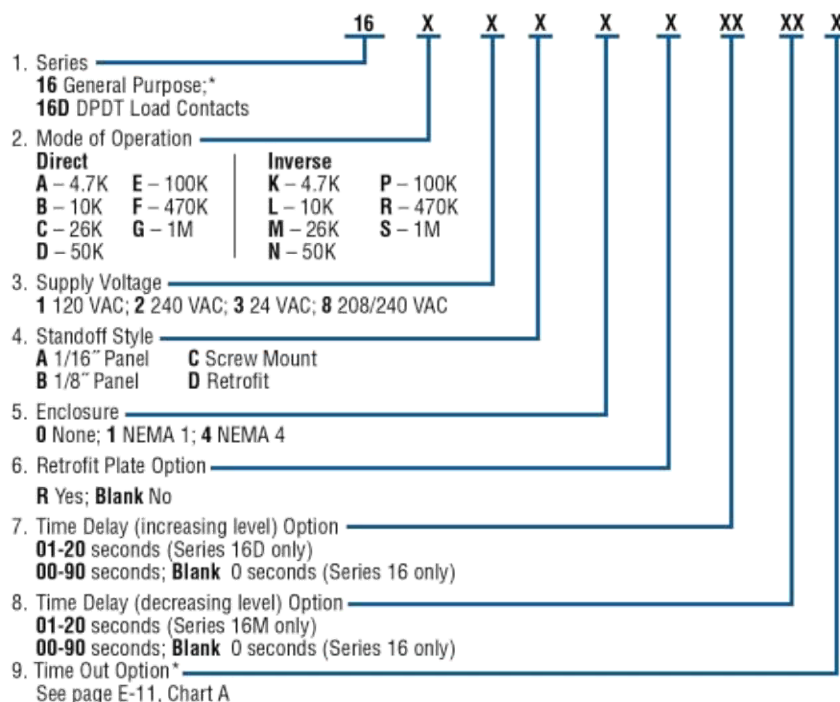
Series 16

Specifications

Contact Design	
Series 16	1 N.O. & 1 N.C. (1 form C)*
Series 16D	2 N.O. & 2 N.C. (2 form C)
Contact Rating (120, 240 VAC)	
Series 16	10 amp Resistive 1/3 hp*
Series 16D	5 amp Resistive 1/10 hp
Mode of Operation	Direct/Inverse, factory set
Sensitivity	0-1M ohm, factory set
Primary Voltage	120 VAC, 240 VAC, 24 VAC, 208 VAC (+10%/-15%) 50/60 Hz 208/240: 187 V min. to 255 V max. VAC 50/60 Hz
Secondary Voltage	12 VAC, 1.5 mA
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals	U.L. 508 File # E44426
Terminal Style	Spade connection
Options	Time Delays, Retrofit Plate, Time Out. See page E-11 for descriptions.

How to Order

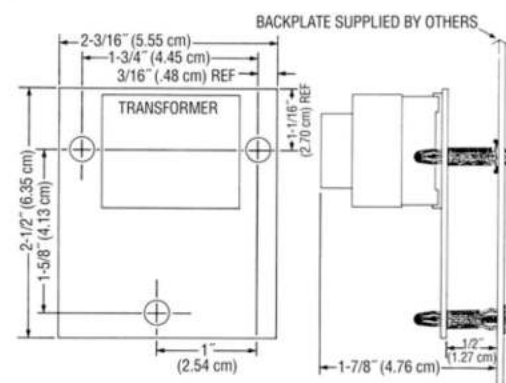
Use the **Bold** characters from the chart below to construct a product code.



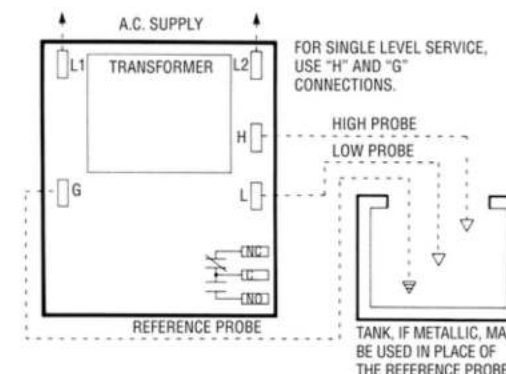
Applications

- Single-Level Service
- Point Level
- Valve Control
- Low-Water Cutoff
- Differential Service
- Alarms
- Pump Control

Dimensions



Wiring



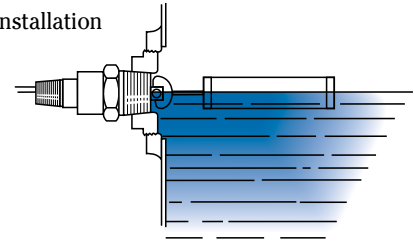
Note: Series 16D similar to Series 16, but with DPDT load contacts.

Large Size – Alloys

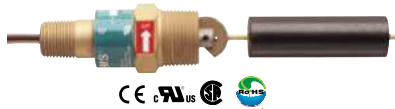
Side Mounting Switches Solve the Problem of Inaccessible Tank Tops & Bottoms

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

Typical Installation

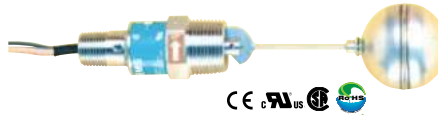


LS-2050 Series – Brass and Buna N



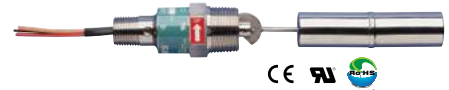
General purpose materials designed to provide reliable service in oils and water.

LS-2050 Series – All-Stainless Steel



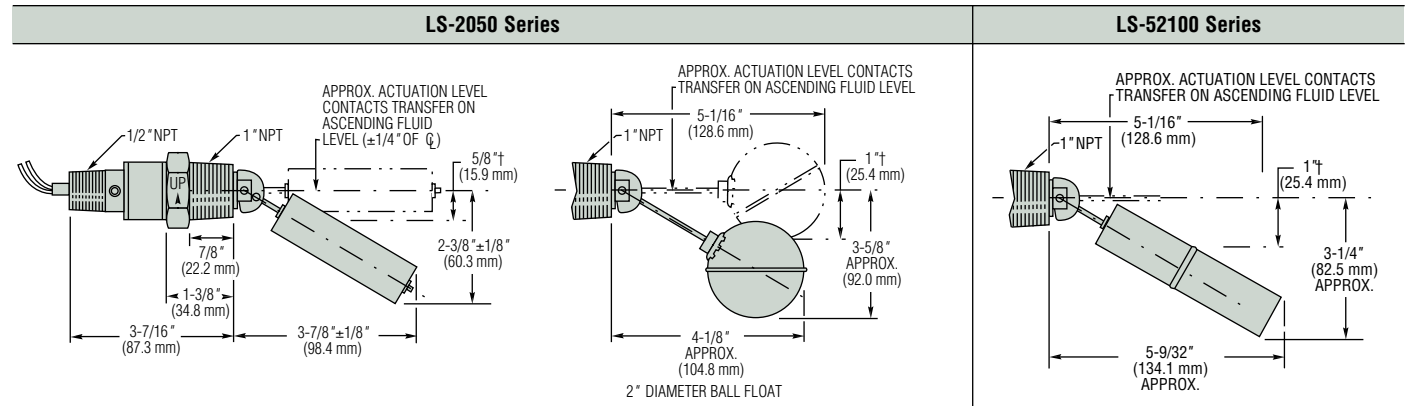
Ultimate strength: for pressures to 900 PSIG and temperatures to 300°F (148.9°C).

LS-52100 Series – All Stainless Steel



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

Dimensions



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

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

For Remote Alarms – See Page E-27

- Adjustable Volume
- Indoor Outdoor
- Solid-State



Common Specifications

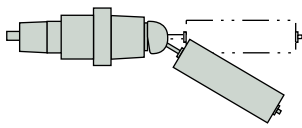
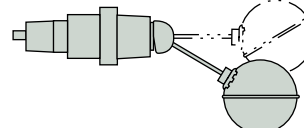
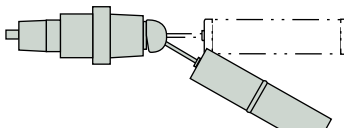
Electrical Termination: No.18 AWG, 24" L., Polymeric Lead Wires.

Approvals: LS-2050 Series Switches are U.L. Recognized – File No. E45168 and are CSA Listed.

RoHS – In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

Mounting Attitude: Horizontal, $\pm 15^\circ$.

Performance

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

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

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

Notes

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

⚡ – Stock Items.

221C Series/261C - Intrinsically Safe Industrial Pressure Transmitters

- ▶ Ex II 1G ; EEx ia IIC T4 (-20°C ≤ Ta ≤ 75°C)
- ▶ Ranges from 0.5b to 400b gauge and 0 to 25bar Absolute range
- ▶ Voltage and 2 wire 4-20mA output models
- ▶ All Stainless Steel wetted parts

Certified to the latest harmonised European standard (ATEX) the 221C and 261C Intrinsically safe pressure transmitters are designed to withstand the rigours of the most difficult applications with an all stainless steel construction, free from seals or oil barriers.

Incorporating Gems CVD Sensors and ASIC technology the 221C and 261C offer long term reliability, excellent performance and long term stability ensuring long service life without routine maintenance.

Available with a wide choice of pressure fittings units can be supplied to IP65 or fully immersible to IP68 200mWG and a variety of electrical connectors.



Specifications

Input

Pressure Range	Vacuum to 400bar G (6000 psi) 0-25bar Absolute
Proof Pressure	2 x Full Scale (FS) (1.5 x FS for 400bar, ≥ 5000psi)

Burst Pressure	>35 x FS ≤ 6bar (100psi) >20 x FS ≥ 60bar (1000psi) >5 x FS ≤ 400bar (6000psi)
-----------------------	--

Fatigue Life	Designed for more than 100 million FS cycles
---------------------	--

Performance

Long Term Drift	0.2% FS/year (non-cumulative)
------------------------	-------------------------------

Accuracy	0.25 % FS typical (optional 0.15% FS)
-----------------	---------------------------------------

Thermal Error	1.5% FS typical (optional 1% FS)
----------------------	----------------------------------

Compensated Temperatures	-20° to 80° C (-5° to 180° F)
---------------------------------	-------------------------------

Operating Temperatures	-40° to 125°C (-40° to 260°F) for elec. codes A, B, C -20° to 80°C (-5° to 180°F) for elec. code G -20° to 50°C (-5° to 125°F) for elec. codes F,M, 3
-------------------------------	---

Zero Tolerance	1% of span
-----------------------	------------

Span Tolerance	1% of span
-----------------------	------------

Mechanical Configuration

Pressure Port	See ordering chart
----------------------	--------------------

Wetted Parts	17-4 PH Stainless Steel
---------------------	-------------------------

Electrical Connection	See ordering chart
------------------------------	--------------------

Enclosure	316 ss, 17-4 PH ss IP65 for elec. codes A, B, C, G (with connector fitted) 3 IP67 for elec. code "F" IP68 for elec. codes M,
------------------	---

Vibration	35g peak sinusoidal, 5 to 2000Hz
------------------	----------------------------------

Acceleration	100g steady acceleration in any direction 0.032%FS/g for 1 bar (15psi) range decreasing logarithmically to 0.0007%FS/g for 400bar (6000psi) range
---------------------	---

Shock	Withstands free fall to IEC 68-2-32 procedure 1
--------------	---

Approvals	Ex II 1G ; EEx ia IIC T4 (-20 ≤ Ta ≤ +75°C)
------------------	---

Weight	Approx. 100grams (additional cable; 75g/m)
---------------	--



Individual Specifications

Voltage Output units

Output	See ordering chart
Supply Voltage (Vs)	1.5Vdc above FS output to 25.5Vdc
Supply Voltage Sensitivity	0.01%FS/Volt
Min. Load Resistance	(FS output / 2) Kohms
Current Consumption	Approx 6mA at 7.5V output

Current Output Units

Output	4-20mA (2 wire)
Supply Voltage (Vs)	24Vdc, (7-25.5Vdc) above 100°C supply limited to 24Vdc
Supply Voltage Sensitivity	0.0 1% FS/Volt
Max. Loop Resistance	(Vs-7) x 50 ohms

Wire Code	Current Units (4-20mA)		
	(+)	(-)	EARTH
A, B, G Industrial DIN	PIN 1	2	4
C "10-6 Bayonet"	PIN A	B	E
D Cable	R	BK	DRAIN
F IP 67 cable	R	BK	DRAIN
1 "8-4-Bayonet"	PIN A	B	D
3 "Conduit & cable"	R	BK	DRAIN
M Immersible IP68 to 200m	R	BL	DRAIN

Wire Code	Voltage Units			
	IN+	COM	OUT+	EARTH
A, B, G Industrial DIN	PIN 1	2	3	4
C 10-6 Bayonet	PIN A	C	B	E
D Cable	R	BK	W	DRAIN
F IP 67 cable	R	BK	W	DRAIN
1 "8-4-Bayonet"	PIN A	C	B	D
3 "Conduit & cable"	R	BK	W	DRAIN
M Immersible IP68 to 200m	R	W	Y	DRAIN

Cable Legend:

R = Red
BL = Blue
BK = Black
W = White

How to Order

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

Series **22IC** **26IC**

Output **B** - 4-20mA **C** - 1-6V **J** - 0.5-5.5V
D - 1-11V **R** - 0-5V
H - 1-5V **S** - 0-10V

Pressure Datum **G** - Gauge
A - Absolute

Pressure Range - bar (Additional intermediate ranges available - please consult factory)

A10 - 0-1	B25 - 0-25	Vac = -1 bar
A16 - 0-1.6	B40 - 0-40	1A0 - Vac-0
A25 - 0-2.5	B60 - 0-60	1A6 - Vac-0.6
A40 - 0-4	C10 - 0-100	2A5 - Vac-1.5
A60 - 0-6	C16 - 0-160	4A0 - Vac-3
B10 - 0-10	C25 - 0-250	6A0 - Vac-5
B16 - 0-16	C40 - 0-400	1B0 - Vac-9
		1B6 - Vac-15
		2B5 - Vac-24
		4B0 - Vac-39

Pressure Range - psi (Additional intermediate ranges available - please consult factory)

F15 - 0-15	G60 - 0-600	Vac = -15 psi
F30 - 0-30	H10 - 0-1,000	1F5 - Vac-0
F60 - 0-60	H15 - 0-1,500	3F0 - Vac-15
G10 - 0-100	H20 - 0-2,000	6F0 - Vac-45
G15 - 0-150	H30 - 0-3,000	1G0 - Vac-85
G20 - 0-200	H40 - 0-4,000	1G5 - Vac-135
G30 - 0-300	H50 - 0-5,000	2G0 - Vac-185
G50 - 0-500	H60 - 0-6,000	3G0 - Vac-285

Pressure Port **01** - G1/4 External **08** - 1/8-27 NPT External
02 - 1/4-18 NPT External **09** - G1/8 Internal
03 - G1/2 Manometer **00** - G1/4 Internal
04 - 7/16-20UNF to SAE J514 **0A** - R1/4 External **Others** - Consult Factory
05 - G1/4 Ext. Soft Seal **19** - Nose Cone (2600 Only)


Electrical Connection **22IC** Series
A - Industrial DIN Mating Connector Supplied
B - Industrial DIN Mating Connector Not Supplied
F - Cable Gland Metal IP67

26IC Series
C - Fixed Plug Size 10-6 Mating Plug Not Supplied
G - Fixed Plug To DIN 43650 Mating Plug Supplied
M - Immersible Max. depth 200metres
1 - Fixed Plug Size 8-4 Mating Plug Not Supplied
3 - Conduit Connector 1/2NPT Ext. 1M Cable

Performance Code
Accuracy/Thermal
A - .25%/1.5%
B - .15%/1.0%


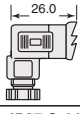
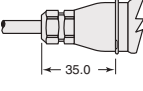
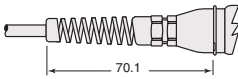
Cable Length
(Max length on 22IC-10 Metres)
U - No Cable Fitted
D - 1 Metre
E - 3 Metres
F - 5 Metres
G - 10 Metres
H - 15 Metres
J - 20 Metres
K - 25 Metres
L - 30 Metres
M - 40 Metres
N - 50 Metres
P - 75 Metres
Q - 100 Metres
R - 125 Metres
S - 150 Metres

Apparatus Protection
B - Intrinsically safe, zener barrier, Gauge only
G - Intrinsically safe, galvanic barrier Gauge or Absolute



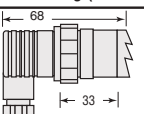
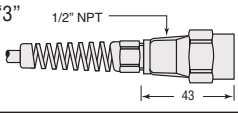
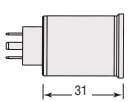
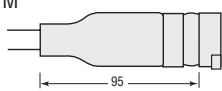
 II IG
Ex ia IIC T4
(-20 < Ta < +75°C)

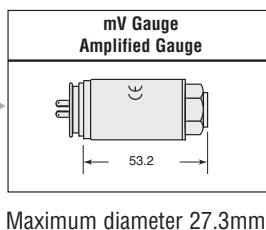
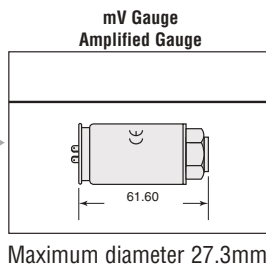
Dimensions (in mm)

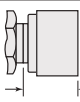
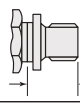
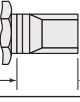
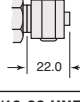
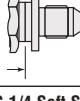
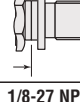
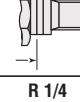
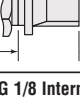

221C Series


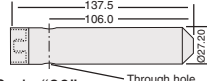
Industrial DIN Connector	
Code "B"	
Industrial DIN Connector (mate supplied)	
Code "A"	
IP67 Cable	
Code "F"	
IP65 or NEMA4 Cable	
Code "D" or "2"	

261C Series

10-6 or 8-4 Mil-C Connector	
10-6 Code "C"	
8-4 Code "1"	
Large DIN 43650 Plug (mate supplied)	
Code "G"	
Conduit Connector with Cable	
Code "3"	
Micro DIN Connector	
Code "T"	
Immersible Cable	
Code "M"	



G 1/4 Internal	
Code "00"	
G 1/4 External	
Code "01"	
1/4 - 1/8 NPT	
Code "02"	
G 1/2 Manometer	
Code "03"	
7/16-20 UNF-2A	
Code "04"	
G 1/4 Soft Seal	
Code "05"	
1/8-27 NPT	
Code "08"	
R 1/4	
Code "0A"	
G 1/8 Internal	
Code "09"	

Nose Cone - Black Acetal	
Code "19"	
Nose Cone Sink Weight	
Code "29"	

Others - Consult factory

D Series – High Flow

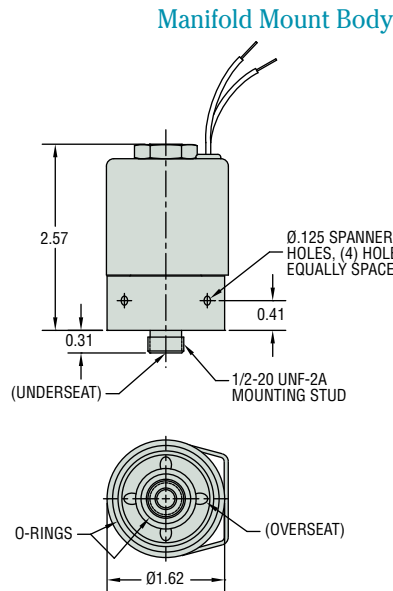
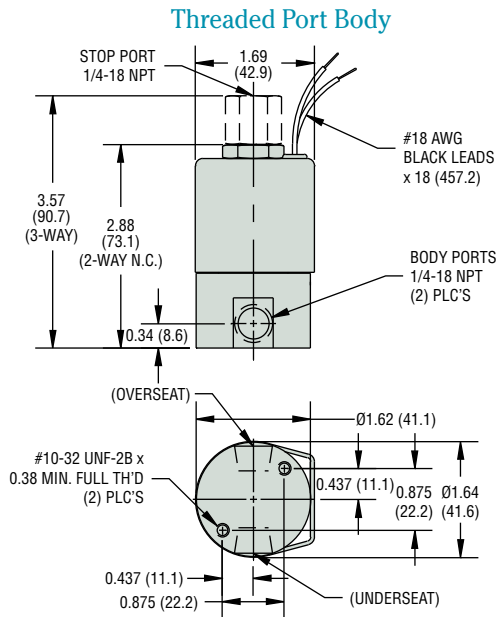
- ▶ MOPD: 900 PSI (62 Bar)
- ▶ C_v Range: 0.045 to 0.880 (K_v Range: 0.038 to 0.748)
- ▶ 10 Watts

For maximum flow in a miniature solenoid valve the D Series valves delivers a wide range of C_v (K_v) values and maximum operating pressures. The D Series is also available in multiple body materials, seal materials, coil constructions, voltages, and wattages. Proven to perform for millions of cycles without failure, the D valve—as with the entire valve series—is ideal for manifold configurations, sub-assemblies, and complete fluidic systems. The D Series is the largest in a progression—A Series, B Series, and C Series—of the highly flexible, modular design, (general purpose) valves.

Typical Applications

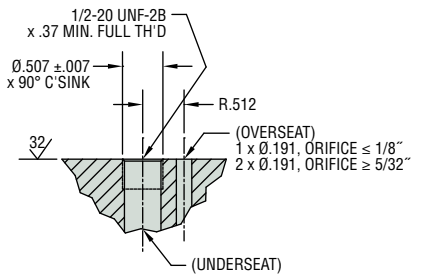
- Agriculture
- Defense
- Sterilization Equipment
- Industrial Automation

Dimensions



Next Day Shipping
On Many Configurations

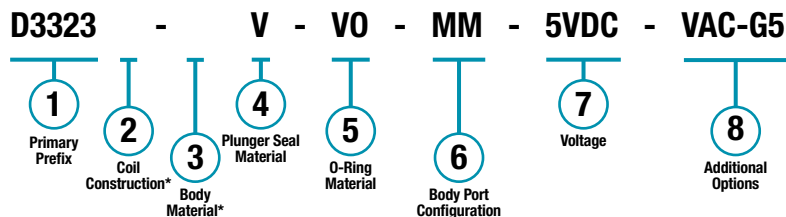
MANIFOLD MATING DIMENSIONS



See Manifold Mount Interface Details on page J-30.

How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.



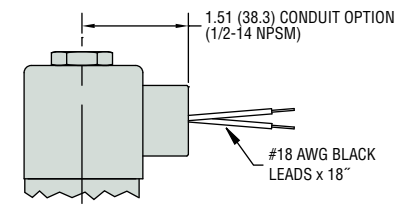
* Blank entry indicates a "Standard" selection
(Tape-wrapped, Class-B, with 18" (46cm) lead-wires and 303 Stainless Steel, in this case).


Example:

D3323-V-VO-MM-5VDC-VAC-G5



















































3-Way Multi Purpose (with 1.26 Conduit Option) solenoid valve, with tape-wrapped, Class-B, with 18" (46cm) lead-wires, 303 stainless steel body, Viton® plunger seal, Viton® o-ring, manifold mount (1/2-20 UNF-2A mounting stud, max. orifice = 14" (35.6cm)), operating at 5 VDC, and includes vacuum application (0 to 29.5" Hg (0 to 1000mBar)) and one piece 316 stainless steel guide assembly options.

Alternate 1/2" Conduit Housing Available on all body configurations



 Take advantage of next day shipping by making your selections from those marked with the Lightning Bolt icon.

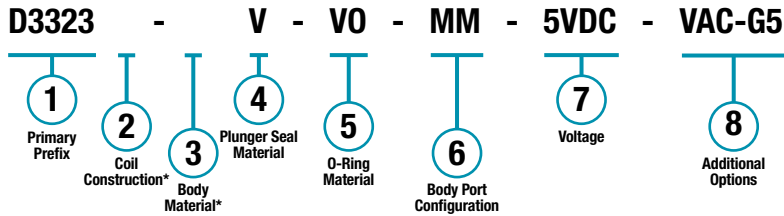
Part Prefix Table ①

	Orifice				MOPD		C _v		K _v		① Primary Prefix	
	Body		Stop		psig	bar	Body	Stop	Body	Stop	Grommet Housing	Conduit Housing
	inches	mm	inches	mm								
2-WAY N.C.	3/64	1.19	—	—	900	62	0.045	—	0.038	—	D2011 	D2021
	1/16	1.98	—	—	650	45	0.080	—	0.068	—	D2012 	D2022
	3/32	2.38	—	—	350	24	0.150	—	0.128	—	D2013 	D2023
	1/8	3.18	—	—	225	16	0.210	—	0.179	—	D2014 	D2024
	5/32	3.97	—	—	130	9.0	0.380	—	0.323	—	D2015 	D2025
	3/16	4.76	—	—	85	5.9	0.430	—	0.366	—	D2016 	D2026
	1/4	6.35	—	—	50	3.4	0.700	—	0.595	—	D2017 	D2027
	5/16	7.94	—	—	20	1.4	0.850	—	0.723	—	D2018 	D2028
2-WAY N.O.	3/8	9.53	—	—	10	0.7	0.880	—	0.748	—	D2019 	D2029
	—	—	3/64	1.19	900	62	—	0.045	—	0.038	D2211 	D2221
	—	—	1/16	1.59	550	38	—	0.080	—	0.068	D2212 	D2222
	—	—	5/64	1.98	300	21	—	0.110	—	0.094	D2213 	D2223
	—	—	3/32	2.38	175	12	—	0.150	—	0.128	D2214 	D2224
	—	—	1/8	3.18	110**	7.6	—	0.210	—	0.179	D2215 	D2225
3-WAY N.C. Free Vent	—	—	5/32	3.97	60**	4.1	—	0.380	—	0.323	D2216 	D2226
	1/16	1.59	1/16	1.59	175	12	0.080	0.080	0.068	0.068	D3011 	D3021
	5/64	1.98	5/64	1.98	150	10	0.110	0.110	0.094	0.094	D3012 	D3022
	3/32	2.38	3/32	2.38	125	8.6	0.150	0.150	0.128	0.128	D3013 	D3023
	1/8	3.18	1/8	3.18	85**	5.9	0.210	0.210	0.179	0.179	D3014 	D3024
	5/32	3.97	5/32	3.97	45**	3.1	0.380	0.380	0.323	0.323	D3015 	D3025
	3/16	4.76	5/32	3.97	30**	2.1	0.430	0.380	0.366	0.323	D3016 	D3026
3-WAY N.C. Line Connection	1/4	6.35	5/32	3.97	10**	0.7	0.700	0.380	0.595	0.323	D3017 	D3027
	1/16	1.59	1/16	1.59	175	12	0.080	0.080	0.068	0.068	D3111 	D3121
	5/64	1.98	5/64	1.98	150	10	0.110	0.110	0.094	0.094	D3112 	D3122
	3/32	2.38	3/32	2.38	125	8.6	0.150	0.150	0.128	0.128	D3113 	D3123
	1/8	3.18	1/8	3.18	85**	5.9	0.210	0.210	0.179	0.179	D3114 	D3124
	5/32	3.97	5/32	3.97	45**	3.1	0.380	0.380	0.323	0.323	D3115 	D3125
	3/16	4.76	5/32	3.97	30**	2.1	0.430	0.380	0.366	0.323	D3116 	D3126
3-WAY N.O.	1/4	6.35	5/32	3.97	10**	0.7	0.700	0.380	0.595	0.323	D3117 	D3127
	1/16	1.59	1/16	1.59	200	14	0.080	0.080	0.068	0.068	D3211 	D3221
	5/64	1.98	5/64	1.98	175	12	0.110	0.110	0.094	0.094	D3212 	D3222
	3/32	2.38	3/32	2.38	150	10	0.150	0.150	0.128	0.128	D3213 	D3223
	1/8	3.18	1/8	3.18	100**	6.9	0.210	0.210	0.179	0.179	D3214 	D3224
	5/32	3.97	5/32	3.97	50**	3.4	0.380	0.380	0.323	0.323	D3215 	D3225
	3/16	4.76	5/32	3.97	35**	2.4	0.430	0.380	0.366	0.323	D3216 	D3226
3-WAY Multi Purpose	1/4	6.35	5/32	3.97	15**	1.0	0.700	0.380	0.595	0.323	D3217 	D3227
	1/16	1.59	1/16	1.59	160	11	0.080	0.080	0.068	0.068	D3311 	D3321
	5/64	1.98	5/64	1.98	130	9.0	0.110	0.110	0.094	0.094	D3312 	D3322
	3/32	2.38	3/32	2.38	110	7.6	0.150	0.150	0.128	0.128	D3313 	D3323
	1/8	3.18	1/8	3.18	75**	5.2	0.210	0.210	0.179	0.179	D3314 	D3324
	5/32	3.97	5/32	3.97	40**	2.8	0.380	0.380	0.323	0.323	D3315 	D3325
	3/16	4.76	5/32	3.97	25**	1.7	0.430	0.380	0.366	0.323	D3316 	D3326
3-WAY Directional Control	1/4	6.35	5/32	3.97	10**	0.7	0.700	0.380	0.595	0.323	D3317 	D3327
	1/16	1.59	1/16	1.59	225	16	0.080	0.080	0.068	0.068	D3411 	D3421
	5/64	1.98	5/64	1.98	185	13	0.110	0.110	0.094	0.094	D3412 	D3422
	3/32	2.38	3/32	2.38	150	10.3	0.150	0.150	0.128	0.128	D3413 	D3423
	1/8	3.18	1/8	3.18	110**	7.6	0.210	0.210	0.179	0.179	D3414 	D3424
	5/32	3.97	5/32	3.97	60**	4.1	0.380	0.380	0.323	0.323	D3415 	D3425
	3/16	4.76	5/32	4.76	40**	2.8	0.430	0.380	0.366	0.323	D3416 	D3426
	1/4	6.35	5/32	3.97	20**	1.4	0.700	0.380	0.595	0.323	D3417 	D3427

** DC or rectified coil only

How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.



2 Coil Construction

(blank) = Tape-wrapped, Class B (130°C), with 18" (45.7cm) lead wires*

W__ = Tape-wrapped coil, lead wires, non-standard length (specify length in inches)

10 = Externally rectified coil (AC voltages lead wires only)

1 = Encapsulated coil, Class B (130°C), lead wires

3 = Encapsulated coil, Class H (180°C), lead wires

4 = Encapsulated coil, Class B (130°C), 3/16" (4.76mm) spade terminals (1/4" (6.35mm) spade terminal optional)

11 = Tape-wrapped coil, Class H (180°C), lead wires

HC = Encapsulated coil, Class B (130°C), 18mm DIN (EN175301-803 Style A Industrial 2+1 poles)

3 Body Material

(blank) = 303 Stainless Steel*

BB = Brass

SB5 = 316 Stainless Steel

4 Plunger Seal Material

(blank) = Nitrile*

E = EPDM

GV = Gasoline Viton® – 2-way normally open and 3-way valves max. orifice = 3/32" (2.38mm)

N = Neoprene – 2-way normally closed valves only, max. orifice = 1/4" (6.35mm)

NS = Nitrile – NSF/FDA, max. orifice = 1/4" (6.35mm)

PF = Perfluoroelastomer – max. orifice = 1/4" (6.35mm)

R = Rulon® – 2-way normally closed valves only, max. orifice = 1/4" (6.35mm)

T = PTFE – max. orifice = 1/4" (6.35mm)

V = Viton®

5 O-Ring Material

(blank) = Nitrile*

EO = EPDM

NO = Neoprene

NSO = Nitrile (NSF/FDA, 2-way valves only)

PFO = Perfluoroelastomer

TO = PTFE

VO = Viton®

6 Body Port Configuration

(blank) = 1/4-18 NPT female thread*

LC = 1/8-27 NPT female thread – max. orifice = 5/16" (7.94mm)

LD = 3/8-18 NPT female thread

LT = 1/8-28 BSPT female thread – max. orifice = 5/16" (7.94mm)

LU = 1/4-19 BSPT female thread

MM = Manifold mount – 1/2-20 UNF-2A mounting stud, max. orifice = 1/4" (6.35mm)^{††}

OB = Omit body (operator style)

BI = Bottom over-seat port, female thread – max. orifice = 1/4" (6.35mm)

BO = Bottom under-seat port, female thread

7 Voltage* (see note below)

C203 = 12 VDC

C204 = 24 VDC

C301 = 120/50/60R (add Coil Option -10)

C303 = 240/50/60R (add Coil Option -10)

__ VDC = DC (specify voltage)

__ VAC = AC (specify voltage; includes copper shading ring)

8 Additional Options

WM = Mounting bracket on the coil housing

TP = PTFE coated plunger

CP = Chamfered plunger

S = Silver shading ring

OC = Cleaned for oxygen use

VAC = Vacuum application – 0 to 29.5" Hg (0 to 1000mBar)

G5 = One piece 316 Stainless Steel guide assembly

* Standard selection; will be used unless otherwise specified. Standard selections are not referenced in final part number.

[†] Can be AC rectified without shading ring. Use coil construction Code 10.

^{††} Teflon® o-ring not suitable for manifold mount.

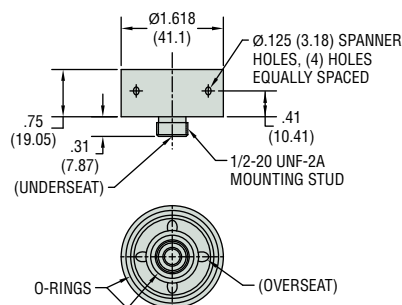


Take advantage of next day shipping by making your selections from those marked with the Lightning Bolt icon.

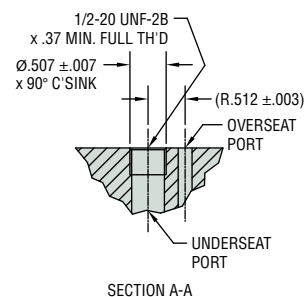
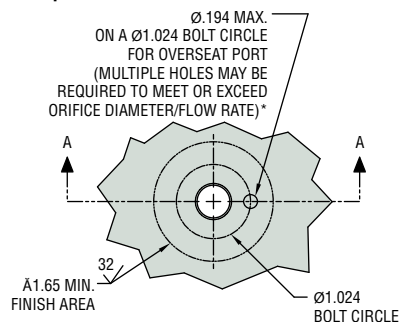
D Series – Manifold Mount Interface Details

Manifold Mounting Bodies

Manifold Mount 1/2"-20 Stud Body (MM)



Manifold Preparation



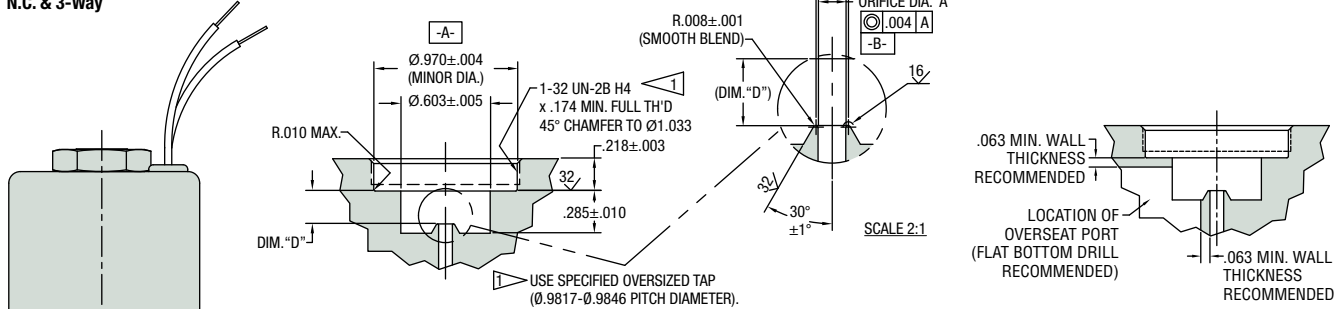
* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Type	Standard		Vacuum	
	Overseat Port	Underseat Port	Overseat Port	Underseat Port
2-Way N.C.	IN	OUT	VAC	IN
2-Way N.O.	IN	—	IN	—
3-Way N.C.	CYL	IN	IN	VAC
3-Way N.O.	CYL	EXH	CYL	EXH
3-Way M.P.	COM	N.C.	COM	N.C.
3-Way D.C.	IN	N.C.	VAC	N.C.

D Series – Operator (OB) Interface Details

Omit Body Manifold Mount (OB)

N.C. & 3-Way

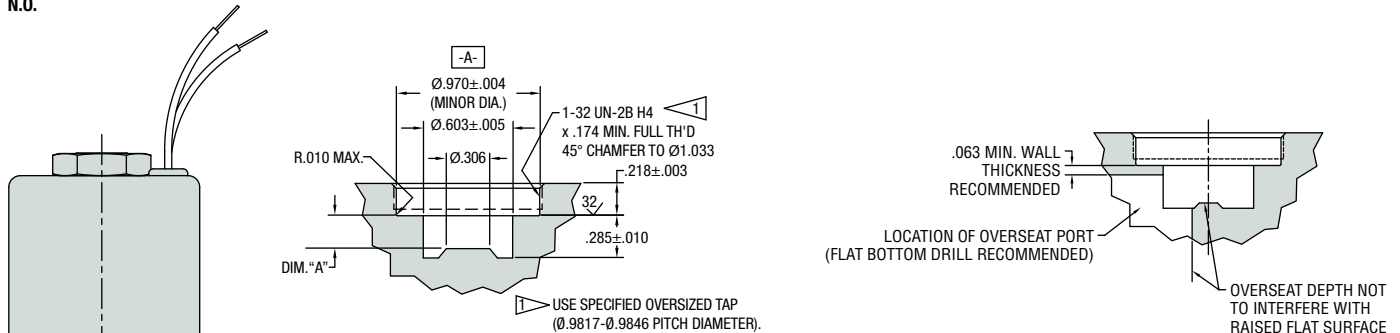


Note: All diameters to be concentric to datum -A- within .003 T.I.R.

Dimensions

Valve Function	Valve Prefix (Code 1)	Orifice Dia. "A" ±.001	Crest Dia. "B" ±.002	Orifice Depth Dim. "D" ±.001
2-Way N.C.	2011	.046 (1.17)	.062 (1.58)	.209 (5.31)
	2012	.062 (1.58)	.078 (1.98)	.213 (5.41)
	2013	.093 (2.36)	.109 (2.77)	.222 (5.64)
	2014	.109 (2.77)	.125 (3.18)	.227 (5.77)
	2015	.156 (3.96)	.172 (4.37)	.237 (6.02)
	2016	.187 (4.75)	.203 (5.16)	.245 (6.22)
	2017	.250 (6.35)	.266 (6.76)	.260 (6.60)
	2018	.312 (7.93)	.328 (8.33)	.285 (7.24)
	2019	.348 (8.84)	.364 (9.25)	.285 (7.24)
3-Way (All)	3X11	.062 (1.58)	.078 (1.98)	.213 (5.41)
	3X12	.078 (1.98)	.094 (2.39)	.217 (5.51)
	3X13	.093 (2.36)	.109 (2.77)	.222 (5.64)
	3X14	.109 (2.77)	.125 (3.18)	.227 (5.77)
	3X15	.156 (3.96)	.172 (4.37)	.237 (6.02)
	3X16	.187 (4.75)	.203 (5.16)	.245 (6.22)
	3X17	.250 (6.35)	.266 (6.76)	.260 (6.60)

N.O.



Note: All diameters to be concentric to datum -A- within .003 T.I.R.

Dimensions

Valve Function	Valve Prefix (Code 1)	Orifice Depth Dia. "A" ±.001	Stop Orifice Ref.
2-Way N.O.	2211	.229 (5.82)	3/64
	2212	.232 (5.89)	1/16
	2213	.236 (5.99)	5/64
	2214	.240 (6.10)	3/32
	2215	.243 (6.17)	1/8
	2216	.251 (6.38)	5/32

Signal Conditioning Modules, 0-5 VDC, 0-12 VDC and 4-20 mA Outputs

Provide signal conditioning as an integral part of the XT-Series Transmitters

- ▶ Stem Mounted
- ▶ J-Box Enclosed
- ▶ Panel Mounted
- ▶ Units with Preset High and Low Alarm

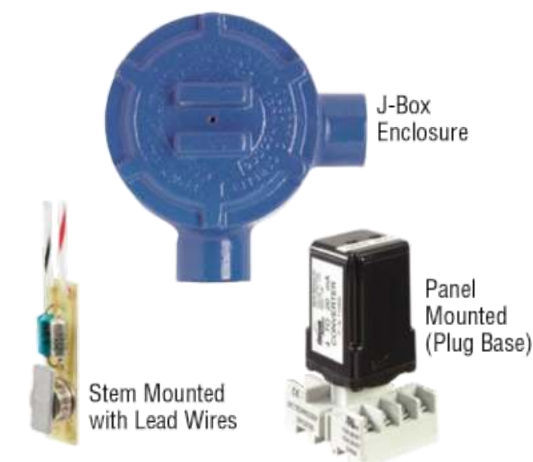
GEMS' signal conditioners provide outputs for direct connection to a wide range of instrumentation. They are ideal for large, multi-tank complexes. Units with 4-20 mA outputs are particularly well suited for instrumentation control loops. No intermediate receiver is required.

Specifications (Not included in table below)

System Accuracy	With XT-36000 Series Transmitters: ±0.4% of full scale or ±1", whichever is greater. With XT-800 Series Transmitters: ±0.4% of full scale or ±1/2", whichever is greater.
Operating Temperature	+5°F to +160°F (-15°C to +71°C)
Storage Temperature	-40°F to +212°F (-40°C to +100°C)
Output Temperature Coefficient (% of full scale, max.)	±0.00388%/°F (±0.007%/°C)
20 mA Types	To within ±1% of 16 mA

Excitation Required for Transmitters using 4-20 mA Signal Conditioners

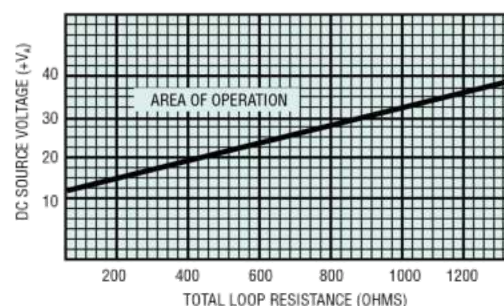
The minimum excitation required for operation of transmitters with 4-20 mA, DC signal converters (See chart at right) can be determined for a given total loop resistance from the graph shown. (Total loop resistance = the sum of the DC termination resistance plus loop resistance.) For optimum operation, which is a function of source voltage (+V_s) and total loop resistance, the source voltage value used should be above the minimum load line for the related loop resistance.



Power Supply Module

Input Power	Part Number
115 VAC, 60 Hz	52560
230 VAC, 60 Hz	52570

Operates on 115 VAC or 230 VAC inputs to supply a regulated 24 VDC to the signal conditioned transmitter where external VDC power is not available. Maximum Load: 70 mA.



How To Order

Select Part Number based on Output Signal desired and XT-Series sensor being used.

Electrical Termination Method	Output Signal	Input Voltage	Module Part Numbers For:		
			XT-800, XT-860 Series	XTP-800	XT-36490 XT-66400
Stem Mount, Lead Wires #22 AWG, Teflon® Jacket, 24" Length	0-5 VDC	8-24 VDC	51965	51965	—
	0-12 VDC	14-30 VDC	51970	51970	—
Junction Box	0-5 VDC	8-24 VDC	52536	154687	52532
	0-12 VDC	15-30 VDC	52537	154685	52533
	4-20 mA	10-40 VDC	52555	116970	52550
Panel Mount with Plug-In Base	4-20 mA	10-40 VDC	112300 ⚡	112300 ⚡	112300 ⚡

⚡ = Stock item

1100 Series Voltage Output

Compact Low Cost OEM Pressure Transmitters

- ▶ Exceptional Long Term Stability
- ▶ 0–150 psi to 0–10,000 psi Ranges (0–10 bar to 0–700 bar)
- ▶ High Proof Pressures with All Stainless Steel Wetted Parts
- ▶ Best in Class Price to Performance Ratio in a Small Package Size
- ▶ Proven Thin Film Sensor Technology

The 1100 Series is a low cost, high quality all stainless steel media isolated Pressure Sensor for measuring gases and liquids compatible with stainless steel. Suitable for industrial, refrigeration, hydraulics, offroad, construction and agriculture applications, the 1100 Series has been designed specifically for those applications with demanding price and performance requirements.

Specifications

Performance

Long Term Drift	0.2% FS/YR (non-cumulative)
Accuracy	0.50%
Thermal Error	1% (Over Compensated Temperatures)
Compensated Temperatures	–4°F to +185°F (–20°C to +85°C)
Operating Temperatures	–40°F to +220°F (–40°C to +105°C)
Zero Tolerance	1.00%
Span Tolerance	1.00%
Response Time	1 ms
Fatigue Life	Designed for more than 100 M cycles

Mechanical Configuration

Pressure Port	See under “How to Order,” last page
Wetted Parts	17-4 PH Stainless Steel
Housing	304 Stainless Steel
Electrical Connection	See under “How to Order,” last page
Enclosure	IP67
Vibration	40 G peak to peak sinusoidal, (Random Vibration: 20 to 1000 Hz @ approx. 40 G peak per MIL-STD-810E)
Shock	Withstands free fall to IEC 68-2-32 procedure 1
EMC (Radiated Immunity)	100 V/m
Approvals	CE, conforms to European Pressure Directive, Fully RoHS compliant, UL recognized files # E219842 & E174228
Weight	1.8–5.3 ounces (50–150 grams). Configuration dependent.

Voltage

Output (3-wire)	0 V min. to 5 V max. See under “How to Order,” last page
Supply Voltage	2 Volts above full scale to 30 VDC max @ 4.5 mA
Source and Sinks	2 mA

Ratiometric

Output	0.5 to 4.5 VDC @ 4 mA (6.5 mA on dual output version)
Supply Voltage	5 VDC ±10%



Integral Connectors

Deutsch DT04-4P



Deutsch DT04-3P



Packard Metri-Pack



Amp Superseal 1.5



DIN 9.4 mm

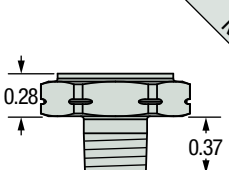
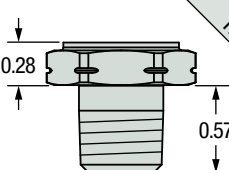
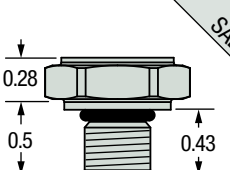
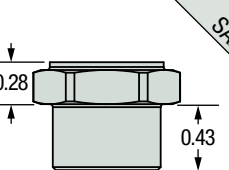
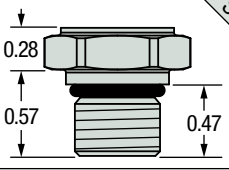
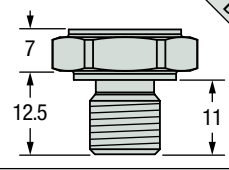
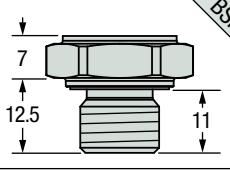
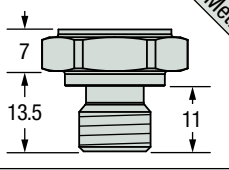


Pressure Capability

Pressure Range	Proof Pressure	Burst Pressure
150–300 psi (10–20 bar)	3.00 × Full Scale	40 × Full Scale
500–1,500 psi (40–100 bar)		20 × Full Scale
2,000–6,000 psi (160–400 bar)		10 × Full Scale
7,500–9,000 psi (600 bar)		6 × Full Scale

Pressure Ports

NPT and SAE Dimensions in Inches. Metric and BSP Dimensions in MM.

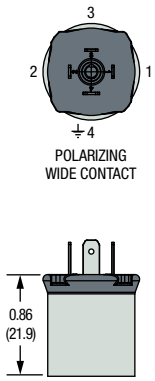
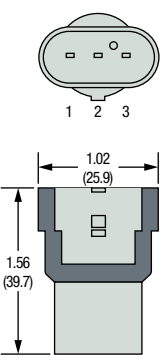
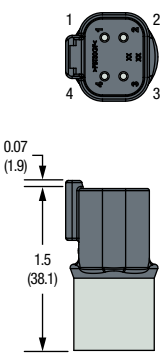
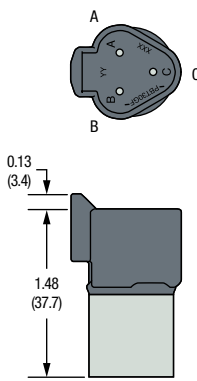
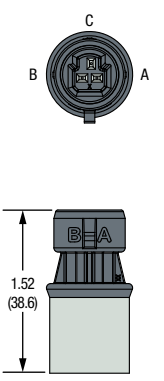
							
Fitting Code	08 = 1/8-27 NPT	02 = 1/4-18 NPT		1J = 7/16-20 UNF		1G = SAE 4 Female 7/16" Schraeder	
Torque	2–3 TFFT*	2–3 TFFT*		18–20 NM		18–20 NM	
							
Fitting Code	1P = 9/16-18 "Heavy Duty"	01 = G 1/4 A		05 = G 1/4 A Integral Face-Seal		0L = M12 x 1.5	
Torque	18–20 NM	30–35 NM		30–35 NM		28–30 NM	

*NPT Threads 2–3 turns from finger tight. Wrench tighten 2–3 turns.

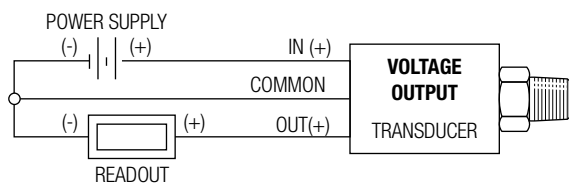
General Notes:

1. The diameter of all cans is 19 mm (0.748")
2. Hex is 22 mm (0.866") Across Flats (A/F) for deep socket mounting
3. O-Ring material, where applicable, is Viton® unless otherwise specified.

Integral Connector Versions

DIN 9.4 mm		Amp Superseal 1.5	Deutsch DT04-4P		Deutsch DT04-3P	Packard Metri-Pack
 <p>POLARIZING WIDE CONTACT</p> <p>inch (mm)</p>						
Code B		Code 6	Code 8		Code Y	Code 9
Pin #	Voltage Mode	Voltage Mode	Voltage Mode	Pin ID	Voltage Mode	Voltage Mode
1	V _{out}	V _{out}	0V	A	+IN	0V
2	+IN	0V	+IN	B	0V	+IN
3	PE	+IN	PE	C	V _{out}	V _{out}
4	0V	—	V _{out}	E	—	—

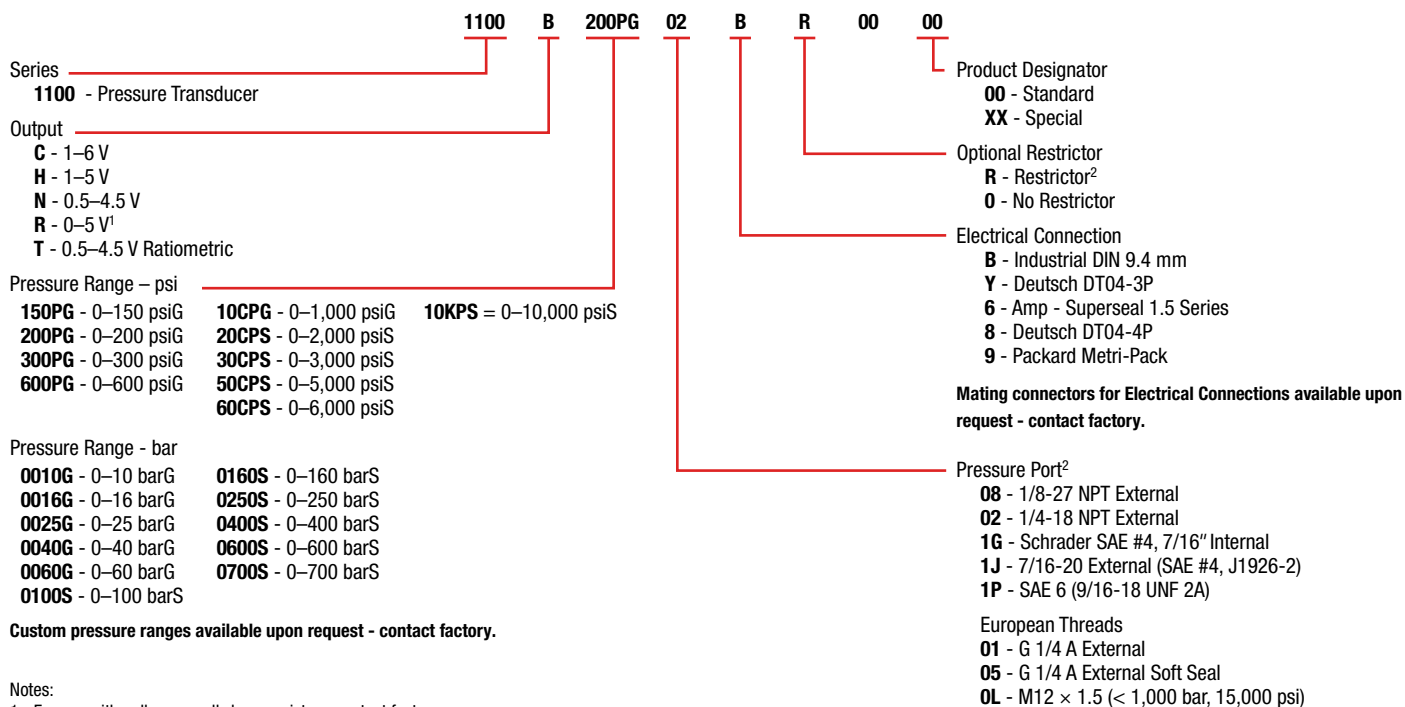
Wiring Diagram



Mating connectors available upon request. Please contact factory.

How to Order

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



Define Switching Mode Anytime With Programmable SAFE-PAK® Relays

Provide normally open (N.O.), normally closed (N.C.) or latching output with variable time delays

- ▶ Designed for use with switches or sensors monitoring flow, pressure, level, etc
- ▶ They render non-voltage-producing sensors intrinsically safe for operation in potentially hazardous areas
- ▶ Streamlined housing suited for group-mounting on a common earth-grounded plate for multiple installation
- ▶ UL recognized, CSA and evaluated by MSHA

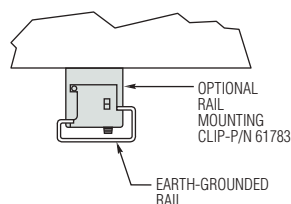
Operations such as normally open, normally closed or latching are programmed into these versatile SAFE-PAK units by the user during installation. Selection is made by simply connecting sensor wiring (and jumper wire when required) to the proper terminals on the unit as diagrammed on opposite page. All units are programmable, except where otherwise indicated.

See table on Page L-2 for specific approval information.

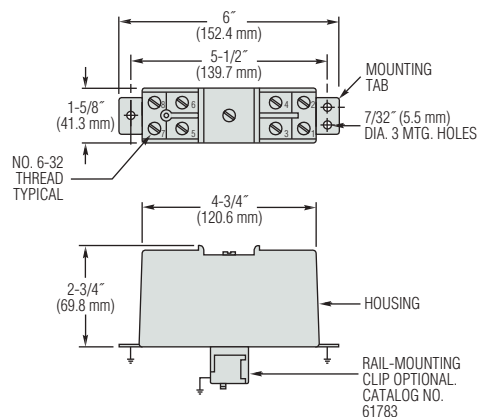
Options

SAFE-PAK Relays can be supplied with any of the following options on special order. Please consult factory.

- With optically isolated operation
- With zero-crossover load switching
- Longer time delays
- Rail-mounting clip (in addition to standard mounting tabs)

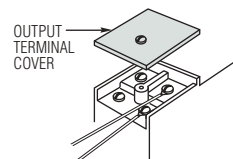


Dimensions



Protective Cover

Assures intrinsic safety integrity of sensor terminals and wiring.



Specifications

Part Number	Operating Voltage ⁴	Load Current Maximum	Load Voltage Range	Turn-On Sensitivity (Typical) ¹	Turn-Off Sensitivity (Typical) ¹	Leakage Current "Off" State, Maximum	Voltage Loss, Maximum	Transient Current ³	Operating Temperature Range
54820 ⚡	95 to 125 VAC, 50-60 Hz	2A	25-250 VAC 50-60 Hz	≤400 K	1 M	3 mA	2 V	20A	+32°F to +140°F (0°C to 60°C)
54825 ⚡		0.5A @ 20 V .05A @ 200 V AC or DC	0-250 VAC 50-400 Hz 0-200 VDC	≤30 K	60 K	—	—	—	

Notes:

1. Temperature Dependent.
2. Housing material is blue Lexan®.
3. Repetitive surge currents caused by transient voltage/current pulses may eventually cause permanent damage to triac-type switches if adequate transient suppression is not utilized.
4. All AC voltage and current specifications are RMS values unless otherwise stated.

⚡ – Stock Items.

How To Order

Specify Part Number based on output.

Description – Hybrid Relay	Switching Mode	Part Number
Triac Output, AC Operation	Programmable, N.O., N.C., or latching	54820 ⚡
Reed Switch Output, AC/DC Operation		54825 ⚡
Optional Rail Mounting Clip		61783

⚡ – Stock Items.

Programming the GEMS Programmable SAFE-PAK

Normally Open Load Operation: Switch closure to terminals 5 and 7 turns Programmable Relay “on” and energizes load. Same switch opening will turn “off” Programmable Relay and de-energize load. Terminals 6 and 8 are not used.

Normally Closed Load Operation: Switch closure to terminals 6 and 7 turns Programmable Relay “off” and de-energizes load. Same switch opening will turn “on” Programmable Relay and energize load. Jumper must be connected between terminals 5 and 7...terminal 8 is not used.

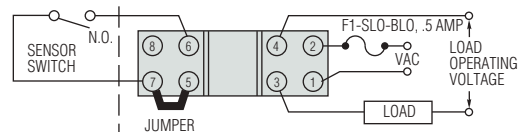
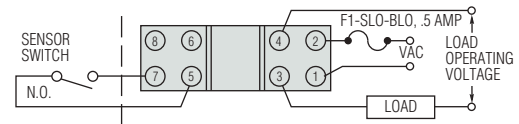
Latching “A” Operation: For refill control, momentary switch closure to terminals 5 and 7 turns Programmable Relay “on” and energizes load. Load remains “on” until the Programmable Relay turns “off” with a momentary switch closure at terminals 6 and 7. The load is then de-energized. Jumper must be connected between terminals 7 and 8. For pump-down, reverse wires on terminals 5 and 6.

Note: Latching function should be accomplished on sensor input side of the Programmable SAFE-PAK. No latching function is advised on the output power circuit side.

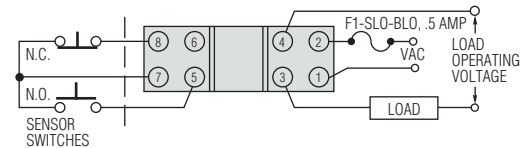
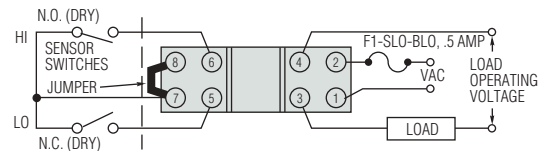
Latching “B” Operation: Momentary switch closure to terminals 5 and 7 turns Programmable Relay “on” and energizes load. Load remains “on” until the N.C. switch terminals 7 and 8 opens. The Programmable Relay turns “off” and load is de-energized. Terminal 6 and jumper are not used.

Note: Latching function should be accomplished on sensor input side of the Programmable SAFE-PAK. No latching function is advised on the output power circuit side.

Typical Wiring

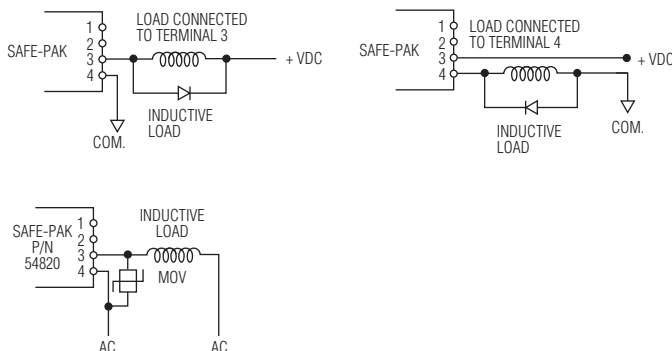


Refill Operation Shown

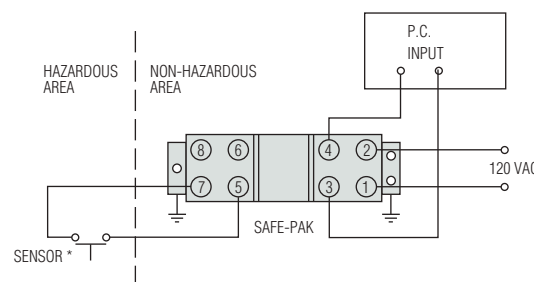


Load Consideration

When these units are used in high-noise electrical systems, connection of a varistor (General Electrical G-MOV or equivalent diode) across terminals 3 and 4 is recommended. Consult factory for recommended varistor protection.



Connecting to Programmable Controllers



Programmable SAFE-PAK, P/N 54825, providing simple on-off functions for hazardous location, and interfacing with TTL or AC logic input of programmable controller.
*Temperature, pressure, position, flow or level.

Installation and maintenance must be in accordance with the National Electrical Code and the applicable GEMS INSTRUCTION, INSTALLATION and SERVICE

FS-930 Series – Oil Flow Switch, Compensates For Viscosity Change In Fluids

Flow Rate Settings: 0.1 GPM to 1.0 GPM

Port Size: 1/4" NPT

Primary Construction Material: Brass

Setting Type: Fixed

UL Approved
Explosion-Proof

A unique, patented piston design assures accuracy within 20% over a full range of viscosities—from 40 to 2000 SSU. Ideal for use in applications where liquids of different viscosities are blended; or for use in lubrication systems where oil flow monitoring is critical at start-ups. Switch compensates for viscosity changes automatically. Each unit is factory preset, using 300 SSU oil, for actuation at specified flow rates.

Specifications

Wetted Materials	
Housing	Brass
Piston	Brass
Spring	316 Stainless Steel
O-Ring	Viton®
Other Wetted Parts	Epoxy
Pressure Rating	
Operating, Maximum	1000 PSIG (69 bar)
Proof	2500 PSIG (172 bar)
Burst	5000 PSIG (345 bar)
Operating Temperature	-20°F to +300°F (-29°C to +148.9°C)
Repeatability	1% Maximum Deviation**
Set Point Accuracy	±10%
Set Point Differential	15% Maximum
Switch*	SPDT, 20 VA
Inlet/Outlet Ports	1/4" NPT
Electrical Termination	No. 18 AWG, 24" L., Polymeric Lead Wires
Explosion-Proof Approvals	U.L. Approved for Class I, Division 2, Groups A, B, C, D. Also available with FM approved, explosion proof junction box for Class I, Division 1, Group D hazardous locations. U.L. Approved — File No. E183854, RoHS

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

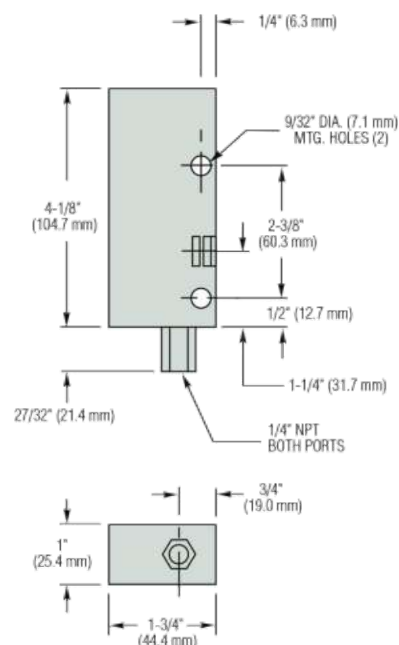
** Reference at 300 SSU set point.



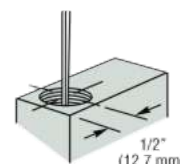
U.L. Recognized —
File No. E31926



Dimensions



Electrical Connection, 1/2" NPT Conduit



How To Order – Standard Models

Specify Part Number based on flow setting.

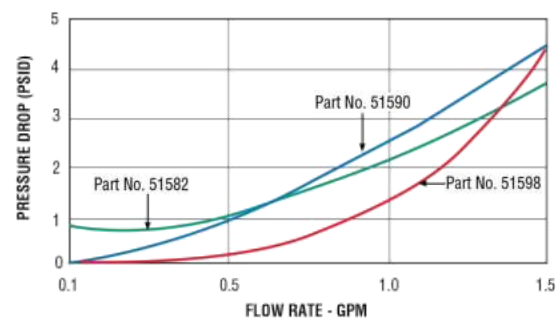
Flow Setting GPM, $\pm 10\%$	Part Numbers
0.10	51582 ⚡
0.25	51586 ⚡
0.50	51590
0.75	51594
1.00	51598

Notes:

- Flow settings are calibrated in a vertical position (lead wires up) with 300 SSU oil. Set points will be maintained within 20% of settings in a liquid viscosity range of 40 to 2,000 SSU.
- Use of 50 micron filtration is recommended.

⚡ – Stock Items.

Pressure Drop – Typical



Tests conducted with units in vertical position (lead wires up) with water at +70°F (21°C).

FS-930 switches are U.L. Approved for Class I, Division 2, Groups A, B, C, D hazardous locations.

They are also available with FM-approved, explosion-proof junction box for Class I, Division 1, Group D hazardous locations. Units must be assembled completely at GEMS.

U.L. Approved — File No. E183854

Standard Wiring Color Code

Wire Color	Terminal
Orange	N.O.
Black	Common
Red	N.C.

FS-380 Series – Compact Flow Switch for High Inline Pressures

Flow Rate Settings: 0.15 GPM to 2.00 GPM

Port Size: Multiple

Primary Construction Material: Brass or Stainless Steel

Setting Type: Fixed

These rugged inline flow switches require 100 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. The FS-380 is also an excellent choice for semicon cooling applications where simple design and reliable operation are required.

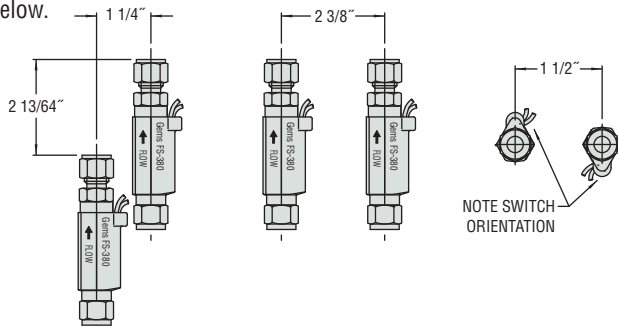
Specifications

Wetted Materials	
Housing	Brass or 316 Stainless Steel
Piston	PPS Composite, Epoxy
Spring	316 Stainless Steel
O-Ring	Fluorocarbon
Operating Pressure, Maximum	1500 PSI (107 bar); 500 PSI (34 bar) for 1/2" Barb Models
Operating Temperature	-20°F to +275°F (-28.8°C to +135°C)
Set Point Accuracy	±20% Maximum
Set Point Differential	20% Maximum
Switch*	SPST, 20VA, N.O. at no Flow
Electrical Termination	No. 22 AWG, 24" to 26" Polymeric leads

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

Spacing

To prevent sensor to sensor magnetic field interference, follow the spacing guidelines below.



How To Order – Standard Models

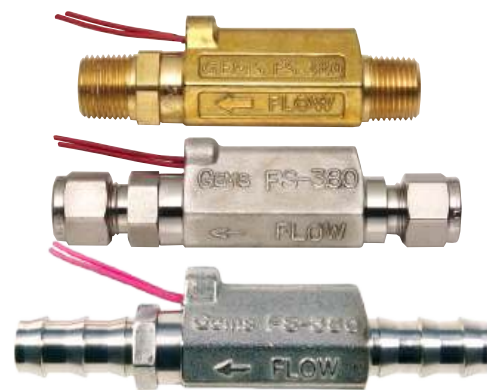
Specify Part Number based on flow settings.

Flow Settings GPM ¹	Brass		Stainless Steel			
	1/2" NPT Male	3/8" NPT Male	3/8" NPT Male	1/4" Compression	3/8" Compression	1/2" Barb
0.15	—	181130	193482	259118	212136	239693
0.25	192562	168432	179992	259119	177592	239692
0.50	192563	168433	179993	259121	177593	239691
1.00	192564	168434	179994	259122	177594	239690
1.50	192566	168435	179995	—	177595	239689
2.00	192567	178353	179996	—	225525	239688

— Stock Items.

Note:

- Flow settings are calibrated using water @ 70°F on increasing flow with units in horizontal position. Consult factory for other fluid compatibility.

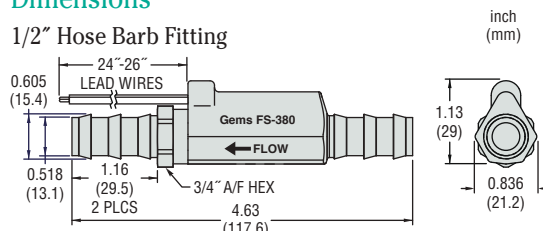


U.L. Recognized
File No. E31926

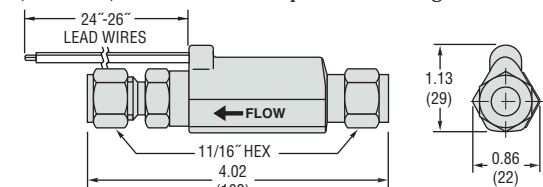


Dimensions

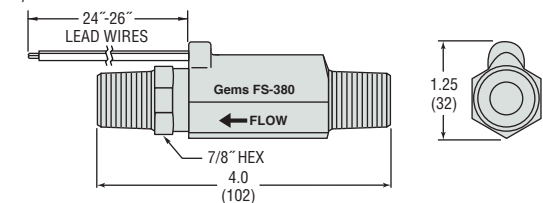
1/2" Hose Barb Fitting



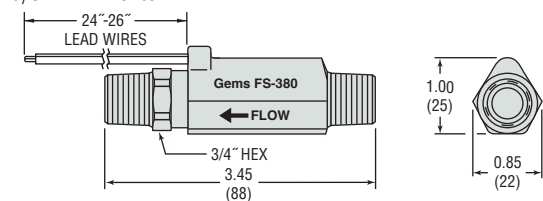
1/4" and 3/8" Tube End Compression Fitting



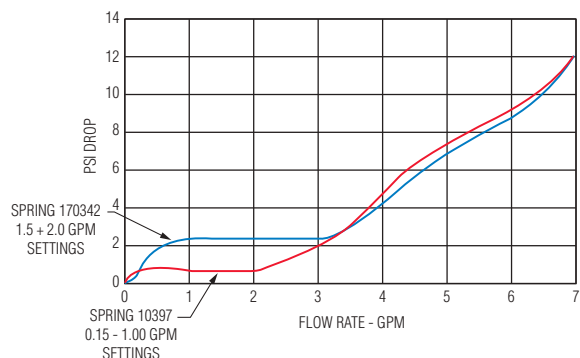
1/2" NPT Ports



3/8" NPT Ports



Pressure Drop – Typical



FS-600 Series – No Moving Part, Thermal Dispersion Flow Switch

Flow Rate Settings: 0.1 GPM to 11 GPM (0.5 LPM to 41 LPM)

Port Size: 1/2" to 1-1/2" NPT

Setting Type: Fixed

The FS-600 series uses proven thermal dispersion technology to provide a robust no moving part flow switch even without filtration. The solid state sensor is compatible with both conductive and non-conductive fluids. Suitable for fluids with particulates or slurries, and is immune to changes in media viscosity. The straight through switch is designed for a long life and can be mounted in any orientation and can handle a wide range of flow rates. No moving parts means years of reliable service.

Specifications

Wetted Materials	
Probe	316L Stainless Steel
Flow Body	316 Stainless Steel
Operating Pressure (Max.)	363 PSIG (25 bar)
Operating Temperature	-14° F to 140°F (-10°C to 60°C)
Power on Delay Time	15 Seconds Max (Output On)
Response Time	10 Seconds Max.
Inlet/Outlet Ports	1/2", 3/4", 1", 1-1/2" NPT
Operating Voltage	24 Vdc or 24Vac +/- 15%
Current Consumption	Less than 50mA
Switch Contact Rating	30Vac@45mA, 42Vdc @65mA
Switch Logic	Normally Open
Ingress Protection	IP65
Set point Accuracy	15%
Set point Differential	20% (Max.)
Electrical Termination	M12 x 1 (4-Pin) (1 meter cable included)
Approvals	CE, RoHS

Calorimetric Principle/Thermal Dispersion

The operating principle of the FS-600 flow switch is based on the calorimetric principle. The FS-600 uses the cooling effect of a flowing fluid to monitor the flow rate. The amount of thermal energy that is removed from the tip determines the local flow rate. This temperature-based operating principle can reliably sense the flow of virtually any liquid.

The sensor tip of the FS-600 flow sensor houses two transistors and a heater element. One transistor is located in the sensor tip, closest to the flowing fluid. This transistor is used to detect changes in the flow velocity of the liquid. The second transistor is bonded to the cylindrical wall and is a reference for ambient fluid conditions.

In order to make the sensor sense flow, it is necessary to heat one of the transistors in the probe. When power is applied, the tip of the probe is heated. As the fluid starts to flow, heat will be carried away from the sensor tip. Cooling of the first transistor is a function of how fast heat is conducted away by the flowing liquid. The difference in temperature between the two transistors provides a measurement of fluid velocity past the sensor probe. When fluid velocity is high, the temperature differential is small. As fluid velocity decreases, there is an increase in temperature differential.

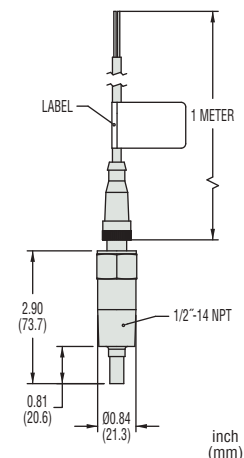
CE



How To Order – Flow Switch Only

Specify Part Number based on Fluid Velocity for the FS-600 Series per the following chart.

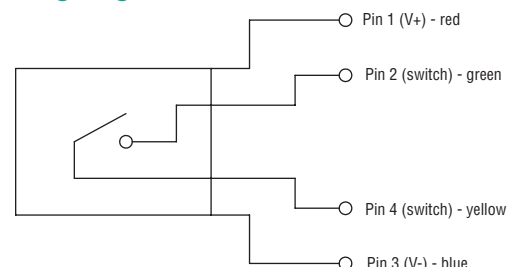
Fluid Velocity (cm/s)	Part Numbers
5	230500-5-05
10	230500-5-10
15	230500-5-15
20	230500-5-20
25	230500-5-25
30	230500-5-30
35	230500-5-35
40	230500-5-40
45	230500-5-45
50	230500-5-50
55	230500-5-55
60	230500-5-60



Notes:

1. Standard calibration is in water with units in a horizontal position.
2. Consult Gems for special applications.

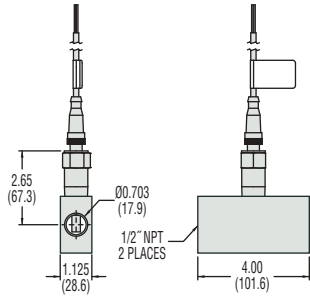
Wiring Diagram



How To Order – Flow Switch with Fitting

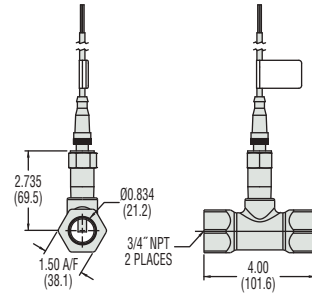
Specify Part Number based on Line Size and Flow Setting per the following chart.

1/2" NPT Port



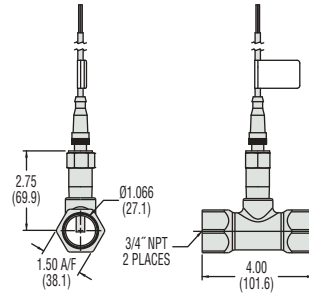
Flow Setting		Part Numbers
GPM	LPM	
0.13	0.48	230500-1-05
0.24	0.90	230500-1-10
0.35	1.31	230500-1-15
0.46	1.73	230500-1-20
0.57	2.14	230500-1-25
0.68	2.56	230500-1-30
0.79	2.98	230500-1-35
0.90	3.39	230500-1-40
1.01	3.81	230500-1-45
1.12	4.23	230500-1-50
1.23	4.64	230500-1-55
1.34	5.06	230500-1-60

3/4" NPT Port



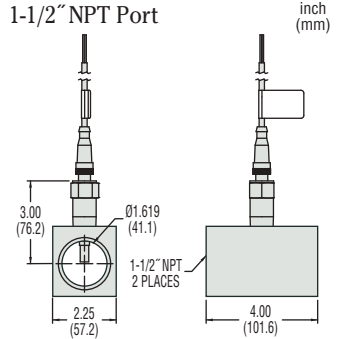
Flow Setting		Part Numbers
GPM	LPM	
0.35	1.31	230500-2-05
0.57	2.15	230500-2-10
0.79	2.99	230500-2-15
1.01	3.83	230500-2-20
1.23	4.67	230500-2-25
1.46	5.51	230500-2-30
1.68	6.00	230500-2-35
1.90	7.00	230500-2-40
2.12	8.00	230500-2-45
2.34	9.00	230500-2-50
2.57	10.00	230500-2-55
2.79	11.00	230500-2-60

1" NPT Port



Flow Setting		Part Numbers
GPM	LPM	
0.64	2.20	230500-3-05
0.97	3.20	230500-3-10
1.31	4.25	230500-3-15
1.65	5.30	230500-3-20
1.99	6.5	230500-3-25
2.32	7.5	230500-3-30
2.66	8.5	230500-3-35
3.00	9.5	230500-3-40
3.33	10.0	230500-3-45
3.67	12.0	230500-3-50
4.01	13.0	230500-3-55
4.34	14.0	230500-3-60

1-1/2" NPT Port



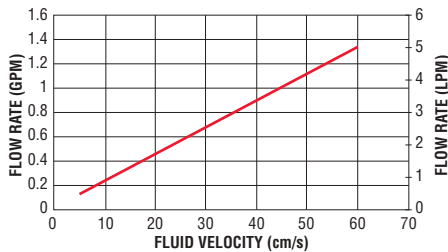
Flow Setting		Part Numbers
GPM	LPM	
1.48	5.50	230500-4-05
2.28	8.5	230500-4-10
3.07	11.6	230500-4-15
3.86	14.6	230500-4-20
4.66	17.6	230500-4-25
5.45	20.6	230500-4-30
6.0	22.7	230500-4-35
7.0	26.5	230500-4-40
8.0	30.3	230500-4-45
9.0	34.1	230500-4-50
10.0	37.9	230500-4-55
11.0	41.6	230500-4-60

Notes:

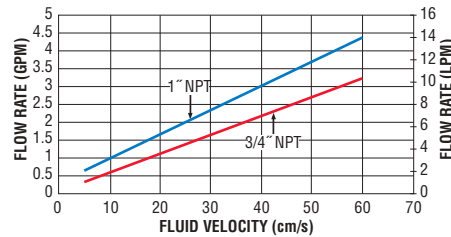
1. Setpoints based on water flow. Contact factory for setpoints of alternate media.
2. -5 through -60 = fluid velocity (cm/s)

Fluid Velocity vs. Flow Rate in GPM/LPM in Water

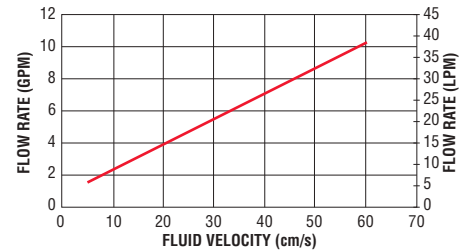
1/2" NPT Port



3/4" NPT and 1" NPT Ports



1-1/2" NPT Port



Cord Set Options — A 1 meter cord set is included with switch

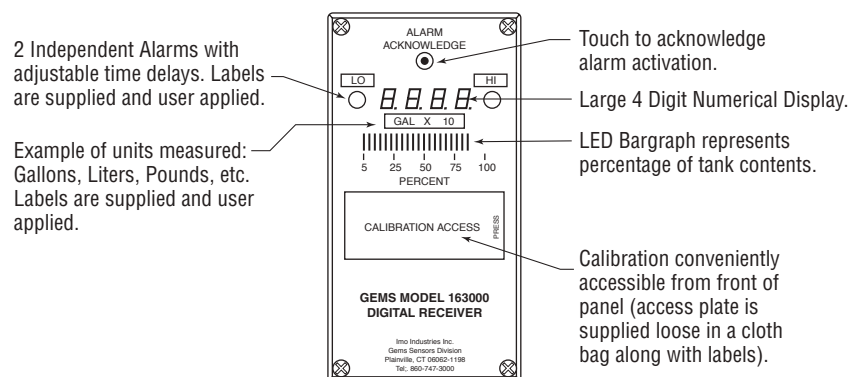
Description	Part#
M12 cord Set-1 meter (Red 1, Green 2, Blue 3, Yellow 4) 22 AWG	557703-01M0
M12 cord Set-3 meter (Red 1, Green 2, Blue 3, Yellow 4) 22 AWG	557703-03M0
M12 cord Set-4 meter (Red 1, Green 2, Blue 3, Yellow 4) 22 AWG	557703-04M0
M12 cord Set-5 meter (Red 1, Green 2, Blue 3, Yellow 4) 22 AWG	557703-05M0

Digital Bargraph Display Receivers - 163000 Series

Gems Digital Bargraph Receivers improve the way you are able to visualize the data being received from your liquid level transmitters. These new receivers display liquid level information in digital numerals in conjunction with a 0-100% LED bargraph readout. The numeric portion is a 1/2" 4-digit display that provides detailed quantification of tank contents, while the bright LED bargraph represents the tank contents as a bar length relative to the percentage of fluid volume within the tank.

If you have a non-linear tank, such as a sphere or a cylinder laying on its side, these receivers are a blessing. They can be calibrated easily so that the digital and bargraph displays will indicate accurate content information for "odd" shape tanks. See "Linearization" below.

In addition to the dual visual displays, the Gems Bargraph Receiver features two independent alarms with adjustable time delays, 10 amp auxiliary dry contacts and easy user set-up. The receiver is available in component form for mounting into custom enclosures or panels, or housed within a NEMA 4X enclosure.



Linearization

Certain tanks, like a sphere or a cylinder laying on its side, are considered "Non-Linear" in terms of volume versus tank height. In these cases this receiver may be linearized according to your tank parameters so that the correct volume is displayed. Any units may be displayed by the receiver. Gallons, inches, tons, cubic inches, liters and etc.

The receiver uses a scheme where 9 points or 8 straight lines are used to calculate the numbers to be displayed. These 8 lines approximate the curve of the non-linear tank.

Examples of Non-Linear Display Values.

1. Gallons in a spherical tank.
2. Gallons in a cylindrical tank laying down.
3. Pounds of liquid in a spherical tank.
4. Cubic meters in a conical shaped tank.
5. Gallons in a non-linear shaped tank.

IMPORTANT: Customer must supply a sounding table, capacity curve and/or tank drawing for linearization of the digital bar graph display receiver.

Specification

Input Signal	4-20mA, Proportional Voltage*, Serial
Accuracy Over Given Range	± 1.0%
Operating Voltage	24VDC or 115VAC
Operating Temperature	32°F to 122°F (0°C to 50°C)
Alarm Contacts, Load	10Amp, Dry Contact
Digital Readout	0000 to 9999

* Proportional voltage as produced by the non-signal conditioned Gems Liquid Level Transmitters (Section H) and SureSite Transmitters (Section G).
Note: Customer alarms (High & Low) set upon request.

Panel Mounted Versions



Enclosed Versions



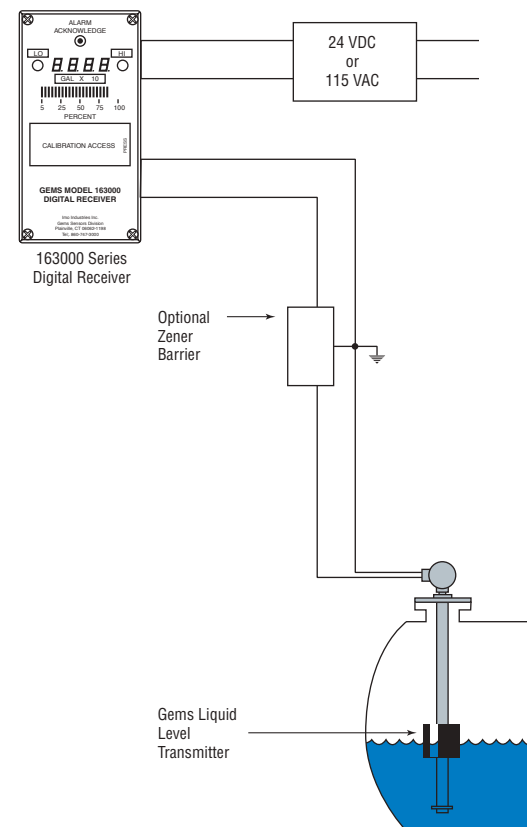
Dimensions

Panel Mounting Receivers



Typical Installation

NEMA 4X Enclosed Receivers



Select receiver type by Part Number based on Input Power and Input/Output Signals required.

Input Power	Input/Output Signals		Part Number	
	Input	Output	Panel Mount	NEMA 4X Fiberglass Enclosed
24 VDC	Transmitter*	None	170680-0100	170690-0100
	Serial	None	170681-0100	170691-0100
	Transmitter*	4-20mA	170682-0100	170692-0100
	4-20mA	4-20mA	170683-0100	170693-0100
		None	170684-0100	170694-0100
115 VAC	Transmitter*	None	170685-0100	170695-0100
	Serial	None	170686-0100	170696-0100
	Transmitter*	4-20mA	170687-0100	170697-0100
	4-20mA	4-20mA	170688-0100	170698-0100
		None	170689-0100	170699-0100

LEVEL INDICATORS - VISUAL

UCL-510 — Transmitter/Multipoint Switching Combo

- ▶ 49-inch (1.25m) range. Compact sensor with 2" dead band and beam width are optimized for small tank applications
- ▶ 1" NPT mounting
- ▶ Reliable, non-contact alternative to float and conductivity level sensors for corrosive, sticky or dirty media
- ▶ Outputs continuous level and provides full pump or valve control
- ▶ PVDF transducer for corrosive liquid media

The UCL-510 is a general purpose ultrasonic sensor providing non-contact level detection up to 49.2" (1.25m), with 4 relays for switch or control functions and continuous level measurement. This compact unit offers a non-contact alternative to our float or conductance sensors in small tank chemical feed or handling applications when corrosive, sticky or dirty media is involved.

The configuration software, supplied with the sensor, provides flexible system integration or retrofit of existing level devices with configuration control. Integral level automation functions can further reduce system costs through the reduction of external control hardware. The analog output enables local tank level indication, remote PLC monitoring or automation functions. Gems UCL-510 is the non-contact solution for small tank level switch, control and measurement.

Specifications

Range	49.2" (1.25 m)
Accuracy	0.125" (3 mm)
Resolution	0.019" (0.5 mm)
Beam Width	2" (5 cm)
Dead Band	2" (5 cm)
Supply Voltage	24VDC (loop)
Loop Resistance	400Ω max.
Consumption	0.5W
Signal Output	4-20 mA, two-wire (when loop powered)
Contact Type	(4) SPST relays 1A
Loop Fail-Safety	4 mA, 20 mA, 21 mA, 22 mA or hold last
Relay Fail-Safety	Power loss: Hold last; Power on: Open, close or hold last
Hysteresis	Selectable
Configuration Software	PC Windows® USB 2.0
Temp. Comp.	Automatic over range
Process Temp.	20°F to 140°F (-7°C to +60°C)
Ambient Temp.	-31°F to +140°F (-35°C to +60°C)
Pressure	MWP = 30 PSI
Enclosure	Type 6P encapsulated, corrosion resistant & submersible
Encl. Material	PC/ABS FR
Strain Relief Mat.	Santoprene®
Trans. Material	PVDF
Cable Length	48" (1.2 m)
Cable Jacket Mat.	Polyurethane
Process Mount	1" NPT (1" G)
Mount. Gasket	Viton®
Classification	General Purpose
Approvals	CE, cFMus



Typical Applications

- Water and Waste Water
- Control Automation
- Chemical Feed
- Food and Beverage
- Acids, Inks, Paints
- Slurries

Control and Switch Functions

- 2 pumps with 2 alarms
- 1 pump with 3 alarms
- 2 pumps (lead-lag) with 2 alarms
- 2 pumps (duplexing) with 2 alarms
- 4 level switch points

Versatile Application

Controller

- Auto fill/empty
- Can control 2 pumps/valves
- Lead/lag
- Duplex
- Unused relays may be used as additional alarms

The UCL-510 feature programmable level intelligence and can be reconfigured for different sensing duties (such as switch actuation points) after installation. This is an advantage over our float or conductivity type sensors. The user-friendly configuration software provides un-matched accuracy and programming for control applications. Multi-function relay control, coupled with 4-20 mA output generates amazing control capabilities. Advanced signal processing techniques provides the UCL-510 with next generation digital processing for control. The UCL-510 is level control made simple.

Switching

- High level alarm (1-4)
- Low level alarm (1-4)
- Any combination of high and/or low alarms

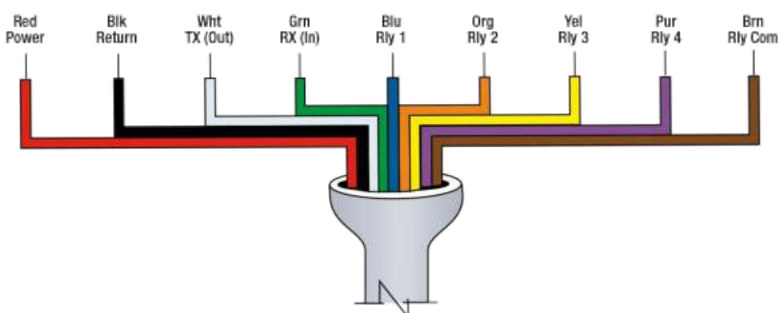
The UCL-510 provides a non-contact alternative to our float and conductivity probes multipoint level switches. It combines 4 built in SPST relays, with a selectable hysteresis that eliminates relay chatter from turbulent media. Additionally, non-contact sensors are immune to the performance issues influenced by changes in a media's specific gravity.

Continuous Transmitter

- Adjustable 4-20 mA output
- Reversible output
- Interface directly to local display and/or to PLC, SCADA, DCS systems
- Remote displays/controllers can increase relay functionality

The UCL-510 is a good non-contact alternative to our XT float type transmitters for challenging media that can damage moving parts. The UCL-510 is for sticky, scaling or corrosive media. It provides exceptional measurement accuracy (0.125"), resolution (0.019") and repeatability ensuring overall system performance reliability.

Wiring



How To Order

Select by Part Number.

Description	Part Number
UCL-510 Transmitter/Multipoint Switch with Configuration Software and Fob	225100
Replacement/Additional Configuration Fob	227100

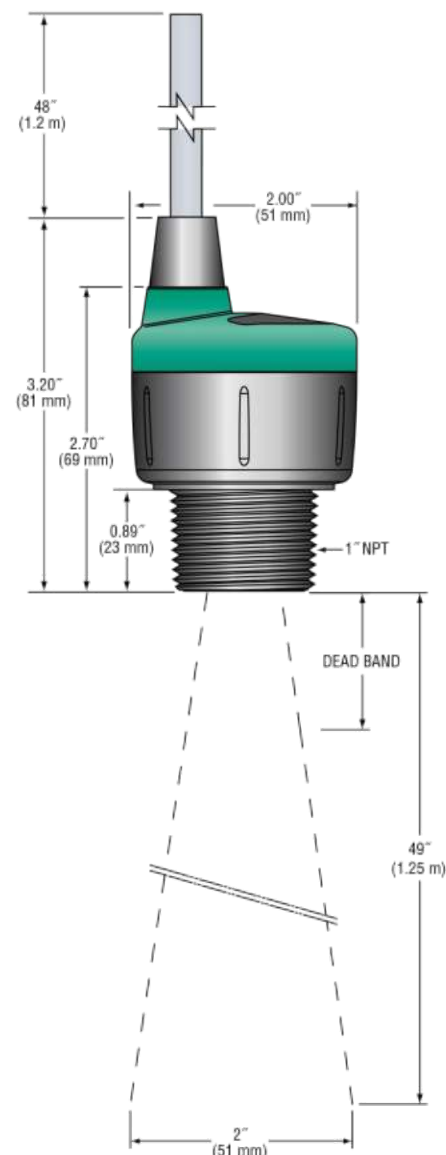
Configuration Software

- Free download @ GemsSensors.com/software
- Windows XP or 2000 compatible; USB 2.0 connection
- Provides configuration, file management (saving, printing, backup), and troubleshooting

The user interface allows you to take complete visual control of your set-up and configuration. Using simple menus and visual representations, the confusion of target calibration are gone. Once you have completed your configuration design, simply click "Write to Unit" and the UCL-510 is configured. It also enables multiple UCL-510's to be configured with just a click of the button. It even generates viewable and printable PDF wiring diagrams of your configurations to simplify and ensure proper field installation.

Gems supplies the USB Fob required to use the configuration software with each UCL-510 sensor. Replacements or additional Fobs may be ordered separately.

Dimensions



C Series – High Flow

- ▶ MOPD: 400 PSI (28 Bar)
- ▶ C_v Range: 0.019 to 0.420 (K_v Range: 0.016 to 0.357)
- ▶ 7 Watts

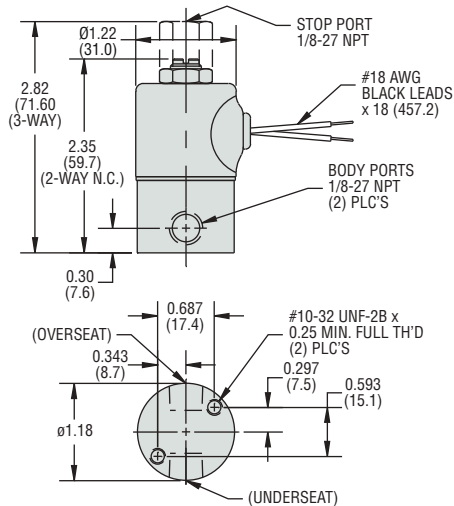
The C Series, available only in brass, is a highly durable miniature 2- or 3-way direct acting valve for applications that require a higher flow control. The C Series also utilizes a larger diameter body and larger port connections for higher C_v (K_v) valves rates. The free machining brass body allows for fast and precise machining, translating into lower product costs as compared to stainless steel. Design engineers appreciate the quality inherent in solid brass components.

Typical Applications

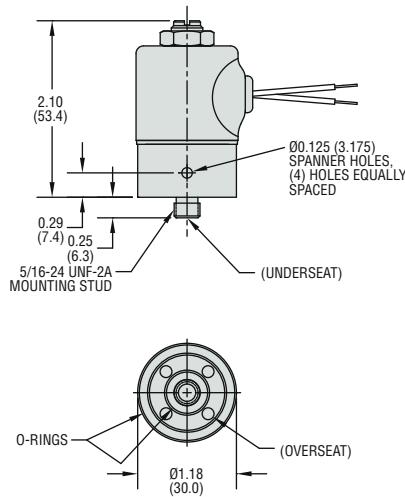
- Therapeutic Beds
- Automotive Applications
- Packaging Equipment

Dimensions

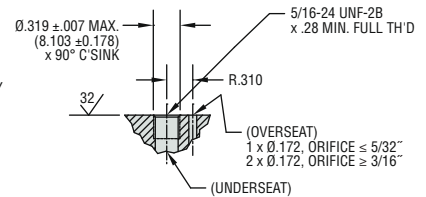
Threaded Port Body



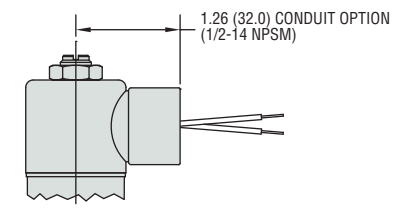
Manifold Mount Body



MANIFOLD MATING DIMENSIONS



Alternate 1/2" Conduit Housing Available on all body configurations



How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

C2016	-	11	-	E	-	EO	-	LB	-	48VDC	-	VAC		
1		2		3		4		5		6		7		8
Primary Prefix		Coil Construction		Body Material*		Plunger Seal Material		O-Ring Material		Body Port Configuration		Voltage		Additional Options

* Blank entry indicates a "Standard" selection (Brass, in this case).

Example:

C2016-11-E-EO-LB-48VDC-VAC

2-Way N.C. solenoid valve, with tape-wrapped coil, Class-H, lead-wires, brass body, EPR plunger seal, EPR o-ring, 1/4-18 NPT female thread, operating at 48 VDC, and includes a vacuum application – 0 to 29.5" Hg (0 to 1000mBar) option.



CE

Part Prefix Table ①

	Orifice				MOPD		C _v		K _v		① Primary Prefix	
	Body		Stop		psig	bar	Body	Stop	Body	Stop	Grommet Housing	Conduit Housing
	inches	mm	inches	mm								
2-WAY N.C.	1/16	1.59	—	—	400	28	0.080	—	0.068	—	C2011	C2021
	7/64	2.78	—	—	200	14	0.180	—	0.153	—	C2012	C2022
	1/18	3.18	—	—	150	10	0.240	—	0.204	—	C2013	C2023
	5/32	3.97	—	—	100	6.9	0.300	—	0.255	—	C2014	C2024
	3/16	4.76	—	—	75	5.2	0.360	—	0.306	—	C2015	C2025
	7/32	5.56	—	—	40	2.8	0.420	—	0.357	—	C2016	C2026
2-WAY N.O.	—	—	1/32	0.79	400	28	—	0.019	—	0.016	C2211	C2221
	—	—	3/64	1.19	300	21	—	0.040	—	0.034	C2212	C2222
	—	—	1/16	1.59	200	14	—	0.075	—	0.064	C2213	C2223
	—	—	5/64	1.98	150	10	—	0.105	—	0.089	C2214	C2224
3-WAY N.C. Free Vent	1/16	1.59	1/16	1.59	125	8.6	0.080	0.075	0.068	0.064	C3011	C3021
	5/64	1.98	5/64	1.98	100	6.9	0.105	0.105	0.089	0.089	C3012	C3022
	1/8	3.18	5/64	1.98	50	3.4	0.240	0.105	0.204	0.089	C3013	C3023
	3/16	4.76	5/64	1.98	25	1.7	0.360	0.105	0.306	0.089	C3014	C3024
	7/32	5.56	5/64	1.98	VAC	1000 mbar	0.420	0.105	0.357	0.089	C3015	C3025
3-WAY N.C. Line Connection	1/16	1.59	1/16	1.59	125	8.6	0.080	0.075	0.068	0.064	C3111	C3121
	5/64	1.98	5/64	1.98	100	6.9	0.105	0.105	0.089	0.089	C3112	C3122
	1/8	3.18	5/64	1.98	50	3.4	0.240	0.105	0.204	0.089	C3113	C3123
	3/16	4.76	5/64	1.98	25	1.7	0.360	0.105	0.306	0.089	C3114	C3124
	7/32	5.56	5/64	1.98	VAC	1000 mbar	0.420	0.105	0.357	0.089	C3115	C3125
3-WAY N.O.	1/16	1.59	1/16	1.59	125	8.6	0.080	0.075	0.068	0.064	C3211	C3221
	5/64	1.98	5/64	1.98	100	6.9	0.105	0.105	0.089	0.089	C3212	C3222
	1/8	3.18	5/64	1.98	75	5.2	0.240	0.105	0.204	0.089	C3213	C3223
	3/16	4.76	5/64	1.98	40	3.4	0.360	0.105	0.306	0.089	C3214	C3224
	7/32	5.56	5/64	1.98	VAC	1000 mbar	0.420	0.105	0.357	0.089	C3215	C3225
3-WAY Multi Purpose	1/16	1.59	1/16	1.59	100	6.9	0.080	0.075	0.068	0.064	C3311	C3321
	5/64	1.98	5/64	1.98	75	5.2	0.105	0.105	0.089	0.089	C3312	C3322
	1/8	3.18	5/64	1.98	25	1.7	0.240	0.105	0.204	0.089	C3313	C3323
	3/16	4.76	5/64	1.98	10	0.7	0.360	0.105	0.306	0.089	C3314	C3324
	7/32	5.56	5/64	1.98	5	0.3	0.420	0.105	0.357	0.089	C3315	C3325
3-WAY Directional Control	1/16	1.59	1/16	1.59	150	10	0.080	0.075	0.068	0.064	C3411	C3421
	5/64	1.98	5/64	1.98	100	6.9	0.105	0.105	0.089	0.089	C3412	C3422
	1/8	3.18	5/64	1.98	50	3.4	0.240	0.105	0.204	0.089	C3413	C3423
	3/16	4.76	5/64	1.98	25	1.7	0.360	0.105	0.306	0.089	C3414	C3424
	7/32	5.56	5/64	1.98	5	0.3	0.420	0.105	0.357	0.089	C3415	C3425

② Coil Construction**(blank)** = Tape-wrapped, Class-B, with 18" (45.7cm) lead-wires***W** = Tape-wrapped coil, lead-wires, non-standard length (specify in inches)**1** = Encapsulated coil, Class-B, lead-wires**3** = Encapsulated coil, Class-H, lead-wires**4** = Encapsulated coil, Class-B, 1/4" (6.35mm) spade terminals – 3/16" (4.76mm) spade optional**10** = Externally rectified coil (lead-wires only)**11** = Tape-wrapped coil, Class-H, lead-wires**HC2** = Encapsulated coil, Class-B, EN175301-803 Style C, Industrial, 9.4mm, 2+1 poles**③ Body Material****(blank)** = Brass***SB** = 304 Stainless Steel**SB1** = 303 Stainless Steel**SB5** = 316 Stainless Steel**SBF** = 430F Stainless Steel**④ Plunger Seal Material****(blank)** = Nitrile***E** = EPR**GV** = Gasoline Viton® (2-way N.C. only)**N** = Neoprene**NS** = Nitrile (NSF/FDA material)**PF** = Perfluoroelastomer**R** = Rulon® (2-way N.C. only)**T** = PTFE**V** = Viton®**⑤ O-Ring Material****(blank)** = Nitrile***EO** = EPR**NO** = Neoprene**NSO** = Nitrile (NSF/FDA material)**PFO** = Perfluoroelastomer**TO** = PTFE**VO** = Viton®**⑥ Body Port Configuration****(blank)** = 1/8-27 NPT female thread***LB** = 1/4-18 NPT female thread**BD** = #10-32 female straight thread

– 2-way N.C. only, max. orifice = 1/8" (3.18mm)

LU = 1/4-19 BSPT female thread (2-way N.C. only)**OB** = Omit body (operator style)**BO** = Bottom under-seat port, female thread**RL** = 90° porting - left hand**RR** = 90° porting - right hand**MM4** = Manifold mount (5/16-24 UNF-2A mounting stud)^{††}**BS** = Stop port, #10-32 female straight thread**⑦ Voltage[†] (see note below)****VDC** = DC (specify voltage)**VAC** = AC (specify voltage; includes copper shading ring)**⑧ Additional Options****WM** = Mounting bracket**TP** = PTFE coated plunger**QO** = Quiet operation (2-way normally closed valves only)**S** = Silver shading ring**OC** = Cleaned for oxygen use**VAC** = Vacuum application – 0 to 29.5" Hg (0 to 1000 mBar)**G1** = One-piece 303 Stainless Steel guide assembly

(standard on 2-way normally open and all 3-way valves)

G5 = One piece 316 Stainless Steel guide assembly

* Standard selection; will be used unless otherwise specified.
Standard selections are not referenced in final part number.

[†] Can be AC rectified without shading ring. Use coil construction Code 10.

^{††} Teflon® o-ring not suitable for manifold mount.

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

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

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

Specifications

Performance	
Nominal Sensing Distance, Sn	0.39" (10mm)
Sensing Range	0-0.39" (0-10mm)
Repeat Accuracy - (% of Sn)	<10%
Hysteresis - (% of Sn)	<20%
Mechanical	
Enclosure Ratings	IP67, NEMA 1,3,4,6,13
Operating Temperature Range	-13°F to +158°F (-25°C to +70°C)
LED Signal Indicator	Yellow
Power On LED Indicator	Green
Potentiometer	Yes
Sensor Type	
Unshielded	L-Type, Non-Embeddable
Shielded	D-Type, Embeddable
Sensor Material	Glass Filled Nylon
Cable	78.74" (2 meter), 3 Wire PVC
Shock	30g, 11ms
Vibration	55Hz, 1mm amplitude in all planes
Electrical	
Supply Voltage	5-48 VDC
Continuous Switching Current	300 mA
Voltage Drop	<2 VDC
Current Consumption	<10 mA
Switching Frequency	100 Hz
Transient Protection	2kV, 1ms, 1 kOhm
Overload Protection	Yes
Short Circuit	Yes
Reverse Polarity Protection	Yes
Approvals	CE (Except at Frequency 803-805 MHz), RoHS

How To Order

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

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

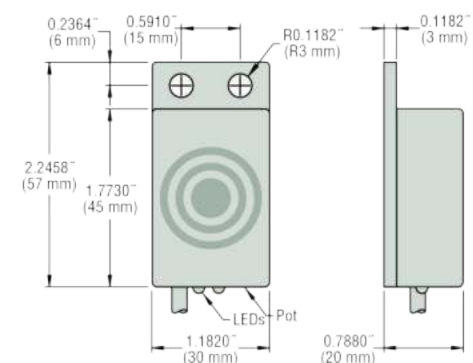


Typical Applications

Fluid Monitoring:

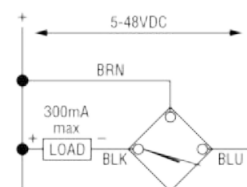
- Waste
- Reagents
- Diluent
- Detergent/Wash
- Coolant
- Printing Ink

Dimensions

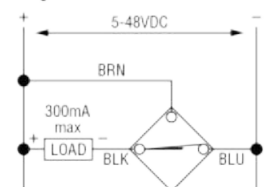


Wiring Diagram

Wet Sink



Dry Sink



4700 Series – High Performance, High Stability, with 5:1 Turndown Capability Industrial Transmitters

- ▶ Gauge, Sealed and Absolute Models
- ▶ Submersible, General Purpose and Wash Down Enclosures
- ▶ IS Models

The 4700 series provides precise laboratory type measurements in a rugged industrial package complete with turndown capabilities. Exceptional levels of stability and other performance specifications are achieved by using a sputtered sensing element, which achieves a molecular fusion of a strain gauge material, an insulating material, and the 17-4 PH ss sensing element. Sputtered or thin film technology provides years of worry free measurements under demanding real world conditions.

Specifications

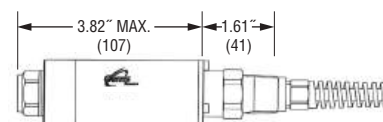
Input	
Pressure Range	4710, 10 to 10,000 psi; 4700, 1 bar to 690 bar
Proof Pressure	2 x Full Scale (FS) for Stainless Steel Units 1.5 x FS for Inconel Units
Burst Pressure	>35 x FS ≤ 10 bar ranges >15 x FS ≤ 100 bar ranges >8 FS ≤ 690 bar ranges
Fatigue Life	3 million FS cycles
Performance	
Output	4-20 mA (2 wire)
Supply Voltage (Vs)	9.5 to 40 VDC (Ex IIG: 9.5 to 28 VDC)
Supply Voltage Sensitivity	0.005% of max. span/Volt
Long Term Drift	0.1% of max span per year non-cumulative
Accuracy	0.1 % FS typical
Thermal Error (typical)	0.8% of max span for performance code E 0.5% of max span for performance code F
Compensated Temperatures	-13°F to +167°F (-25°C to +75°C)
Operating Temperatures	-13°F to +185°F (-25°C to +85°C) elec. conn. code C, G & L -4°F to +122°F (-20°C to +50°C) elec. conn. code M & 3 -22°F to +212°F (-30°C to +100°C) process/media
Zero Tolerance	0.1% FS, typical
Span Tolerance	0.1% FS, typical
Zero Adjustment	±10% (100% at factory) by potentiometer
Span Adjustment	25% to 125% of span by potentiometer
Max. Loop Resistance	(Vs-8) x 50 ohms
Mechanical Configuration	
Pressure Port	see ordering chart
Wetted Parts	17-4 PH ss (optional Inconel) [17-4 PH and 15-7 Mo Stainless Steel ≤ 1.6 bar (30 Psi)]
Electrical Connection	see ordering chart
Enclosure	318 Duplex ss, 17-4 PH ss and glass filled polyester IP40 for gauge datum & electrical conn. code C IP65 for absolute and sealed datum & elec. conn. code C IP65 for electrical connection code G IP68 for electrical connection code F
Vibration	35g peak sinusoidal, 5 to 2000 Hz
Acceleration	100g steady acceleration in any direction 0.05% FS/g for 15 psi (1 bar) range decreasing logarithmically to 0.0001% FS/g for 10000 psi (690 bar) range.
Shock	Withstands free fall to IEC 68-2-32 procedure 1
Approvals	CE, Lloyds Register, optional Intrinsically Safe EEx ia IIC T4 per ATEX, (Quality Assurance Certificate Supplied), ABS Certified
Weight	approx. 305 g (additional; cable 75 grams/m)



Dimensions in. (mm)

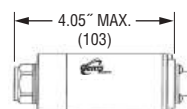
Max diameter 39mm, all models

Code 3



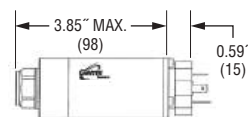
1/2 - 14 NPT conduit

Code C



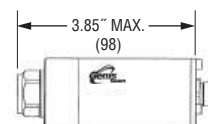
6 Pin Fixed Plug Size (10-6)

Code G



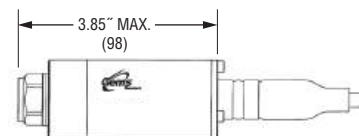
Fixed Plug to DIN 43650 Mate Supplied

Code L



5 Pin M12 x 1 Fixed Plug

Code M



Immersible IP68 to 200m WG

How to Order

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

- SELECT:**
1. **4700** bar units, **4710** psi units
2. Output Response: **B** 4-20 mA Undamped
3. Pressure Datum: **G** gauge; **A** absolute
(For differential models and compound ranges consult sales)
4. Insert pressure range code from table below
5. Pressure Port see chart
6. Electrical Connection
C Fixed plug size 10-6, mate sold separately part # 499532-0006
G Fixed plug to DIN 43650 mating plug supplied; **L** M12 x 1 (5 pin)
M IP68 immersible cable; **3** 1/2-14 NPT Conduit
7. Approvals/Protection (For flame proof units see next page)
3 CE; **G** ATEX approved intrinsically safe EEIa IIC T4, Galvanic, isolators
8. Cable Length in meters (requires electrical connection code F)
000 No Cable; **001** 1 meter; **999** 999 meters
9. Static/Thermal Performance
E 0.2%/1.6%; **F** 0.2%/1.0%. 500mbar range performance code **E** only

Electrical Connections

Electrical Connection Code	Wiring		
	(+)	(-)	EARTH
G "DIN"	1	2	4
C "10-6 Bayonet"	A	B	E
F "IP 68 Cable"	R	BL	DRAIN

Cable Legend:

R = Red BL = Blue

4700 Model Bar Ranges	Range Code	Gauge (G)* Absolute (A)
0 to 500mb	N50	G, A
0 to 1	A10	G, A
0 to 1.6	A16	G, A
0 to 2.5	A25	G, A
0 to 4	A40	G, A
0 to 6	A60	G, A
0 to 10	B10	G, A
0 to 16	B16	G, A
0 to 25	B25	G, A
0 to 40	B40	G, A
0 to 60	B60	G, A
0 to 100	C10	G, A
0 to 160	C16	G, A
0 to 250	C25	G, A
0 to 400	C40	G, A
0 to 600	C60	G, A**
0 to 690	C69	G, A**

4710 Model PSI Ranges	Range Code	Gauge (G)* Absolute (A)
0 to 10	F10	G
0 to 15	F15	G, A
0 to 30	F30	G, A
0 to 60	F60	G, A
0 to 100	G10	G, A
0 to 150	G15	G, A
0 to 200	G20	G, A
0 to 300	G30	G, A
0 to 500	G50	G, A
0 to 1000	H10	G, A
0 to 1500	H15	G, A
0 to 3000	H30	G, A
0 to 5000	H50	G, A
0 to 6000	H60	G, A
0 to 10000	J60	G, A**

* For compound ranges please consult factory

** Inconel pressure port required.

Pressure Ports - See Page H-50 for Dimensions

Codes		Description
SS	Inconel	
OO	OK	G 1/4 internal
AO	AK	G 1/4 AT external
KO	KK	7/16-20 UNF 3A external
MO	MK	M14 x 1.5 external
PO	PK	G 1/2 AT external
BO	BK	1/4-18 NPT external
GO	GK	1/2-14 NPT external
SO	SK	7/16-20 UNJF external, MS 33656E4
Immersible		
10		Plastic nose cone
20		Nose cone with restrictor
30		Nose cone w/ss Sink Weight

Large Size – Alloys

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

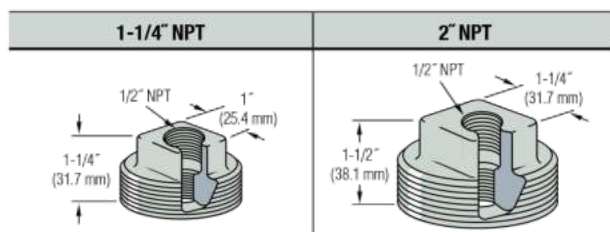
GEMS FABRI-LEVEL™ units can be custom-assembled in minutes from standard components, right in your plant. Simple instructions are furnished with kits.

FABRI-LEVEL™ Components

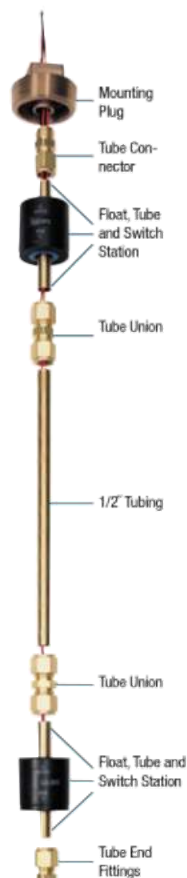
How to Order: Specify Part Number and quantity of each component required.

Mounting Types

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



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



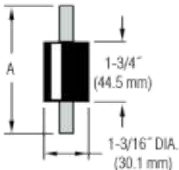
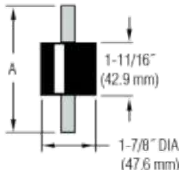
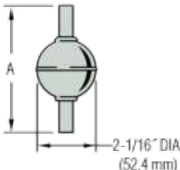
RoHS Compliant:

All LS-3 Series level switches featured on this page and the next are in compliance with EU-directive 2011/65/EC.

Level Station Assemblies

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

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

Float Material			Buna N			316 Stainless Steel		
Compatible Mounting Type			1-1/4" NPT		2" NPT			
Float Dimensions								
Operating Temperature			Water: to +180°F (+82°C); Oil: -40°F to +230°F (-40°C to +110°C)				-40°F to +275°F (-40°C to +135°C)	
Pressure, PSI, Max.			150				750	
Min. Media Specific Gravity			.75		.55		.75	
Mounting Size	Switch Type	Tubing Material	Part Number	A Dim.	Part Number	A Dim.	Part Number	A Dim.
1-1/4" NPT	SPST 20 VA	Brass	26609	4" (101.6 mm)	—	—	—	—
		Stainless Steel	26608					
	SPDT 20 VA	Brass	26737	4-29/64" (113.0 mm)				
		Stainless Steel	26738					
2" NPT	SPST 20 VA	Brass	—	—	24410	4" (101.6 mm)	—	4-1/4" (107.9 mm)
		Stainless Steel			25328		24411 ⚡	
	SPDT 20 VA	Brass			24578	4-29/64" (113.0 mm)	—	4-29/64" (113.0 mm)
		Stainless Steel			25329		24579	

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

⚡ — Stock Items.

Fittings and Tubing

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

FABRI-LEVEL™ Kits

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

Specifications

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

RoHS: In compliance with EU-directive 2011/65/EC requirements for chemicals and substances.

How To Order

Specify Kit Number and quantity.

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

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

⚡ – Stock Items.



Each Kit Contains:

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

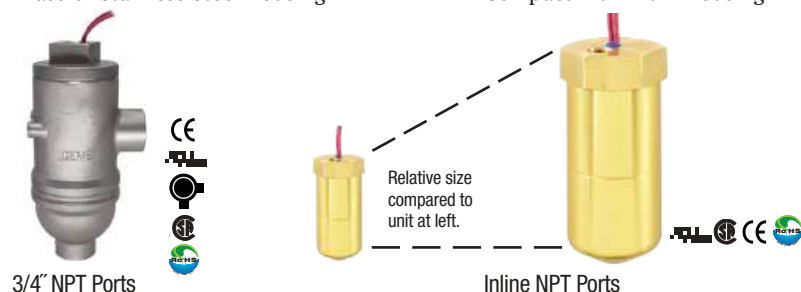
Large Size – Alloys

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

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

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

LS-159000 Series – Low Cost,
Compact Aluminum Housing



For Remote Alarms –
See Page E-27

- Adjustable Volume
- Indoor Outdoor
- Solid-State



Dimensions

LS-800-5 – Brass and Stainless Steel	LS-159000
<p>†L₁ = Switch actuation level, nominal (based on a liquid specific gravity of 1.0).</p>	<p>Switch operation is NC as shown. May be changed to NO by inverting float on stem, or by mounting unit with lead wires down.</p>

Common Specifications

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

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

RoHS (except for LS-800-5 in Brass, part numbers 172625, 172986, and 172988) – In compliance with EU-directive 2015/863/EU requirements for chemicals and substances.

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

Mounting Attitude: Vertical with lead wires up.

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

Materials					Min. Liquid Sp. Gr.	Pressure, PSIG, Max.	Operating Temperature	L ₁	Switch*	Part Number
Series Number	Housing	Stem and Mounting	Float	Other Wetted						
LS-800-5	Brass	316 Stainless Steel	Beryllium Copper	.75	500 @ 70°F	-40°F to +300°F (-40°C to +148.9°C)	3/4" (19 mm)	SPST, 20 VA		172625 ⚡
								SPST, 100 VA		172986
	316 Stainless Steel	S.S. ARMCO H-15-7 MO	750				7/16" (11 mm)	DPDT		172988
								SPST, 20 VA		172635 ⚡
LS-159000	Aluminum	Brass	316 S.S.	Beryllium Copper	.90	600 @ 70°F	-40°F to +300°F (-40°C to +148.9°C)	See Dimensions	SPST, 20 VA	144080
			Buna N	Viton®	.50	250 @ 70°F	-40°F to +250°F (oil); +180°F (water) (-40°C to +121°C [oil]; +82°C [water])			160405

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

FS-200 Series – General Purpose, Straight-Through Flow Path

- **Flow Rate Settings:** Fixed: 0.5 GPM to 100.0 GPM
Adjustable: 1.0 GPM to 15.0 GPM
- **Port Size:** 1-11.5 NPT to 2-11.5 NPT
- **Primary Construction Material:** Bronze or Stainless Steel
- **Setting Type:** Fixed or Adjustable

The FS-200 Series offers accurate flow detection, with 1% repeatability, over a broad range of flow settings and port sizes. Its durable construction delivers long-life reliability in either water or oil. Generous flow paths keep pressure drop low. These switches are ideal for detection of improper flow rates in high volume lubrication, cooling or process systems.

FS-200 Adjustable Series switches offer the same accuracy and are as rugged as those with fixed settings, but provide one additional feature: external adjustability. With these versatile switches your choice of flow settings is diverse within a given range. An ordinary, flat-blade screwdriver is all that's required for the actuation adjustment.

Specifications

Wetted Materials

Housing

FS-200 Bronze or 316 Stainless Steel

FS-200 Adjustable Bronze

Shuttle Teflon®

Bonnet Bronze or Stainless Steel

Spring 316 Stainless Steel

Other Wetted Parts Viton®, Ceramic

Pressure Rating

Operating 400 psig (27.6 bar) @ 100°F (37.8°C)

Proof 800 psig (55.2 bar) @ 100°F (37.8°C)

Operating Temperature

FS-200 -20°F to +300°F (-29°C to +148.9°C)

FS-200 Adjustable -20°F to +200°F (-29°C to +93.3°C)

Repeatability 1% Maximum Deviation

Set Point Accuracy ±10%

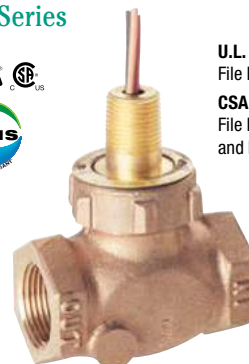
Set Point Differential 15% Maximum

Switch* SPDT, 20 VA

Electrical Termination No. 18 AWG, 24" L., Polymeric Lead Wires
Red NC, Black Common, Orange NO

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

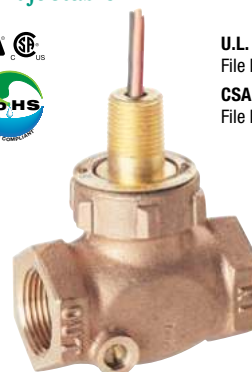
FS-200 Series



U.L. Recognized:
File No. E31926

CSA Listed:
File No. LR30200
and LR22666

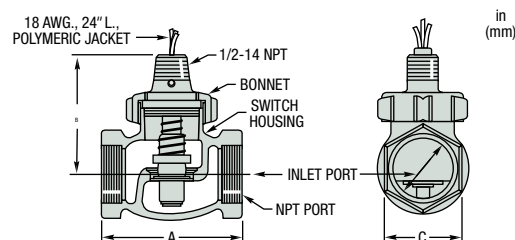
FS-200 Adjustable



U.L. Recognized:
File No. E31926

CSA Listed:
File No. LR22666

Dimensions



Model	Port Size NPT	A	B	C Hex
FS-200 and FS-200 Adjustable	1-11.5	3-1/4" (82.6 mm)	3" (76.2 mm)	1-25/32" (45.2 mm)
	1¼-11.5	4" (101.6 mm)	3-3/16" (80.9 mm)	2-3/16" (55.5 mm)
	1½-11.5 ss	4-1/2" (114.3 mm)	3-3/16" (80.9 mm)	2-3/16" (55.5 mm)
	1½-11.5	4-1/2" (114.3 mm)	3-1/2" (88.9 mm)	2-1/2" (63.5 mm)
	2-11.5	5-3/8" (136.5 mm)	4" (101.6 mm)	3-3/32" (78.5 mm)

Notes:

- Adjustable versions available in 1 inch port sizes only.
- Standard calibration is in water with units in a horizontal position.
- Viscosity changes will affect setpoints. Typically, as viscosity increases setpoints will decrease.
- Consult Gems for special applications.

How To Order – Standard Models

Specify Part Number for the FS-200 Series based on desired housing material, port size and flow setting, or based on flow setting range for FS-200 Adjustable versions.

FS-200 Series

Port Size NPT	Flow Setting GPM	Part Numbers	
		Bronze	Stainless Steel
1-11.5	0.5	27051 ⚡	27059 ⚡
	1	27052 ⚡	27060
	2	27053 ⚡	27061
	3	27054 ⚡	27062
	4	27055 ⚡	27063
	5	27056 ⚡	27064
	6	27057 ⚡	27065
	8	27058 ⚡	27066
1¼-11.5	1	27067 ⚡	27076
	2	27068	27077
	4	27069	27078
	6	27070	27079
	8	27071	27080
	10	27072	27081
	12	27073	27082
	16	27074	27083
	20	27075	27084
1½-11.5	1.5	27085 ⚡	27093
	3	27086	27094
	5	27087	27095
	7.5	27088	27096
	10	27089	27097
	15	27090	27098
	20	27091	27099
	30	27092	27100
2-11.5	2	27101 ⚡	27109 ⚡
	4	27102	27110
	5	27103	27111
	10	27104	27112
	15	27105	27113
	25	27106	27114
	35	27107	27115
	50	27108	27116

FS-200 Adjustable

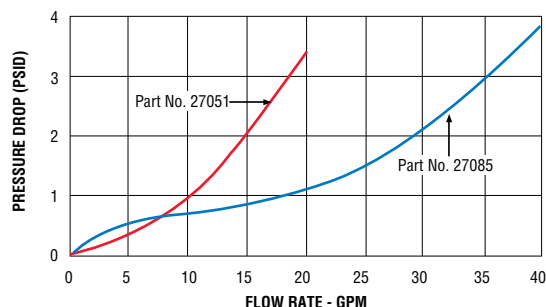
Port Size NPT	Flow Setting Adjustment Range GPM	Part Numbers
1"	1.0-6.0	26615 ⚡
	5.0-15.0	26616 ⚡
	2.0-8.0	26838 ⚡

Notes:

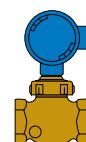
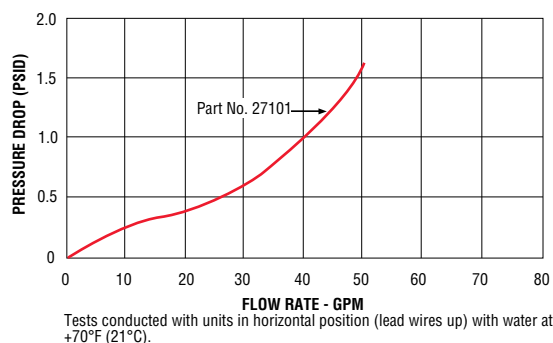
- Flow settings for fixed versions are calibrated using water at +70°F on increasing flow, with units in a horizontal position (lead wires up). Consult factory regarding special flow setting calibration, or liquids other than water. Temperature changes will slightly affect the flow settings listed. Oil flow settings will vary with viscosity.
 - Adjustable units that are set to customer specification are subject to GEMS test stand accuracy.
 - Use of 150 micron filtration is recommended.
 - Minimum 5 PSI line pressure required.
- ⚡ Stock Items

Pressure Drop - Typical

1-11.5 NPT and 1½-11.5 NPT Ports



2-11.5 NPT Ports



FS-200 Series Flow Switches are U.L. Approved for Class I, Division 2, Groups A, B, C, D hazardous areas.
U.L. Approved : File No. E183854

For Remote Alarms – See Page E-31

- Adjustable Volume
- Indoor Outdoor
- Solid-State



Series 3M – Food Grade Fitting

Series 3MT – Food Grade Fitting

- ▶ Easy Removal for Cleaning
- ▶ CSA Approved
- ▶ FDA Approved Materials

Designed for use in food, beverage and pharmaceutical applications where cleanliness is vital. Two-piece Series 3M assemblies can handle up to 4 probes. FDA-approved materials. Engineered for fast removal of fitting to facilitate cleaning and sterilization.

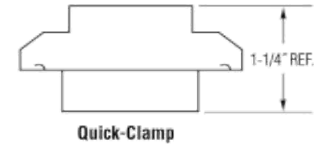
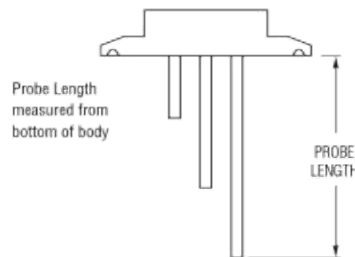
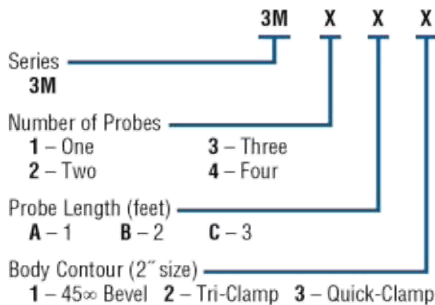
Series 3MT fittings are similar to 3M fittings, except they also feature Teflon®-covered probes with polished tips to meet the most demanding application requirements.

Specifications

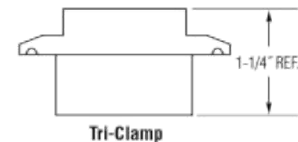
Probes	1 thru 4
Body Contour	45° bevel, Tri-Clamp, Quick Clamp
Body Material	Type 66 Nylon
Probe Material	
Series 3M	316 stainless steel, cut to length by user
Series 3MT	Teflon®-covered 316 stainless steel probes. Tip polished to RA <25 microns max. spec. (factory set lengths)
Pressure/Temperature	150 psig (10.3 bar) @ 150°F (65°C)
Approvals	FDA-approved materials; CSA

How to Order Series 3M

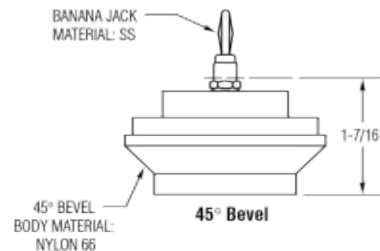
Use the **Bold** characters from the chart below to construct a product code.



Quick-Clamp



Tri-Clamp



45° Bevel

45° BEVEL
BODY MATERIAL:
NYLON 66

Components ordered separately; see bottom of page

Applications

- Food & Beverage
- Pharmaceutical
- CIP

Body Styles

How to Order Series 3MT

3MT components must be ordered separately.

Step 1. Upper Assembly*:

Select one part number.

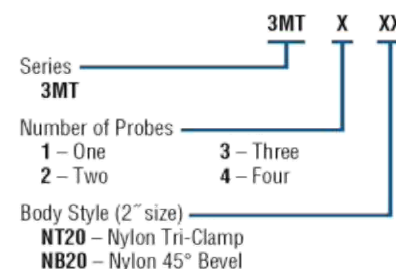
- 7790575** – 1 Probe
- 7790577** – 2 Probes
- 7790581** – 3 Probes
- 7790584** – 4 Probes

*10" lead length standard.



Step 2. Lower Assembly:

Complete part number based on Upper Assembly selected and Body Style.



Step 3. Probe Lengths*:

Select a length for each probe to be used; maximum four.

- Probe 1 3MTPRL ____ (inches)
- Probe 2 3MTPRL ____ (inches)
- Probe 3 3MTPRL ____ (inches)
- Probe 4 3MTPRL ____ (inches)

*Probe length must be specified in whole inches, 06" to 36". Length is not field adjustable.



Series 67 Multi-Function Control Duplex Pump System Control

- ▶ Inverse or Direct Acting, Field Selectable
- ▶ Solid State Reliability
- ▶ Compact Size
- ▶ Four Independent Channels – 2 Single, 2 Differential
- ▶ Field Adjustable, Sensitivity and Mode Selection
- ▶ LED Channel Indicators
- ▶ Built-in Silence/Acknowledge Circuit
- ▶ U.L. "Intrinsically Safe"

Warrick's Series 67 four channel level control is an ideal solution to liquid level problems in hazardous applications for the sewage, waste water, chemical and groundwater remediation industries.

Connected to floats or conductance probes this versatile control provides simplex or duplex pump/solenoid valve control; automatic or manual alternation; high and/or low level alarms with silence/acknowledge capabilities.

The Series 67 can be used in hazardous applications as an intrinsically safe interface to non-powered contacts and sensors such as push button operators, limit, temperature, pressure and vacuum switches.

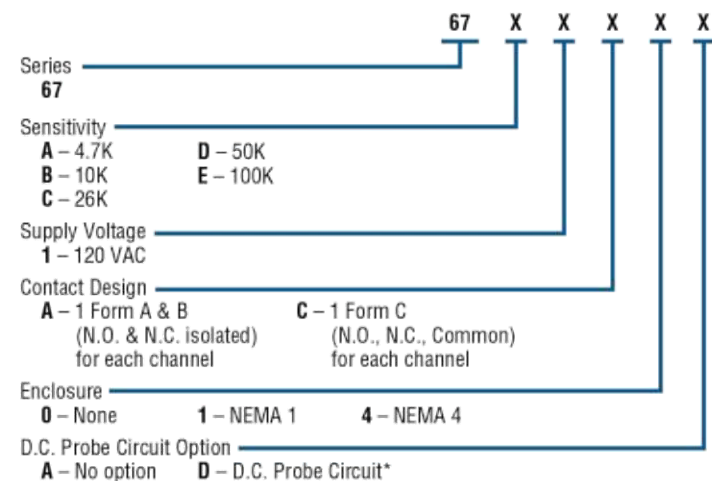
Designed for hazardous applications, its low cost, integrated features and compact size also make it ideal for non-hazardous applications.

Specifications

Contact Design	Standard N.O., N.C. (form C); Optional N.O., N.C.
Contact Rating (30VDC, 120/240VAC)	10 amp (style C); 5 amp (style A)
Primary Voltage	120 VAC, 50/60 Hz
Secondary Voltage	12 VAC @ 6mA RMS
Sensitivity	4.7K - 100K ohms maximum specific resistance, factory set
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals	U.L. 913 File # E44570

How to Order

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

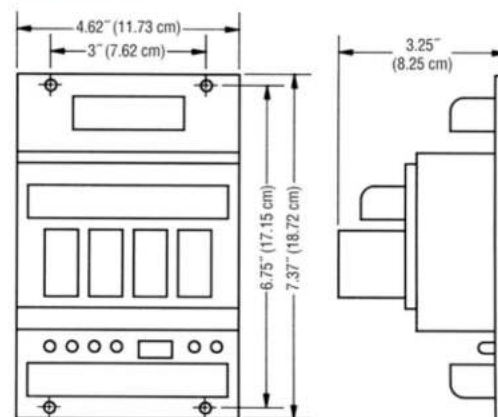


Series 67

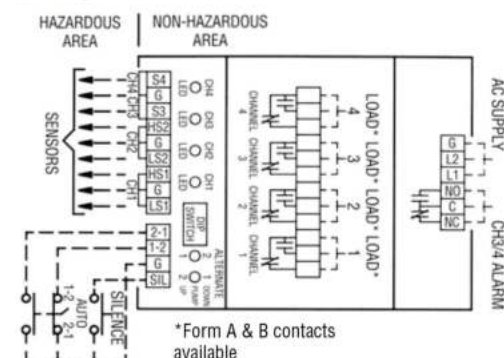
Applications

- Hazardous Atmospheres
- Multiple Functions
- Simplex or Duplex
- High/Low Level Alarms
- Auto or Manual Alternation
- Pump/Solenoid Valves
- Sewage Lift Stations
- Wastewater Treatment
- Chemical Plants
- Groundwater Remediation

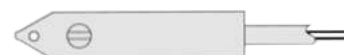
Dimensions



Wiring



See Our Interstitial Tank Monitoring Products on page A-22.



AS Series

- ▶ MOPD: 150 PSI (10 Bar)
- ▶ C_v Range: 0.02 to 0.30 (K_v Range: 0.017 to 0.256)
- ▶ 7 Watts

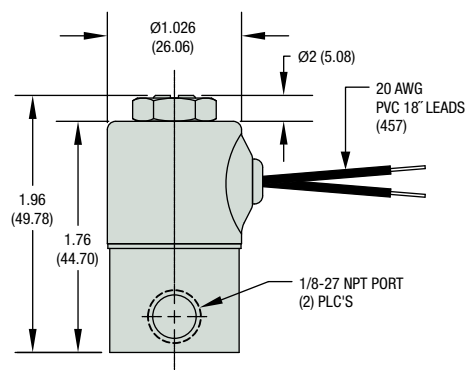
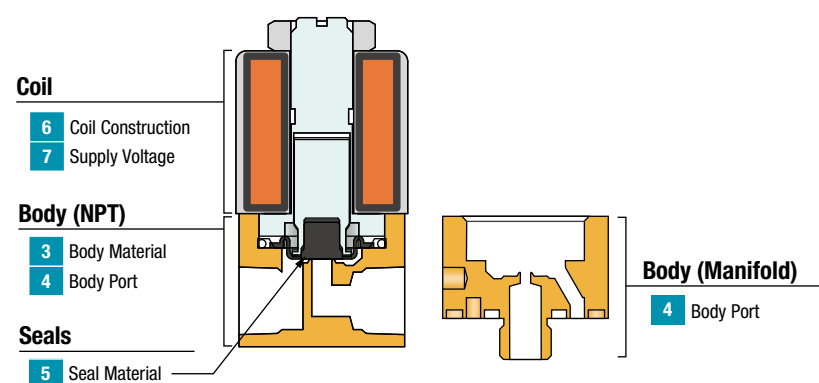
The AS Series is a 2-way isolation valve, designed to control the flow of various aggressive liquids and gases with several body and diaphragm materials. With a modular design, the AS offers performance flexibility and the protection your media needs from the solenoid's internal components. Numerous port configurations, voltage options, and coil constructions enable the AS Series to be a truly versatile miniature inert isolation valve, easily integrated into any complex or demanding system.

Typical Applications

- Analytical Instruments
- Clinical Diagnostic Analyzers
- Bio-Instrumentation

Reference

2-Way Valve



Example Shown

Part Number: AS2036-01LC-V-G1-204
From How to Order example below.

How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

AS	20	36	-	01	LC	-	V	-	G1	-	204
Series	Function	MOPD	-	Body Material	Body Port	-	Seal Material	-	Coil Construction	-	Supply Voltage

Product Description from Example Shown Above:

AS2036-01LC-V-G1-204

AS2036 = AS Series with 2-Way Normally Closed Valve Function; 15 MOPD

-01LC = 303 Stainless Steel Body Material; 1/8" NPT Female Body Port

-V = Viton® Seal Material

-G1 = Grommet Housing, Tape-Wrapped (Class B) Coil Construction

-204 = 24 VDC Supply Voltage

AS Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

AS			-			-		-			-	
Series	1	2		3	4		5		6		7	

1 + 2 Valve Function & Maximum Operating Pressure Differential

Valve Function	Code	MOPD		Max Back Pressure		C _v	K _v	Orifice	
		psig	bar	psig	bar			Body	Body
2-WAY Normally Closed	2017	150	10	5	0.3	0.020	0.017	1/32	0.79
	2021	110	7.6	5	0.3	0.035	0.030	3/64	1.19
	2023	90	6.2	5	0.3	0.065	0.055	1/16	1.59
	2027	70	4.8	5	0.3	0.090	0.077	5/64	1.98
	2030	45	3.1	5	0.3	0.155	0.132	3/32	2.38
	2036	15	1.0	5	0.3	0.240	0.205	1/8	3.18
	2038	5	0.3	5	0.3	0.300	0.256	5/32	3.97

3 Body Material

- 01** 303 Stainless Steel
- 03** Brass
- 05** 316 Stainless Steel
- XX** No Body
(4 Body Port **OB** only)

6 Coil Construction

- G1** Grommet Housing,
Tape-Wrapped (Class B) Lead Wires
- G5** Grommet Housing,
Epoxy Encapsulated (Class B) Lead Wires

4 Body Port

- LC** 1/8" NPT Female
- MM** Manifold Mount
(1/4"-28 Stud)
- OB** Omit Body (operator only)*
(3 Body Material **XX** only)

7 Supply Voltages

- 203** 12 VDC
- 204** 24 VDC

5 Seal Material

- E** EPR
- V** Viton®

* Contact Gems for the operator orifice drawings

AS Series – Additional Component Details & Dimensions

1 Valve Function

Flow Schematic

Flow Key

- Blocked Flow
- Free Flow
- O/S = Over Seat
- U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		

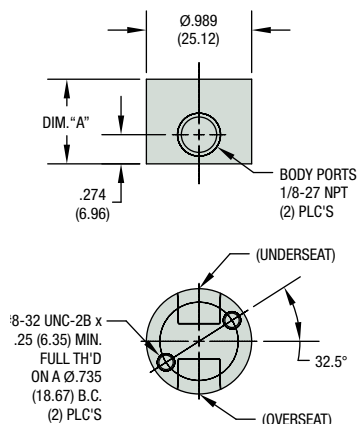
AS Series – Additional Component Details & Dimensions, cont.

4 Body Port

Note: Contact Gems for the operator orifice drawings

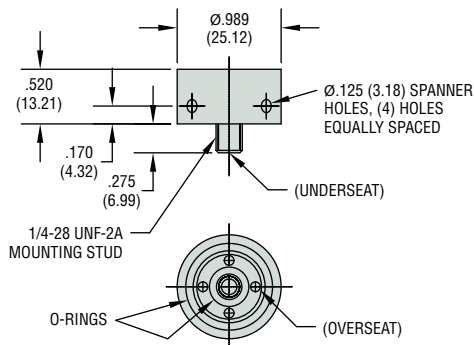
Ported Bodies

1/8" NPT Port (LC)

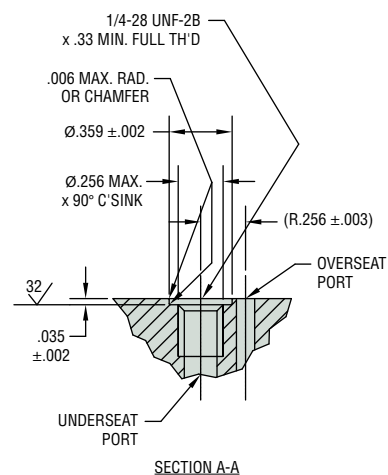
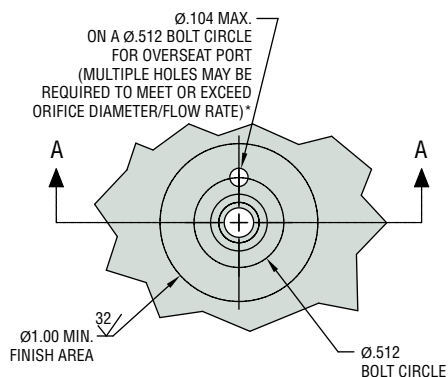


Orifice Size Range	Dim. "A"
1/32" – 3/32"	.795 (20.19)
1/8" & 5/32"	.820 (20.83)

Manifold Mount 1/4"-28 Stud Body (MM)



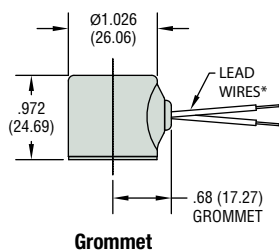
Manifold Preparation



* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Type	Overseat Port	Underseat Port
2-Way N.C.	OUT	IN

6 Coil Construction



G Series – Subminiature

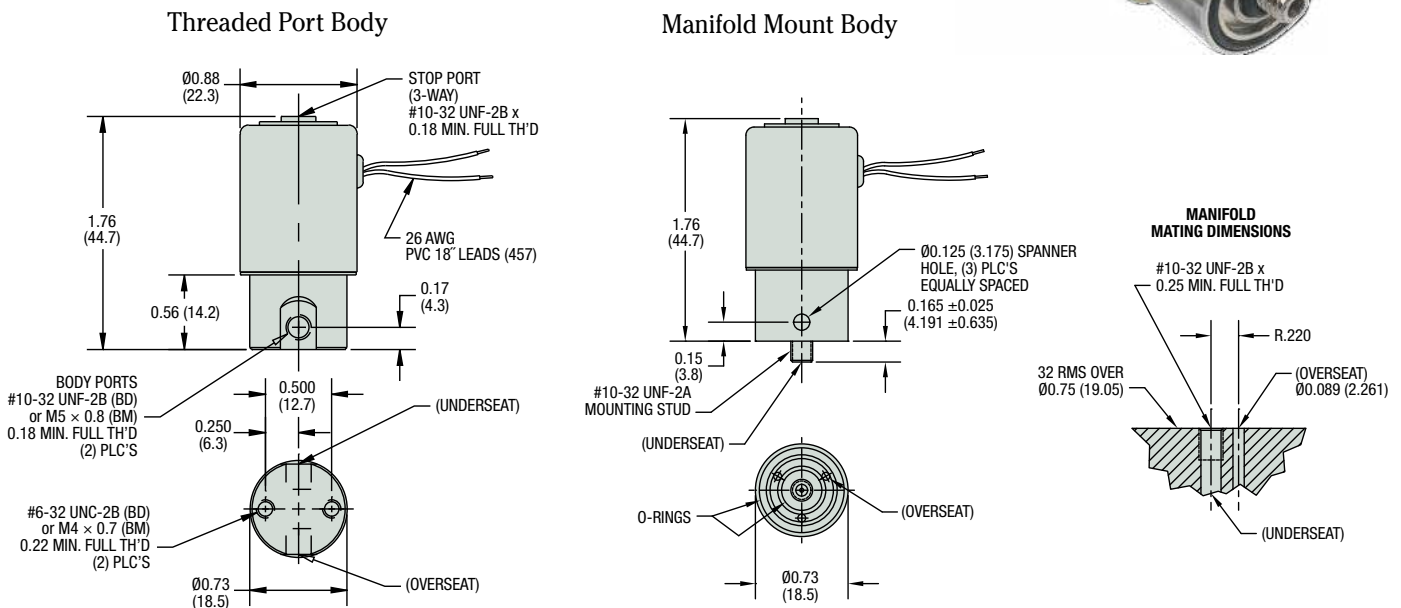
- ▶ MOPD: 250 PSI (17 Bar)
- ▶ C_v Range: 0.018 to 0.070 (K_v Range: 0.015 to 0.054)
- ▶ 0.65 Watts or 2 Watts

This extremely versatile 2- or 3-way sub-miniature valve gives you the option of choosing the highly durable stainless steel or the lightweight corrosion resistant acetal body, to meet your overall design parameters. Select stainless steel or Delrin®, and other materials available to resist corrosion in most acids and alkaline solutions, or pick acetal for a tough and heat resistant metal substitute to meet your weight and chemical inert requirements.

Typical Applications

- Medical and Respiratory Healthcare
- Printing Machinery and Sorting Equipment
- Automated Packaging Equipment
- Air Monitoring Systems

Dimensions



How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

G	G	20	27	-	01	MM	-	B	-	G1	-	203
Series	1 Power Rating	2 Function	3 MOPD	-	4 Body Material	5 Body Port	-	6 Seal Material	-	7 Coil Construction	-	8 Supply Voltage

Product Description from Example Shown Above:

GG2027-01MM-B-G1-203

GG2027 = G Series with 0.65 Watt **Power Rating**, 2-Way Normally Closed Valve **Function**; 70 **MOPD**

-01MM = 303 Stainless Steel **Body Material**; Manifold Mount **Body Port**

-B = Nitrile (Buna-N) **Seal Material** (Plunger Seal and Internal O-Ring)

-G1 = Grommet Housing, Tape-Wrapped (Class B) **Coil Construction**

-203 = 12 VDC **Supply Voltage**

G Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

G				-	01		-		-		-	
Series	1	2	3		4	5		6		7		8

1 + 2 + 3 Power Rating, Valve Function, & Maximum Operating Pressure Differential

Valve Function	Code	Power Rating	MOPD		C _v		K _v		Orifice			
			psig	bar	Body	Stop	Body	Stop	Body		Stop	
									inches	mm	inches	mm
2-WAY Normally Closed	G2020	0.65W	125	8.6	0.015	0.018	—	—	0.030	0.762	—	—
	G2027		70	4.8	0.020	0.023	—	—	0.040	1.016	—	—
	G2031		40	2.8	0.032	0.038	—	—	0.055	1.397	—	—
	G2035		20	1.4	0.054	0.063	—	—	0.078	1.981	—	—
	H2009	2W	250	17	0.015	0.018	—	—	0.030	0.762	—	—
	H2014		175	12	0.020	0.023	—	—	0.040	1.016	—	—
	H2022		100	6.9	0.032	0.038	—	—	0.055	1.397	—	—
	H2029		50	3.4	0.054	0.063	—	—	0.078	1.981	—	—
3-WAY Normally Closed	G3120	0.65W	125	8.6	0.018	0.015	0.0153	0.018	0.030	0.762	0.030	0.762
	G3127		70	4.8	0.023	0.020	0.01955	0.023	0.040	1.016	0.040	1.016
	G3131		40	2.8	0.038	0.032	0.0323	0.038	0.055	1.397	0.055	1.397
	G3135		20	1.4	0.063	0.054	0.04845	0.057	0.078	1.981	0.078	1.981
	H3111	2W	200	14	0.018	0.015	0.01955	0.023	0.030	0.762	0.030	0.762
	H3117		150	10	0.023	0.020	0.01955	0.023	0.040	1.016	0.040	1.016
	H3125		100	6.9	0.038	0.032	0.0323	0.038	0.055	1.397	0.055	1.397
	H3131		50	3.4	0.063	0.054	0.04845	0.057	0.078	1.981	0.078	1.981
3-WAY Normally Open	G3220	0.65W	125	8.6	0.015	0.018	0.018	0.015	0.030	0.762	0.030	0.762
	G3227		70	4.8	0.020	0.023	0.023	0.020	0.040	1.016	0.040	1.016
	G3231		40	2.8	0.032	0.038	0.038	0.032	0.055	1.397	0.055	1.397
	G3235		20	1.4	0.048	0.057	0.057	0.049	0.078	1.981	0.078	1.981
	H3214	2W	175	12	0.015	0.018	0.018	0.015	0.030	0.762	0.030	0.762
	H3217		150	10	0.020	0.023	0.023	0.020	0.040	1.016	0.040	1.016
	H3225		80	5.5	0.032	0.038	0.038	0.032	0.055	1.397	0.055	1.397
	H3231		40	2.8	0.048	0.057	0.057	0.049	0.078	1.981	0.078	1.981
3-WAY Multi Purpose	G3325	0.65W	80	5.5	0.015	0.018	0.018	0.015	0.030	0.762	0.030	0.762
	G3331		40	2.8	0.020	0.023	0.023	0.020	0.040	1.016	0.040	1.016
	G3335		20	1.4	0.031	0.036	0.029	0.024	0.055	1.397	0.055	1.397
	G3337		10	0.7	0.054	0.063	0.053	0.045	0.078	1.981	0.078	1.981
	H3321	2W	110	7.6	0.015	0.018	0.018	0.015	0.030	0.762	0.030	0.762
	H3324		85	5.9	0.020	0.023	0.023	0.020	0.040	1.016	0.040	1.016
	H3329		50	3.4	0.031	0.036	0.029	0.024	0.055	1.397	0.055	1.397
	H3334		25	1.7	0.054	0.063	0.057	0.049	0.078	1.981	0.078	1.981
3-WAY Directional Control	G3418	0.65W	135	9.3	0.015	0.018	0.018	0.015	0.030	0.762	0.030	0.762
	G3425		80	5.5	0.020	0.023	0.023	0.020	0.040	1.016	0.040	1.016
	G3430		45	3.1	0.025	0.029	0.029	0.024	0.055	1.397	0.055	1.397
	G3435		20	1.4	0.054	0.063	0.055	0.046	0.078	1.981	0.078	1.981
	H3412	2W	190	13	0.015	0.018	0.018	0.015	0.030	0.762	0.030	0.762
	H3415		165	11	0.020	0.023	0.020	0.017	0.040	1.016	0.040	1.016
	H3425		80	5.5	0.032	0.038	0.038	0.032	0.055	1.397	0.055	1.397
	H3431		40	2.8	0.054	0.063	0.063	0.053	0.078	1.981	0.078	1.981

G Series – Part Number Build cont'd

4 Body Material	6 Seal Material	8 Supply Voltages
01 303 Stainless Steel	B Nitrile	203 12 VDC
	V Viton®	204 24 VDC
5 Body Port	7 Coil Construction	
BD #10-32 Straight Thread	G1 Grommet Housing, Tape-Wrapped (Class B) Lead Wires	
BM M5 × 0.8	G5 Grommet Housing, Epoxy Encapsulated (Class B) Lead Wires	
MM Manifold Mount (#10-32 Threaded Stud)		

G Series – Additional Component Details & Dimensions

2 Valve Function	Flow Key
Flow Schematics	<div><div></div> Blocked Flow</div> <div><div></div> Free Flow</div> <div>O/S = Over Seat</div> <div>U/S = Under Seat</div>

Valve Type	De-Energized	Energized
2-Way Normally Closed		
3-Way Normally Closed		
3-Way Normally Open		
3-Way Multi Purpose		
3-Way Directional Control		

E Series – Subminiature Gas

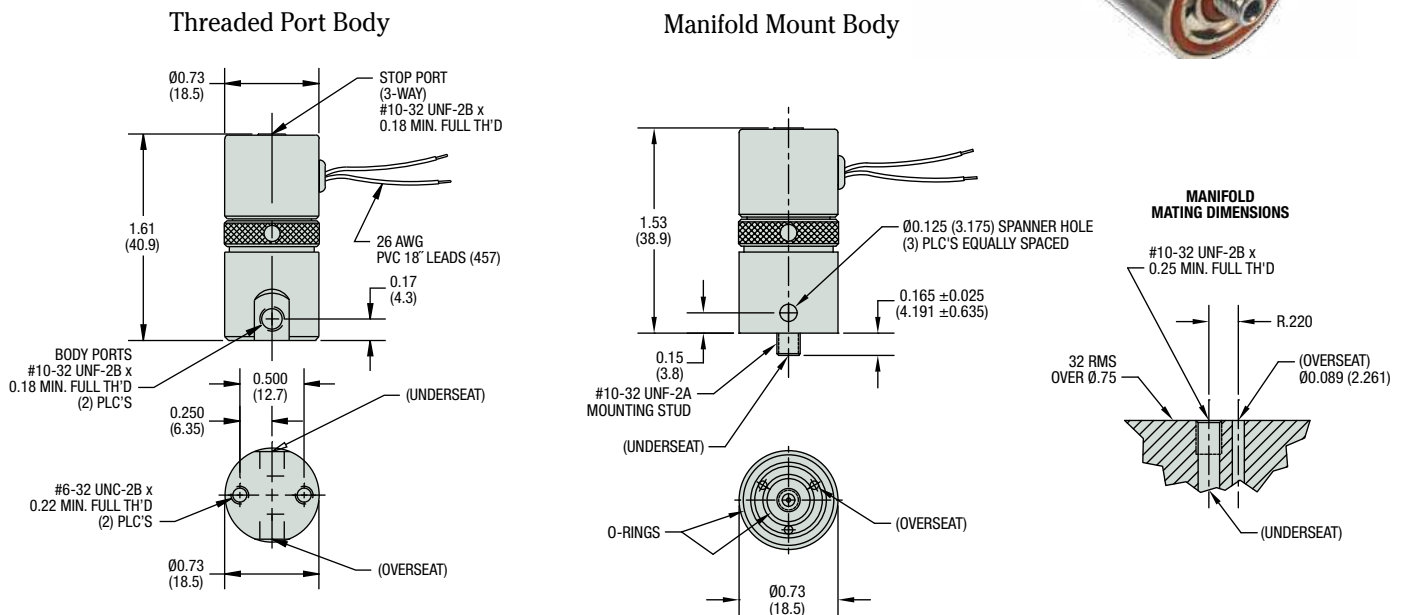
- ▶ MOPD: 175 PSI (12 Bar)
- ▶ C_v Range: 0.018 to 0.070 (K_v Range: 0.015 to 0.060)
- ▶ 0.65 Watts or 2 Watts

A 2- or 3-way sub-miniature solenoid valve that delivers faster response times—and higher flow rates, the E Series is specifically engineered for air and dry gas applications. A nickel-plated body and coil housing construction produces a highly durable, corrosion resistant valve. With a wattage range of 0.65–2 the E Series provides versatility for power conserving, high pressure, and high flow applications.

Typical Applications

- Medical and Respiratory Healthcare
- Printing Machinery and Sorting Equipment
- Automated Packaging Equipment
- Air Monitoring Systems

Dimensions



How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

E	H	20	14	–	06	BD	–	B	–	G1	–	203
Series	1	2	3		4	5		6		7		8
	Power Rating	Function	MOPD		Body Material	Body Port		Seal Material		Coil Construction		Supply Voltage

Product Description from Example Shown Above:

EH2014-03BD-B-G1-203

EH2014 = E Series with 2 Watt **Power Rating**, 2-Way Normally Closed Valve **Function**; 175 **MOPD**

-06BD = Nickel-Plated Brass **Body Material**; #10-32 Thread Female **Body Port**

-B = Nitrile (Buna-N) **Seal Material** (Plunger Seal and Internal O-Ring)

-G1 = Grommet Housing, Tape-Wrapped (Class B) **Coil Construction**

-203 = 12 VDC **Supply Voltage**

E Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

E				-	06		-		-	G1	-	
Series	1	2	3		4	5		6		7		8

1 + 2 + 3 Power Rating, Valve Function, & Maximum Operating Pressure Differential

Valve Function	Code	Power Rating	MOPD		C _v		K _v		Orifice			
			psig	bar	Body	Stop	Body	Stop	Body		Stop	
									inches	mm	inches	mm
2-WAY Normally Closed	G2020	0.65W	125	9	0.018	—	0.015	—	1/32	0.79	—	—
	G2027		70	5	0.023	—	0.020	—	3/64	1.19	—	—
	G2031		40	3	0.036	—	0.031	—	1/16	1.59	—	—
	G2035		20	1	0.070	—	0.060	—	5/64	1.98	—	—
	H2014	2W	175	12	0.018	—	0.015	—	1/32	0.79	—	—
	H2017		150	10	0.023	—	0.020	—	3/64	1.19	—	—
	H2022		100	7	0.036	—	0.031	—	1/16	1.59	—	—
	H2029		50	3	0.070	—	0.060	—	5/64	1.98	—	—
3-WAY Normally Closed	G3120	0.65W	125	9	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	G3127		70	5	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	G3131		40	3	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59
	H3114	2W	175	12	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	H3117		150	10	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	H3122		100	7	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59
3-WAY Normally Open	G3220	0.65W	125	9	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	G3227		70	5	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	G3231		40	3	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59
	H3214	2W	175	12	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	H3217		150	10	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	H3222		100	7	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59
3-WAY Multi Purpose	G3325	0.65W	80	6	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	G3331		40	3	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	G3335		20	1	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59
	H3317	2W	150	10	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	H3322		100	7	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	H3329		50	3	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59
3-WAY Directional Control	G3418	0.65W	135	9	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	G3425		80	6	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	G3430		45	3	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59
	H3412	2W	190	13	0.018	0.018	0.015	0.015	1/32	0.79	1/32	0.79
	H3415		165	11	0.023	0.023	0.020	0.020	3/64	1.19	3/64	1.19
	H3425		80	6	0.036	0.032	0.031	0.027	1/16	1.59	1/16	1.59

4 Body Material

06 Nickel-Plated Brass

7 Coil Construction

G1 Grommet Housing,
Tape-Wrapped (Class B) Lead Wires

5 Body Port

BD #10-32 Straight Thread
MM Manifold Mount
(#10-32 Threaded Stud)

8 Supply Voltages

203 12 VDC
204 24 VDC

6 Seal Material

B Nitrile
V Viton®

E Series – Additional Component Details & Dimensions

2

Valve Function

Flow Schematics

Flow Key

Blocked Flow

Free Flow

O/S = Over Seat

U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		
3-Way Normally Closed		
3-Way Normally Open		
3-Way Multi Purpose		
3-Way Directional Control		

22FA Series / 26FA Series – CSA Intrinsically Safe Industrial Pressure Transmitters

- ▶ CSA Certified Intrinsically Safe (See Specification)
- ▶ Ranges from 7.5 to 6000psi (0.5 to 400 bar) and 0-300psi (0-25 bar) Absolute
- ▶ Voltage and 2 Wire 4-20mA output models
- ▶ All stainless steel wetted parts

Certified by CSA for Canada and USA, the 22FA and 26FA Series intrinsically safe pressure transmitters are designed to withstand the rigors of the most difficult applications. An all-stainless steel construction, eliminates the need for seals and oil barriers that can deteriorate over time.

Incorporating Gems CVD Sensors and ASIC technology the 22FA and 26FA Series offer long term reliability, excellent performance and long term stability ensuring long service life without routine maintenance.

Available with a wide choice of pressure fittings and electrical connections rated from IP65 to fully immersible (IP68 200m WG).

Specifications

Input	
Pressure Range	Vacuum to 6000 psi G (400 bar); 300 psi Absolute (0-25 bar)
Proof Pressure	2 x Full Scale (FS) (1.5 x FS for 400 bar, ≥ 5000 psi)
Burst Pressure	>35 x FS ≤ 100 psi (6 bar); >20 x FS ≤ 1000 psi (60 bar); >5 x FS ≤ 6000 psi (400 bar)
Fatigue Life	Designed for more than 100 million FS cycles
Performance	
Long Term Drift	0.2% FS/year (non-cumulative)
Accuracy	0.25% FS typical (optional 0.15% FS)
Thermal Error	1.5% FS typical (optional 1% FS)
Compensated Temperatures	-5°F to +180°F (-20°C to +80°C)
Operating Temperatures	-40°F to +260°F (-40°C to +125°C) for elec. codes A, B, C -5°F to +180°F (-20°C to +80°C) for elec. codes G -5°F to +125°F (-20°C to +50°C) for elec. codes F, M, 3
Zero Tolerance	1% of span
Span Tolerance	1% of span
Mechanical Configuration	
Pressure Port	See ordering chart
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See ordering chart
Enclosure	316 SS, 17-4 PH SS IP65 for elec. codes A, B, C, 3 and G (with DIN connector fitted) IP67 for elec. code F IP68 for elec. codes M
Vibration	35g peak sinusoidal, 5 to 2000 Hz
Acceleration	100g steady acceleration in any direction 0.032% FS/g for 15 psi (1 bar) range decreasing logarithmically to 0.0007% FS/g for 6000 psi (400 bar) range.
Shock	Withstands free fall to IEC 68-2-32 procedure 1
Approvals	CSA certified intrinsically safe Class I, Division 1, Group D when used with a zener safety barrier
Weight	Approx. 100 grams (additional cable; 75 g/m)

Series 22FA



Series 26FA



Individual Specifications

Voltage Output units	
Output	See ordering chart
Supply Voltage (Vs)	1.5 VDC above FS output to 28 VDC
Supply Voltage Sensitivity	0.01% FS/Volt
Min. Load Resistance	(FS output / 2) Kohms
Current Consumption	Approx 6 mA at 7.5V output
Current Output units	
Output	4-20 mA (2 wire)
Supply Voltage (Vs)	24 VDC, (7-28 VDC)
Supply Voltage Sensitivity	0.01% FS/Volt
Max. Loop Resistance	(Vs-7) x 50 ohms

Electrical Connections

	Connection Code	mA Output			Voltage Output			
		(+)	(-)	EARTH	IN+	COMMON	OUT+	EARTH
22FA	A, B	1	2	E	1	2	3	4
	2, D, F	R	BK	DRAIN	R	BK	W	DRAIN
26FA	1	A	B	D	A	C	B	D
	C	A	B	E	A	C	B	E
	G	1	2	4	1	2	3	4
	3 (Cable)	R	BK	DRAIN	R	BK	W	DRAIN
	F (Leads)	R	BK	DRAIN	R	BK	W	DRAIN
	M	R	BL	DRAIN	R	W	Y	DRAIN

Electromagnetic Capability

Meets the requirement for CE marking of EN50081-2 for emissions and EN50082-2 for susceptibility.

Test Data:


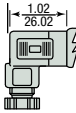
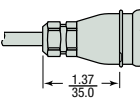
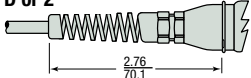
- EN61000-4-2 Electrostatic Discharge. 8kV air discharge, 4kV contact discharge. Unit survived.
- ENV50140 Radiated RF Susceptibility. 10V/m, 80MHz-1GHz, 1kHz mod. Maximum recorded output error was <±1%
- ENV50204 Radiated RF Susceptibility to Mobile Telephones. 10V/m, 900MHz. Maximum recorded output error was <±1%.
- EN61000-4-4 Fast Burst Transient. 2kV, 5/50ns, 5kHz for 1 minute. Unit survived.
- ENV50141 Conducted RF Susceptibility. 10Vms, 1kHz mod, 150kHz - 80MHz. Maximum recorded output error was <±1%

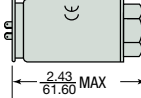
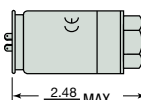
Cable Legend:

R = Red
BK = Black
W = White
G = Green
BL = Blue
Y = Yellow

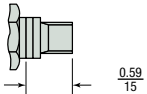
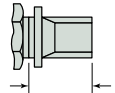
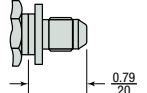

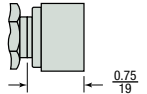
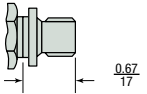
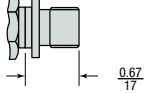
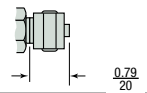
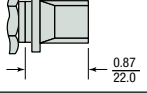
Dimensions

22FA Series


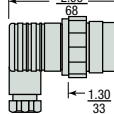
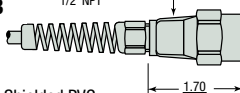
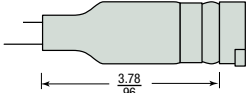
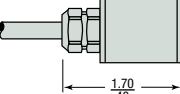
Industrial DIN Connector	
Code B	
Industrial DIN Connector (mate supplied)	
Code A	
IP67 Cable	
Code F	
24 AWG Shielded PVC	
IP65 or NEMA4 Cable	
Code D or 2	
24 AWG Shielded PVC	


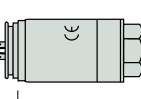
Amplified Gauge

Amplified Absolute


Maximum diameter 1.07" (27.3 mm)

1/8-27 NPT	
Code 08	
G1/8 Internal	
Code 09	
1/4 - 1/8 NPT	
Code 02	
7/16-20 UNF-2A	
Code 04	
G1/4 Internal	
Code 00	
G1/4 External	
Code 01	
G1/4 Soft Seal	
Code 05	
R1/4	
Code 0A	
G1/2 Manometer	
Code 03	

26FA Series

10-6 or 8-4 Mil-C Connector	
10-6 Code C	
8-4 Code 1	
Large DIN 43650 Plug (mate supplied)	
Code G	
Conduit Connector with Cable	
Code 3	
24 AWG Shielded PVC	
Conduit Connector with Flying Leads	
Code M	
Code F	

Amplified Gauge

Amplified Absolute


Maximum diameter 1.07" (27.3 mm)

inch
mm

How to Order

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

Series	22FA	26FA	B	G	A60	01	A	C	U	A	
Output											Performance Code
Pressure Datum											Accuracy/Thermal
Pressure Range ¹ - psi											A - .25%/1.5%
Pressure Range ¹ - bar											B - .15%/1.0%
Pressure Port ²											Cable Length
											U - No Cable Fitted
											D - 3 feet (1 Meter)
											E - 9 feet (3 Meters)
											F - 16 feet (5 Meters)
											G - 32 feet (10 Meters)
											H - 50 feet (15 Meters)
											J - 65 feet (20 Meters)
											K - 82 feet (25 Meters)
											L - 98 feet (30 Meters)
											M - 132 feet (40 Meters)
											N - 164 feet (50 Meters)
											P - 246 feet (75 Meters)
											Q - 328 feet (100 Meters)
											R - 410 feet (125 Meters)
											S - 525 feet (160 Meters)
											Apparatus Protection
											C - CSA Approved Intrinsically Safe
											Electrical Connection
											22FA Series
											A - Industrial DIN Mating Connector Supplied
											B - Industrial DIN Mating Connector Not Supplied
											F - Cable Gland Metal IP67
											2 - IP65 - NEMA4 Cable
											D - IP65 - NEMA4 Cable
											26FA Series
											C - Fixed Plug Size 10-6 Mating Plug Not Supplied
											G - Fixed Plug To DIN 43650 Mating Plug Supplied
											M - Immersible Max. Depth 200 Meters
											1 - Fixed Plug Size 8-4 Mating Plug Not Supplied
											3 - Conduit Connector 1/2 NPT Ext. 1M Cable
											F - Cable Gland Metal IP67

Notes:

1. Additional Pressure Ranges are available. Please consult factory.
2. For other Pressure Ports, please consult factory.

A Series

- ▶ MOPD: 1000 PSI (69 Bar)
- ▶ C_v Range: 0.019 to 0.3 (K_v Range: 0.016 to 0.256)
- ▶ 6 Watts

The A Series gives you a highly adaptable design for practically all applications requiring flow between C_v 0.019 and 0.300 (K_v 0.016 to 0.259). This robust 2- or 3-way miniature solenoid utilizes a stainless steel body to resist corrosion for most acids, alkaline solutions, and harsh environments. Also available in plastic—from polypropylene to Delrin®—when specific inert or demanding requirements are needed. Available in numerous port configurations, orifice sizes, and material combinations, the A Series is a highly flexible valve that fulfills the requirements for most applications.

Typical Applications

Stainless Steel Bodies:

- Medical Equipment
- Laboratory Equipment
- Food Processing Equipment

Brass Bodies:

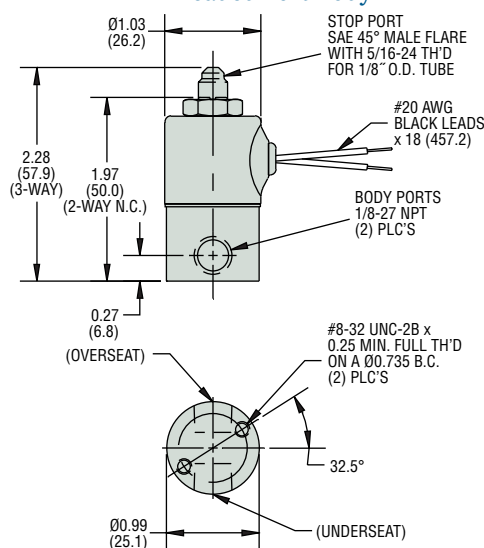
- Industrial Applications
- Automotive
- Water Transfer Systems


Next Day Shipping
On Many Configurations

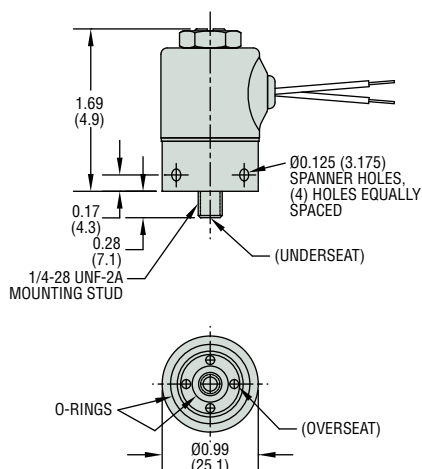


Dimensions

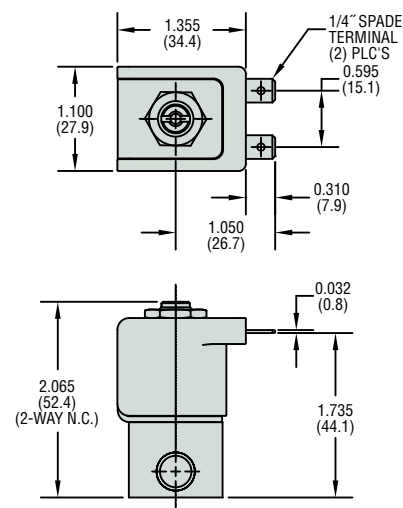
Threaded Port Body



Manifold Mount Body

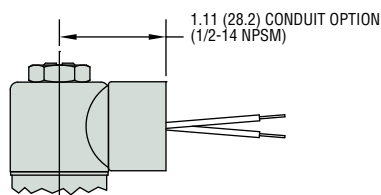


Molded Coil



Alternate 1/2" Conduit Housing

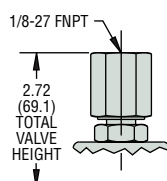
Available on all body configurations



See Manifold Mount Interface Details on pages J-17–J-18.

Stop Port

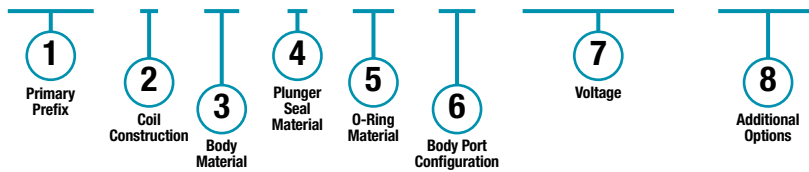
Standard on 2-way N.O.;
Option "AD" on 3-Way.



How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

A2213 - 3 - BB - N - NO - LB - 110/60VAC - WM-TP



Note: After the Primary Prefix, any "-Code" may be blank when standard (blank) selections are specified.

Example:

A2213-3-BB-N-NO-LB-110/60VAC-WM-TP

2-Way N.O. (with 1/8"-27 NPT stop port adaptor) solenoid valve, with brass body, neoprene plunger seal, neoprene O-ring, 1/4"-18 FNPT body ports, operating at 110/60 VAC/Hz, and includes the mounting bracket and PTFE coated plunger options.



Take advantage of next day shipping by making your selections from those marked with the Lightning Bolt icon.

Part Prefix Table ①

	Orifice				MOPD		C _v		K _v		① Primary Prefix	
	Body		Stop		psig	bar	Body	Stop	Body	Stop	Grommet Housing	Conduit Housing
	inches	mm	inches	mm								
2-WAY N.C.	1/32	0.79	—	—	1000	69	0.020	—	0.017	—	A2011	A2021
	3/64	1.19	—	—	500	34	0.035	—	0.030	—	A2012	A2022
	1/16	1.59	—	—	300	21	0.065	—	0.055	—	A2013	A2023
	5/64	1.98	—	—	200	14	0.090	—	0.077	—	A2014	A2024
	3/32	2.38	—	—	175	12	0.155	—	0.132	—	A2015	A2025
	1/8	3.18	—	—	100	6.9	0.240	—	0.205	—	A2016	A2026
2-WAY N.O. (option AD standard)	5/32	3.97	—	—	50	3.4	0.300	—	0.256	—	A2017	A2027
	—	—	1/32	0.79	200	14	—	0.019	—	0.016	A2211	A2221
	—	—	3/64	1.19	150	10	—	0.040	—	0.034	A2212	A2222
	—	—	1/16	1.59	100	6.9	—	0.075	—	0.064	A2213	A2223
	1/32	0.79	1/32	0.79	200	14	0.019	0.019	0.016	0.016	A3011	A3021
	3/64	1.19	3/64	1.19	150	10	0.040	0.040	0.034	0.034	A3012	A3022
3-WAY N.C. Free Vent	1/16	1.59	3/64	1.19	100	6.9	0.070	0.040	0.060	0.034	A3013	A3023
	1/16	1.59	1/16	1.59	75	5.2	0.070	0.070	0.060	0.060	A3014	A3024
	3/32	2.38	3/64	1.19	50	3.4	0.170	0.040	0.145	0.034	A3015	A3025
	1/32	0.79	1/32	0.79	200	14	0.019	0.019	0.016	0.016	A3111	A3121
3-WAY N.C. Line Connection	3/64	1.19	3/64	1.19	150	10	0.040	0.040	0.034	0.034	A3112	A3122
	1/16	1.59	3/64	1.19	100	6.9	0.070	0.040	0.060	0.034	A3113	A3123
	1/16	1.59	1/16	1.59	75	5.2	0.070	0.070	0.060	0.060	A3114	A3124
	3/32	2.38	3/64	1.19	50	3.4	0.170	0.040	0.145	0.034	A3115	A3125
	1/32	0.79	1/32	0.79	150	10	0.019	0.019	0.016	0.016	A3211	A3221
3-WAY N.O.	3/64	1.19	3/64	1.19	100	6.9	0.040	0.040	0.034	0.034	A3212	A3222
	1/16	1.59	3/64	1.19	90	6.2	0.070	0.040	0.060	0.034	A3213	A3223
	1/16	1.59	1/16	1.59	75	5.2	0.070	0.070	0.060	0.060	A3214	A3224
	3/32	2.38	3/64	1.19	50	3.4	0.170	0.040	0.145	0.034	A3215	A3225
	1/32	0.79	1/32	0.79	125	8.6	0.019	0.019	0.016	0.016	A3311	A3321
3-WAY Multi Purpose	3/64	1.19	3/64	1.19	100	6.9	0.040	0.040	0.034	0.034	A3312	A3322
	1/16	1.59	3/64	1.19	90	6.2	0.070	0.040	0.060	0.034	A3313	A3323
	1/16	1.59	1/16	1.59	75	5.2	0.070	0.070	0.060	0.060	A3314	A3324
	3/32	2.38	3/64	1.19	25	1.7	0.170	0.040	0.145	0.034	A3315	A3325
	1/32	0.79	1/32	0.79	225	16	0.019	0.019	0.016	0.016	A3411	A3421
3-WAY Directional Control	3/64	1.19	3/64	1.19	150	10	0.040	0.040	0.034	0.034	A3412	A3422
	1/16	1.59	3/64	1.19	100	6.9	0.070	0.040	0.060	0.034	A3413	A3423
	1/16	1.59	1/16	1.59	75	5.2	0.070	0.070	0.060	0.060	A3414	A3424
	3/32	2.38	3/64	1.19	50	3.4	0.155	0.040	0.132	0.034	A3415	A3425

2 Coil Construction

- (blank)** = Tape-wrapped, Class B (130°C), with 18" (45.7cm) lead wires* ⚡
W = Tape-wrapped coil, lead wires, non-standard length (specify length in inches)
10 = Externally rectified coil (AC voltages lead wires only) ⚡
1 = Encapsulated coil, Class B (130°C), lead wires
3 = Encapsulated coil, Class H (180°C), lead wires
4 = Encapsulated coil, Class B (130°C), 3/16" (4.76mm) spade terminals (1/4" (6.35mm) spade terminal optional)
11 = Tape-wrapped coil, Class H (180°C), lead wires
2M = Over molded coil, Class F (155°C), lead wires
3M = Over molded coil, Class H (180°C), lead wires
5M = Over molded coil, Class F (155°C), 1/4" (6.35mm) spade terminals
6M = Over molded coil, Class H (180°C), 1/4" (6.35mm) spade terminals
HC2 = Encapsulated coil, Class B (130°C), 9.4mm DIN (EN175301-803 Style C Industrial 2+1 poles)

3 Body Material

- (blank)** = 303 Stainless Steel* ⚡
BB = Brass
SB = 304 Stainless Steel
SB5 = 316 Stainless Steel
SBF = 430F Stainless Steel

4 Plunger Seal Material

- (blank)** = Nitrile* ⚡
E = EPR ⚡
GV = Gasoline Viton® (2-way N.C. valves only)
N = Neoprene ⚡
NS = Nitrile (NSF/FDA, 2-way N.C. valves only) ⚡
PF = Perfluoroelastomer ⚡
R = Rulon® (2-way N.C. valves only)
T = PTFE
V = Viton® ⚡

5 O-Ring Material

- (blank)** = Nitrile* ⚡
EO = EPR ⚡
NO = Neoprene ⚡
NSO = Nitrile (NSF/FDA, 2-way N.C. valves only) ⚡
PFO = Perfluoroelastomer ⚡
TO = PTFE
VO = Viton® ⚡

6 Body Port Configuration

- (blank)** = 1/8-27 NPT female thread* ⚡
LB = 1/4-18 NPT female thread
BD = #10-32 female straight thread
 – max. orifice = 1/8" (3.18mm)
LT = 1/8-28 BSPT female thread (2-way N.C. valves only)
LU = 1/4-19 BSPT female thread (2-way N.C. valves only)
MM = Manifold mount (1/4-28 UNF-2A mounting stud)^{†††}
MM3 = Manifold mount (5/16-24 UNF-2A mounting stud)^{†††}
OB = Omit body (operator style)
MB = Bottom metering – max. orifice = 3/32" (2.38mm)
BI = Bottom over-seat port, female thread
 – max. orifice = 1/8" (3.18mm)
BIM = Bottom over-seat port, 1/8-27 NPT male thread
 – max orifice = 5/64" (1.98mm) brass body only
BO = Bottom under-seat port, female thread
BOM = Bottom under-seat port, 1/8-27 NPT male thread
 – max orifice = 1/8" (3.18mm) brass body only
RL = 90° porting - left hand
RR = 90° porting - right hand
BS = Stop port, #10-32 female straight thread[†]

7 Voltage^{††} (see note below)

- C203** = 12 VDC ⚡
C204 = 24 VDC ⚡
C301 = 120/50/60R (add Coil Option -10) ⚡
C303 = 240/50/60R (add Coil Option -10) ⚡
VDC = DC (specify DC voltage)
VAC = AC (specify AC voltage; includes copper shading ring)

8 Additional Options

- Y** = Yoke
WM = Mounting bracket
TP = PTFE coated plunger
AD = 1/8 - 27 NPT stop port adapter (3-way valves only) ⚡
QO = Quiet operation (2-way valves only)
S = Silver shading ring
OC = Cleaned for oxygen use
VAC = Vacuum application – 0 to 29.5" Hg (0 to 1000mBar)
G1 = One-piece 303 Stainless Steel guide assembly
G5 = One piece 316 Stainless Steel guide assembly

* Standard selection; will be used unless otherwise specified. Standard selections are not referenced in final part number.

[†] Plastic body available, contact Gems.

^{††} Can be AC rectified without shading ring. Use coil construction Code 10.

^{†††} Teflon® o-ring not suitable for manifold mount.

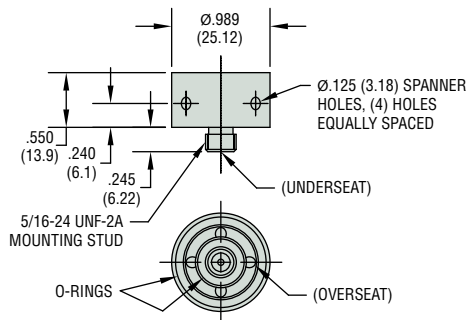


Take advantage of next day shipping by making your selections from those marked with the Lightning Bolt icon.

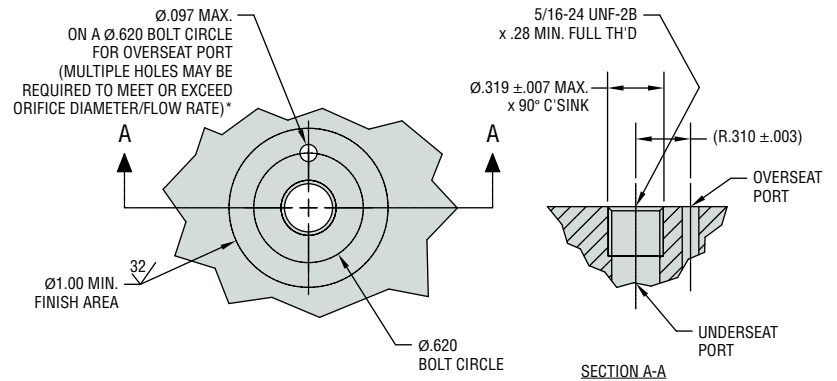
A Series – Manifold Mount Interface Details

Manifold Mounting Bodies

Manifold Mount 5/16"-24 Stud Body (MM3)



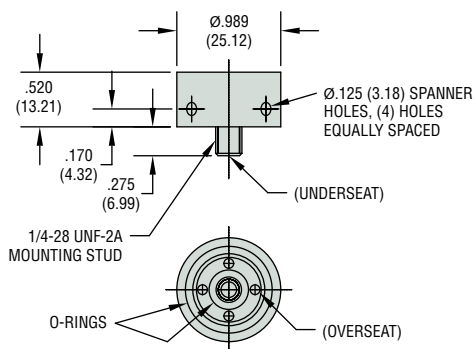
Manifold Preparation



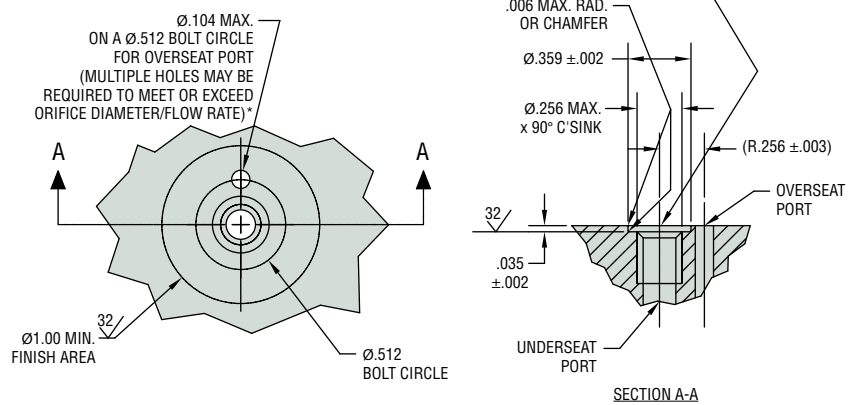
* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Type	Standard		Vacuum	
	Overseat Port	Underseat Port	Overseat Port	Underseat Port
2-Way N.C.	IN	OUT	VAC	IN
2-Way N.O.	IN	—	IN	—
3-Way N.C.	CYL	IN	IN	VAC
3-Way N.O.	CYL	EXH	CYL	EXH
3-Way M.P.	COM	N.C.	COM	N.C.
3-Way D.C.	IN	N.C.	VAC	N.C.

Manifold Mount 1/4"-28 Stud Body (MM)



Manifold Preparation



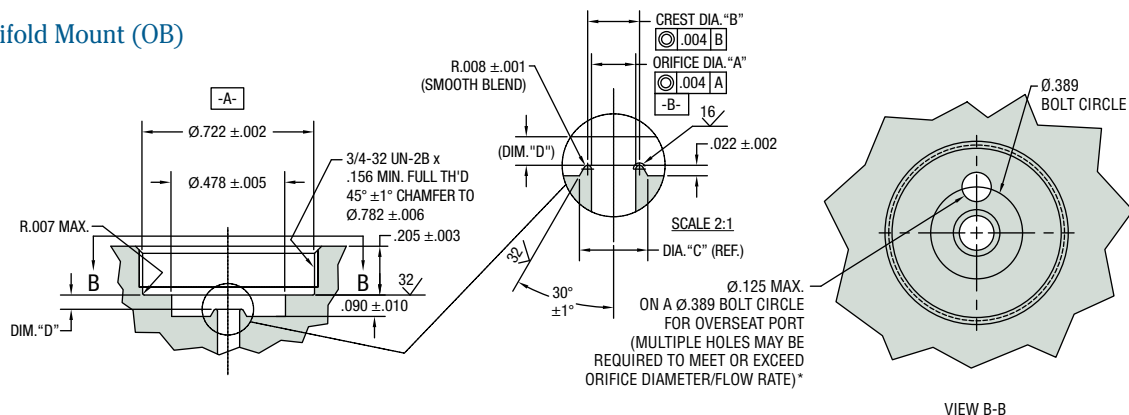
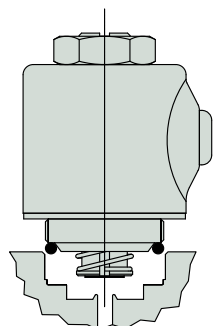
* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Type	Standard		Vacuum	
	Overseat Port	Underseat Port	Overseat Port	Underseat Port
2-Way N.C.	IN	OUT	VAC	IN
2-Way N.O.	IN	—	IN	—
3-Way N.C.	CYL	IN	IN	VAC
3-Way N.O.	CYL	EXH	CYL	EXH
3-Way M.P.	COM	N.C.	COM	N.C.
3-Way D.C.	IN	N.C.	VAC	N.C.

A Series – Operator (OB) Interface Details

Omit Body Manifold Mount (OB)

N.C. & 3-Way



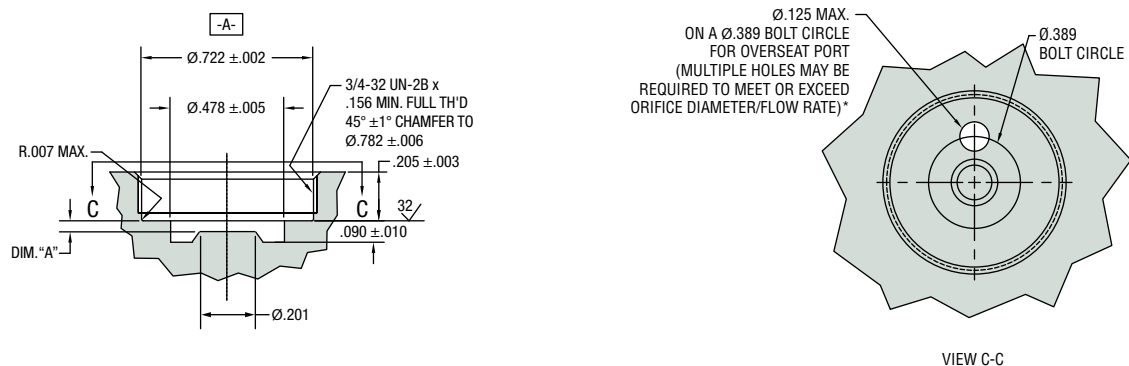
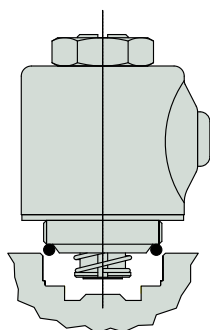
Note: All diameters to be concentric to datum -A- within .003 T.I.R.

* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Dimensions

Valve Function	Valve Prefix (Code 1)	Orifice Dia. "A" $\pm .001$	Crest Dia. "B" $\pm .002$	Base Dia. "C" Ref.	Orifice Depth Dim. "D" $\pm .001$
2-Way N.C.	2011	.040 (1.02)	.052 (1.32)	.0843 (2.141)	.047 (1.19)
	2012	.046 (1.19)	.062 (1.57)	.0966 (2.454)	.048 (1.22)
	2013	.062 (1.57)	.078 (1.98)	.1126 (2.860)	.052 (1.32)
	2014	.078 (1.98)	.094 (2.38)	.1286 (3.266)	.056 (1.42)
	2015	.093 (2.36)	.109 (2.77)	.1436 (3.647)	.060 (1.52)
	2016	.120 (3.05)	.136 (3.45)	.1706 (4.333)	.067 (1.70)
	2017	.148 (3.76)	.164 (4.17)	.1986 (5.044)	.074 (1.88)
3-Way (All)	3X11	.040 (1.02)	.052 (1.32)	.0843 (2.141)	.047 (1.19)
	3X12	.046 (1.19)	.062 (1.57)	.0966 (2.454)	.048 (1.22)
	3X13	.062 (1.57)	.078 (1.98)	.1126 (2.860)	.052 (1.32)
	3X14	.062 (1.57)	.078 (1.98)	.1126 (2.860)	.052 (1.32)
	3X15	.093 (2.36)	.109 (2.77)	.1436 (3.647)	.060 (1.52)

N.O.



Note: All diameters to be concentric to datum -A- within .003 T.I.R.

* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Dimensions

Valve Function	Valve Prefix (Code 1)	Orifice Depth Dia. "A" $\pm .001$	Stop Orifice Ref.
2-Way N.O.	2211	.047 (1.19)	1/32
	2212	.048 (1.22)	3/64
	2213	.052 (1.32)	1/16

ELS-1150

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

The enhanced ELS-1150 series is the highest performing electro optic level switch from Gems Sensors. The ELS-1150 features a microprocessor board design to provide a wide range of capabilities including sinking and sourcing and time delay outputs. The strong fused glass prism eliminates leak potential and is capable of handling extreme temperature and pressure applications up to 2500 psi (172.37 bar). Built with solid state reliability, the sensor is available at an affordable price in Nickel-Plated Carbon Steel or Stainless Steel. The compact size of the sensor makes them ideal candidates for monitoring the small, pressurized vessels found in HVAC, refrigeration and hydraulic applications in Oil and Gas. The sensors are most commonly used for low, high and intermediate level detection in a variety of media.

The stainless steel version (ELS-1150SS) is excellent for application requiring corrosion resistance and is ideal for acids, solvents and dielectric water applications. An explosion proof version, ELS-1150XP, is excellent for applications in Oil & Gas that require small, accurate level sensing of constant media (ie. hydraulic fluid or coolant).

Contact our factory experts for additional ordering information and options.

Applications

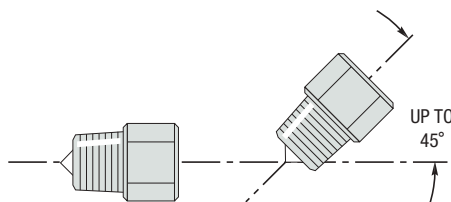
- Hydraulic and lubricating oil reservoirs
- Critical fluid level monitoring on machine tools, compressors, chillers and other industrial OEM equipment
- Corrosive liquids such as: acids, solvents, and dielectric water applications
- Medical Equipment; Anesthesia, Histology

Specifications

Mounting	1/2-14 NPT, 3/4-16 UNF
Materials	
Housing	Nickel-Plated Carbon Steel or Stainless Steel
Prism	Fused Glass
Max. Operating Pressure	0 to 2500 psi (0 to 172.37 bar)
Operating Temperature*	-40°F to +257°F (-40°C to +125°C)
Input Voltage	5-28 VDC ±5%
Current Consumption	~1 mA
Output	Open Collector/Emitter Output, 100 mA Sink @ 30 VDC, Max.; 100 mA Source, Max.
Electrical Termination	22 AWG, Polymeric, 12" to 14" Extended Lead Wires
Approvals	CE, UL File E31926

Mounting Attitude

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



ELS-1150



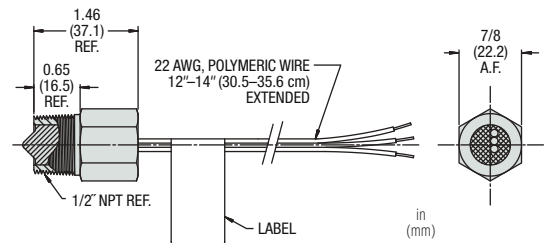
CE, UL

ELS-1150SS

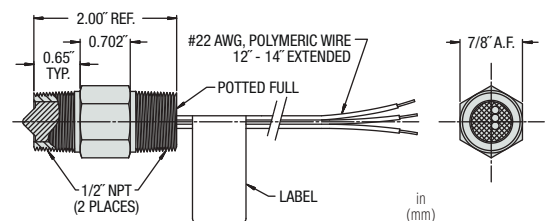
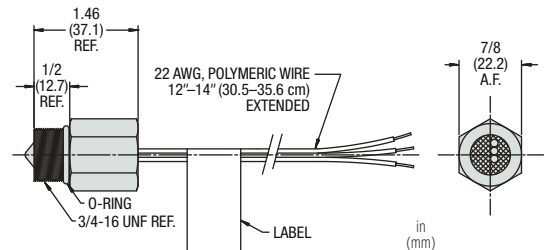


Dimensions

1/2-14 NPT Mounting

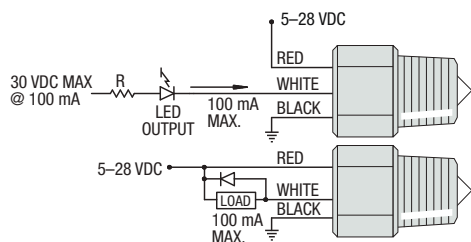


3/4-16 UNF Straight Thread Mounting



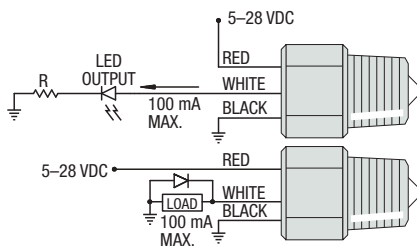
Wiring Diagrams - Typical

Sinking



Note: Inductive loads must be diode suppressed.

Sourcing



How To Order

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

Housing Material	Output Configuration	Operation	1/2" NPT Mounting	3/4" - 16 Straight Thread
Nickel Plated Steel	Sink	Wet	229251	232716
		Dry	229252	232717
	Source	Wet	229253	232718
		Dry	229254	232719
Stainless Steel	Sink	Wet	229255	—
		Dry	229256	—
	Source	Wet	229257	—
		Dry	229258	—

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

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-28.



ELS-1150XP

FM-Approved Explosion-Proof

The explosion-proof ELS-1150XP series is designed for use in areas containing flammable bases or vapors in quantities sufficient to produce explosive or ignitable mixtures. It is FM-Approved for use with virtually all hydrocarbon based liquids, as well as with combustible atmospheres containing dusts of coal, coke, flour, starch or other grain.

These solid-state level sensors are available in nickel-plated carbon steel or stainless steel. The strong fused glass prism eliminates leak potential and is capable of handling high temperature and pressure applications up to 5000 psi. The compact size of the sensor makes them ideal candidates for monitoring the small, pressurized vessels found in oil, gas and petrochem environments.

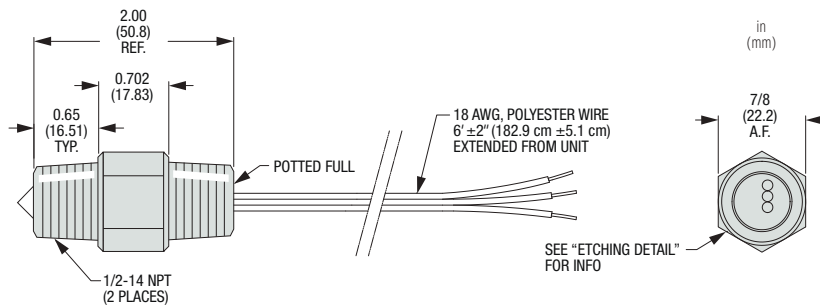
Applications

- Storage Tank Level Monitoring
- Remote Level Monitoring
- Chemical Injection
- Well Head Automation

Specifications

Mounting	1/2-14 NPT
Materials	
Housing	Nickel-Plated Carbon Steel or Stainless Steel
Prism	Fused Glass
Max. Operating Pressure	0 to 5000 psi, 10000 psi Proof (0 to 344.7 bar, 689.5 bar Proof)
Operating Temperature	-40°F to +257°F (-40°C to +125°C)
Input Voltage	5-28 VDC $\pm 5\%$
Current Consumption	~1 mA
Output	Open Collector Output, 100 mA Sink @ 30 VDC, Max.; 100 mA Source, Max.
Electrical Termination	18 AWG, Polyester, 6' $\pm 2"$ Extended Lead Wires
Approvals	FM Approved Class I, Div. I Groups A, B, C, D Class II/III, Groups E, F, G

Dimensions



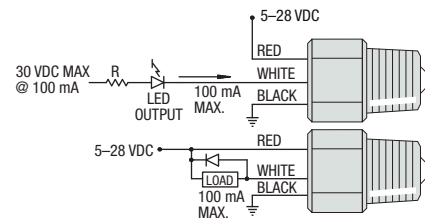
How To Order

Specify Part Number based on Output Logic State and material required.

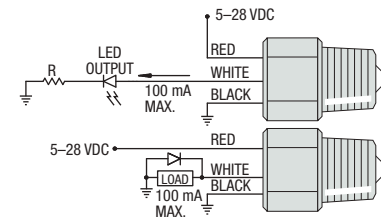
Output Logic State	Nickel-Plated Steel Housing	Stainless Steel Housing
Wet - Sink	227201	227257
Dry - Sink	227202	227256
Wet - Sourcing	227203	227255
Dry - Sourcing	227204	227254



Wiring Diagrams - Typical Sinking



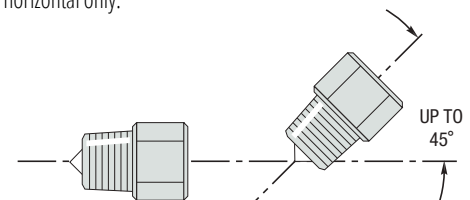
Sourcing



Note: Inductive loads must be diode suppressed.

Mounting Attitude

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



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

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-28.



FS-B Series – Bidirectional Flow Switch

Direction Indication Flow Switch

Flow Rate Settings: Normally Open at No Flow; Closes at 0.35 GPM (1.32 LPM) Max

Port Size: 3/8" Female NPT

Primary Construction Material: Brass

Setting Type: Fixed

This inline flow switch is a flow/no flow device with the ability to detect flow in either direction. It is key for applications where detection of flow direction is desirable or where undesired reverse flow is possible and must be prevented to avoid system damage. The FS-B is capable of rigorous application demands, high temperatures, media compatibility, and low pressure drop.

Typical Applications

Any closed loop application where direction of flow needs to be indicated.

- Automotive Service Carts
- Bidirectional Hydraulics

Specifications

Wetted Materials	
Housing	Brass and 316 Stainless Steel
Piston	Brass, Epoxy
Spring	316 Stainless Steel
O-Ring	Buna N
Port Adapters	316 Stainless Steel
Port Size	3/8" NPT
Operating Pressure, Maximum	1000 PSI (69 bar)
Operating Temperature	-20°F to +221°F (-28°C to +105°C)
Set Point Differential	20% Maximum
Switch*	SPST, 10VA**, N.O. at no Flow
Electrical Termination	4-conductor, 22 AWG, PVC Cable

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

**Not recommended for AC Service

How To Order – Standard Models

Specify Part Number based on flow setting.

Flow Settings – GPM ¹	Flow Settings – LPM ¹	Part Number
0.35	1.32	254300

Note:

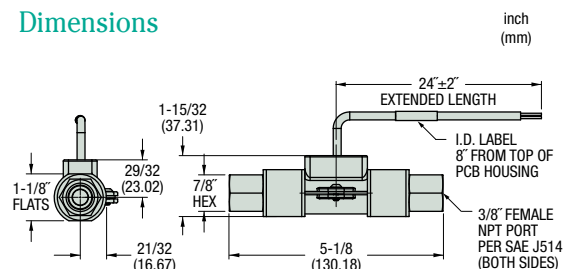
1. Flow settings are calibrated using water @ 70°F on increasing flow with units in horizontal position.
2. If a different actuation point is needed, please consult with your Gems sales rep or contact our factory.



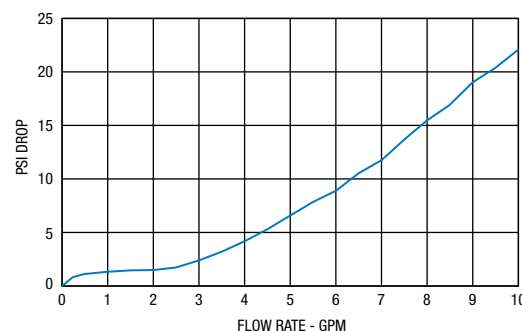
U.L. Recognized
File No. E31926



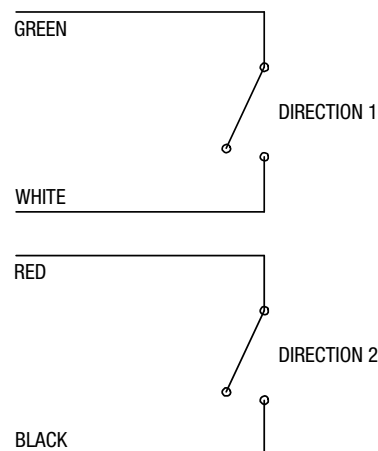
Dimensions



Pressure Drop – Typical



Wiring Diagram



FT-110 Series – TurboFlow® Economical Flow-Rate Sensors

- ▶ Low Cost Plus High Accuracy $\pm 3\%$ of Reading
- ▶ Measures Low Liquid Flow Rates of 0.13 to 9.2 GPM (0.5 to 35 LPM)
- ▶ Lightweight Plastic Design Enables Mounting in any Position
- ▶ O-ring Design for Manifold Mounting

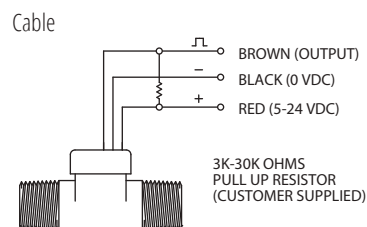
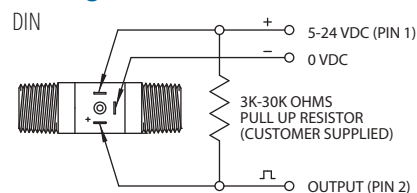
Gems Hall Effect turbine flow rate sensor is ideal for OEM applications involving low flow liquid monitoring. The low cost coupled with 1/2% repeatability makes it an ideal candidate for replacing dispensing timer systems. Unlike existing timing systems, turbine technology is not influenced by changes in system pressure caused by aging filters. The sensor's standard power and output specifications make it easy to retrofit to existing controllers.

Specifications

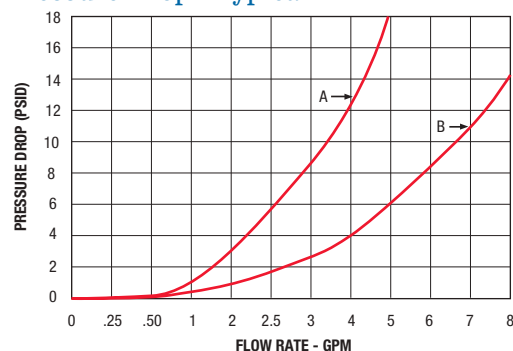
Wetted Materials	
Body	Nylon 12
Turbine	Nylon 12 Composite
Bearings	PTFE/15% Graphite
Operating Pressure	200 PSIG (13.7 bar)
Burst Pressure	1450 PSIG (99.97 bar)
Operating Temperature	-4°F to 212°F (-20°C to 100°C)
Viscosity	32 to 81 SSU (.8 to 16 Centistokes)
Filter	<50 Microns
Input Power	5 to 24 VDC @ 8mA
Output (Hz)	NPN Sinking Open Collector @ 20mA Maximum Leakage Current 10 μ A (Pull-Up Resistor Required)
Accuracy	$\pm 3\%$ of Reading
Repeatability	0.5% of Full Scale
Electrical Connection	DIN 9.4mm Spacing* 24 AWG 3 ft. Cable
Inlet/Outlet Ports	3/8" NPT Male G3/8 Male O-Ring

* Mating DIN ordered separately.

Wiring



Pressure Drop—Typical



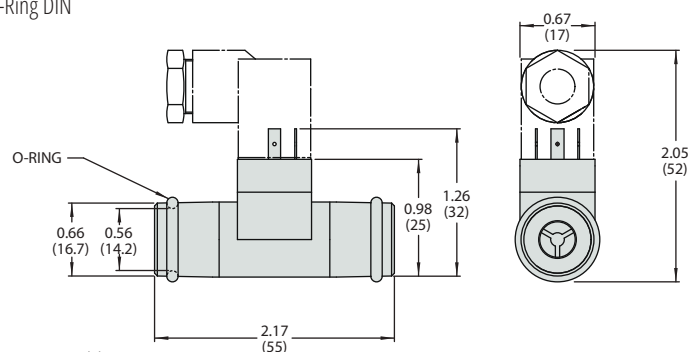
Tests conducted with water flow at 68°F (20°C).

Flow Range A
.13 - 2.6 GPM
.5 - 10 LPM

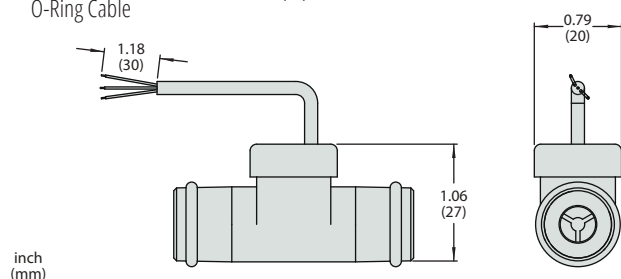
Flow Range B
.26 - 9.2 GPM
1 - 35 LPM

Dimensions

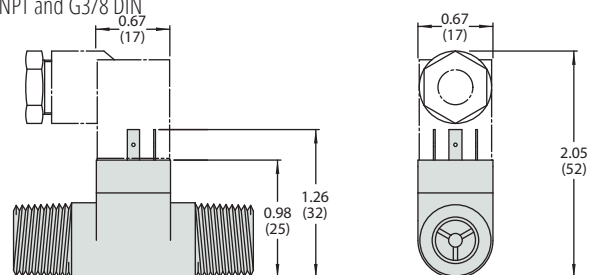
O-Ring DIN



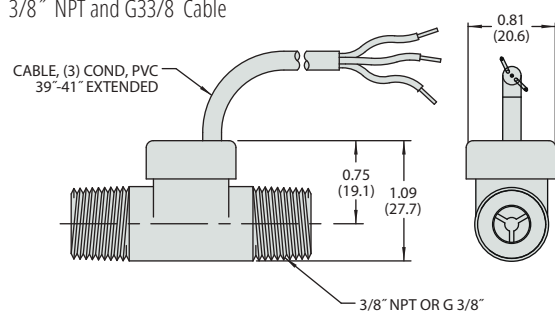
O-Ring Cable



3/8" NPT and G3/8 DIN



3/8" NPT and G3/8 Cable



How To Order – Standard Models

Specify Part Number based on flow range.

Flow Range		Pulses per		Frequency Output	3/8" NPT Part Number		O-Ring Part Number		G3/8 European Thread P/N	
GPM	Liters/m	Gallon	Liter		Cable	DIN	Cable	DIN	Cable	DIN
.13-1.3	.5-5	26200	6900	58-575 Hz	173931-C	173931-D	244421-C	244421-D	173936-C	173936-D
.13-2	.5-7.5	17800	4700	39-588 Hz	173933-C	173933-D	244423-C	244423-D	173938-C	173938-D
.26-2.6	1-10	12500	3300	55-550 Hz	173932-C	173932-D	244422-C	244422-D	173937-C	173937-D
.26-4	1-15	8300	2200	37-550 Hz	173934-C	173934-D	244424-C	244424-D	173939-C	173939-D
.26-6.6	1-25	3800	1000	16.7-416 Hz	173935-C	173935-D	244425-C	244425-D	173940-C	173940-D
.53-9.2	2-35	2840	750	25-438 Hz	234265-C	234265-D	244426-C	244426-D	234266-C	234266-D

FT-110 Accessories

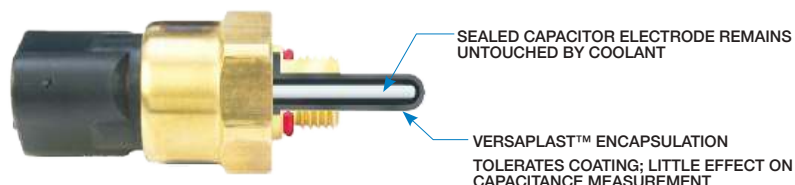
Consult factory for special customized OEM versions.

Description	Part Number
1 Meter DIN PVC Cable Assembly with 10K Pull-Up Resistor	218572
Mating DIN Connector	212404

CAP-3 Series – Capacitive Level Sensor

- ▶ Durable sealed design – IP67 & IP6k9k
- ▶ Developed for the most rugged aqueous applications
- ▶ Tolerates coolant coating
- ▶ Small size – under 3" total length

The versatile CAP-3 is a solution for OEM applications. The sensor is compact, tolerates coating, and is rugged enough for OHV, Rail, Power Generation, and HVAC applications.



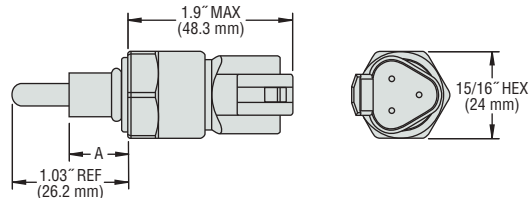
Specifications

Mountings	1/4" NPT, 1/2" NPT, M12x1.5 ISO 6149-3
Materials	
Housing	Brass
O-Ring	EPDM
Probe Tip	Versaplast™
Operating Pressure	Up to 100 PSIG
Operating Temperature	-40°F to +212°F (-40°C to +100°C)
Supply Voltage	9 to 32 VDC
Current Consumption	15mA max. (no load)
Output	Open collector, sinking or sourcing output, 9-32 VDC, 30mA max.
Electrical Termination	3-pin Deutsch
Sensing Element Length	1.03" (26.2mm) Max. (including thread length)
Approvals	CE, IP67, IP6k9k, RoHS



Dimensions

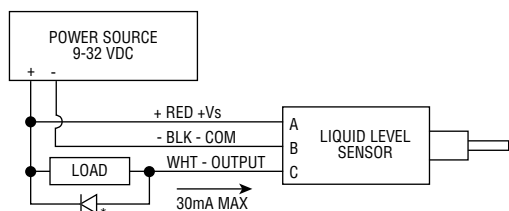
Deutsch® Connector



Thread Sizes	A DIM. REF.		EPDM O-Ring
	M12x1.5	0.53" (15.2 mm)	9.3 x 2.2 mm
	1/4"-18NPT	0.62" (15.7 mm)	None
	1/2"-14NPT	0.62" (15.7 mm)	None

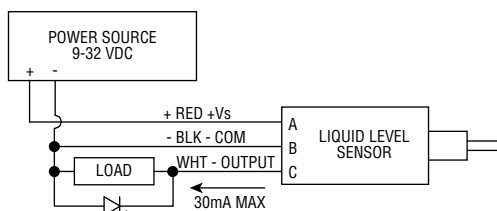
Wiring Diagram

Sinking



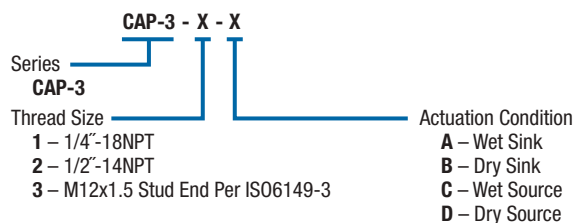
* For inductive loads, use diode suppression.

Sourcing



How To Order

Select a Part Number based on thread size and actuation condition.



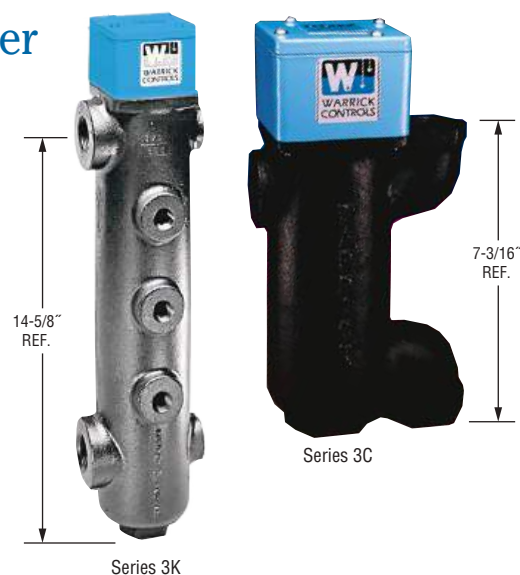
Series 3C – Short External Mount Side Chamber

Series 3K – Long External Mount Side Chamber

- ▶ Side Mounting
- ▶ Gauge Tappings
- ▶ Pressure Tight
- ▶ CSA Approved
- ▶ Tricock Tappings
- ▶ 1-4 Probes
- ▶ Cast Iron and Brass
- ▶ U.L. Recognized

Series 3C side chamber fittings are cast iron or brass, pressure-tight chambers containing up to 4 probes from 1-1/2" to 6" in length. Pipe tappings provide connection to the side of boilers and pressure vessels to equalize the level in the chamber with the level in the vessel.

Series 3K fittings contain up to 4 probes and accommodate probes from 1-3/4" to 13" in length. Additional tappings are available for tricocks and gauges.



Specifications

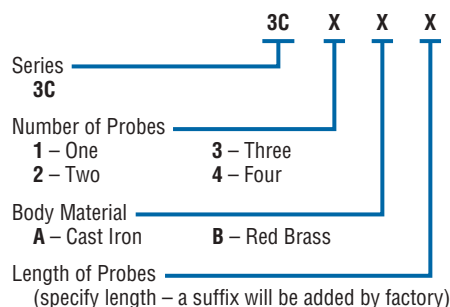
Probes	1 thru 4, with 316 Stainless Steel/Teflon® wetted parts
Body Material	
Series 3C	Cast iron, red brass
Series 3K	Cast iron
Pressure/Temperature	250 psig (17.2 bar) @ 406°F (200°C) (saturated steam)
Probe Length	
Series 3C	1-1/2" to 6" (3.81 cm to 15.24 cm)
Series 3K	1-3/4" to 13" (4.45 cm to 33.02 cm)
Approvals	U.L. File # MP2489, Vol. 1, Sec. 2; CSA

Applications

- Boilers
- Hydropneumatic Tanks
- Steam Generators
- Pressure Vessels
- Pump Operation
- Low Water / High Water Alarm

How to Order Series 3C

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

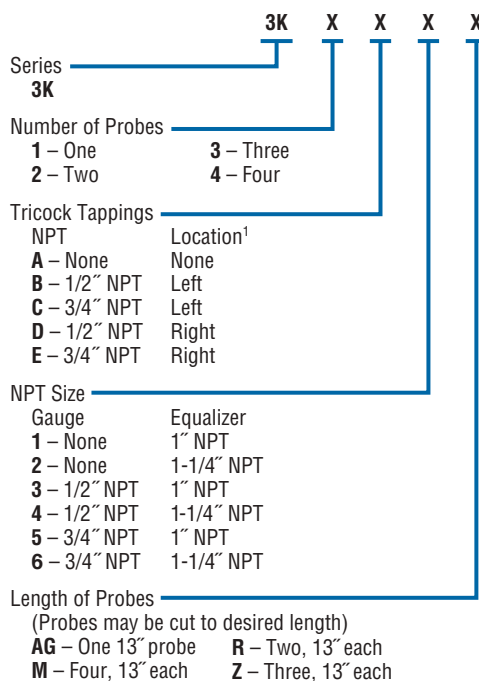


Notes:

1. Contact your representative for more details on this fitting.
2. The 3C attaches to a vessel by two 1" NPT tappings, one 1" NPT blowdown port and one 3/4" NPT side port.

How to Order Series 3K

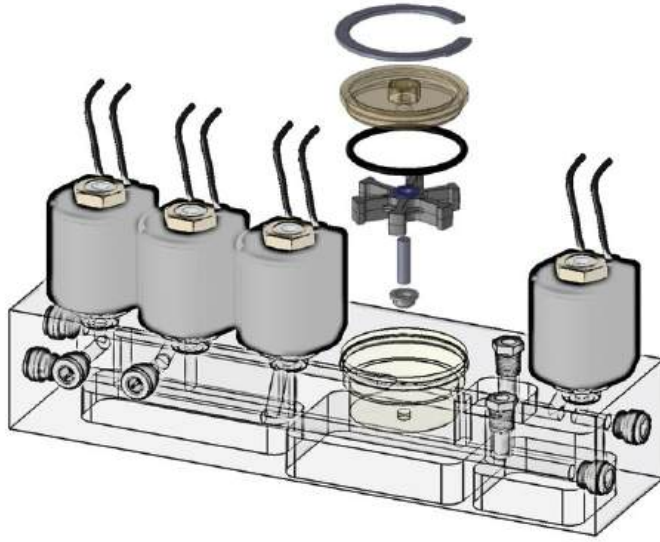
Use the **Bold** characters from the chart below to construct a product code.



Note:

1. Viewer facing gauge glass

ROTORFLOW®



Specifications

All specifications listed are of "typical applications" and do not represent the extreme ranges of applications. For extreme applications consultations are encouraged.

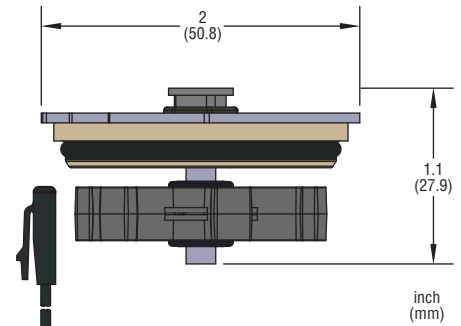
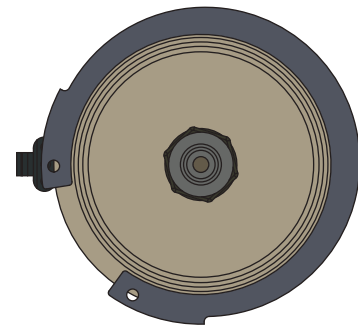
Flow Range	
Liquid	0.1 to 60 GPM (0.4 to 227.1 l/min)
Turn Down Ratio*	10x
Accuracy	±5%
Signal Outputs	
Pulsed DC	10-225Hz
Analog Voltage	0-10Vdc
Current Output	4-20mA
Threshold Switch	20VA
Operating Temperature	
Plastic Manifolds	-20°F to +180°F (-29°C to +82°C)
Alloy Manifolds	-20°F to +300°F (-29°C to 149°C)
Operating Pressure	
Plastic Manifolds	100 PSIG (6.9 bar)
Alloy Manifolds	500 PSIG (34.5 bar)
Wetted Materials	
Rotor Options	PPS Composite, Nylon / Epoxy
Rotor Pin	Ceramic
Lens Options	Polysulfone, Polypropylene, Stainless Steel
O-ring	FKM or OEM specified
Maximum Viscosity (To maintain linearity)	200SSU
Recommended Filtration (Integrated pre-filters available)	150 Microns or Better

* Turn down ratio is the difference between the lowest and highest flow range the system operates within the linear range. i.e. If the porting is designed to go as low as 0.1 GPM the highest reading would be 1.0 GPM.

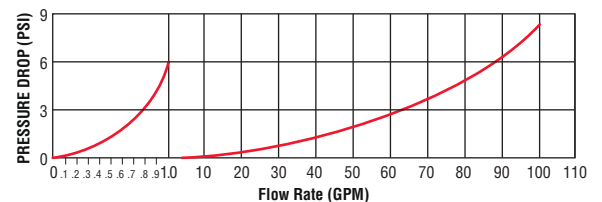
Continuous Flow Solutions

Debris tolerant rotor, transparent & field serviceable lens are among the many reasons the RotorFlow has been integrated into a variety of mission critical coolant manifolds.

Typical Space Requirements



Typical Pressure Drop



2400 Slimline Borehole Transducer/Transmitters

- ▶ Triple sealed to ensure immersible integrity
- ▶ <10ms switch on/settling period
- ▶ 19mm diameter

Gems Sensors 2400 Series immersible pressure transducer has been specifically designed to meet the rigors of long term immersibility. A custom designed hermetic header guarantees that water cannot enter the transducer even if the cable sheath is damaged during use. The large bore vent tube is connected directly to the back of the sensor which provides rapid venting, even on the longest cable run. The sensor itself is impervious to the effects of water guaranteeing long service life even in areas of high humidity, which can cause condensation. The all welded electronics enclosure is completely segregated from all other areas with the electronics themselves designed to provide fast switch on and settling to ensure maximum battery life and ease of calibration.

Specifications

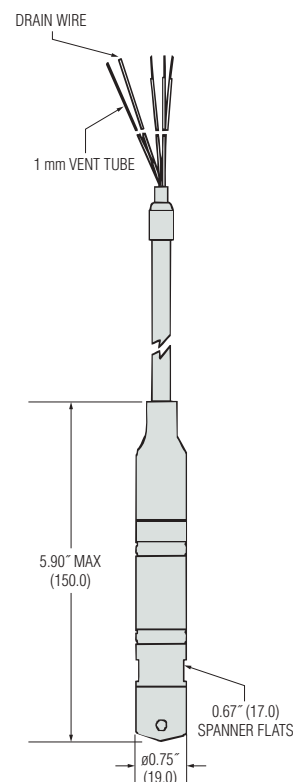
Input	
Pressure Range	0 to 4 to 0 to 200mWg (mA & V) 0 to 10, 20, 50, 100, 200mWg (mV)
Proof Pressure	1.5 x Fs nominal range
Burst Pressure	3 x Fs
Fatigue Life	Designed for more than 100 million FS cycles
Performance	
Long Term Drift	0.2% FS/year (non-cumulative)
Accuracy	0.25% FS typical
Thermal Error	0.5% Typical 30°F to 120°F (0°C to 50°C)
Compensated Temperatures	15°F to 120°F (-10°C to +50°C)
Operating Temperatures	-40°F to +180°F (-40°C to +80°C)
Zero Tolerance	1% of span
Mechanical Configuration	
Pressure Port	G1/4" AT external fitted with nosecone
Wetted Parts	316 Stainless Steel, Polyurethane, Acetal
Electrical Connection	Polyurethane Cable
Enclosure	IP68 to 650ft (200mWG)
Vibration	35g peak sinusoidal, 5 to 2000 Hz
Shock	Withstands free fall to IEC 68-2-32 procedure 1
Approvals	CE
Weight	Approx. 100 grams (additional; cable 75 g/m)

Individual Specifications

Voltage Output units	
Output	0 to 10V
Supply Voltage (Vs)	13 to 28 VDC
Supply Voltage Sensitivity	0.026% span/V
Min. Load Resistance	(FS output / 2) Kohms
Current Consumption	Approx 6 mA @ 8 VDC
Current Output units	
Output	4-20 mA (2 wire)
Supply Voltage (Vs)	24 VDC, (8-28 VDC)
Supply Voltage Sensitivity	0.026% span/V
Max. Loop Resistance	(Vs-7) x 50 ohms
Millivolt units	
Output	100mV ±1mV
Supply Voltage	10 VDC regulated (15 VDC max)
Bridge Resistance	3.5KOHM ± 20% @ 77°F (25°C)
Sink Weight	P/N 198700



Dimensions in. (mm)



2400 B 1 010 @ 7 psi

For electrical output codes B&S specify in 1psi increments the full scale calibration required.

Cable Length

001 = 1 metre, 999 = 999 metres etc

Code

1 10mV
2 20mWG
3 50mWG
4 100mWG
5 200mWG

Code

1 6 to 14psi (4 to 10mWG)
2 15 to 28psi (11 to 20mWG)
3 29 to 57psi (21 to 40mWG)
4 58 to 142psi (41 to 100mWG)
5 143 to 284psi (101 to 200mWG)

Code

A 100 mV Not Rangeable
B 4-20 mA
S 0-10 VDC

Intrinsically Safe SAFE-PAK® Relays Amplify Sensor Load-Handling Capabilities

Costly explosion-proof enclosures with their mounting requirements are unnecessary. No purging is required.

SAFE-PAK: Less than 100 microamps at 9 VDC actuates the unit to control loads to 5A at 120 VAC. Resistive (up to 100,000 Ω) or short-circuiting sensors operate the unit. 120 VAC and 240 VAC model.

Low Sensitivity SAFE-PAK: Sensor closures up to 1000 Ω resistance control resistive loads to 5A at 120 VAC. 120 VAC, N.O. model.

See table on Page L-2 for specific approval information.



P/N
22445
25872
25873
64101

Safe-Pak®



P/N
144600

Dimensions

SAFE-PAK	SAFE-PAK P/N 144600

How To Order

Select Part Number based on Relay Style, Operating Voltage and Switch Operation required.

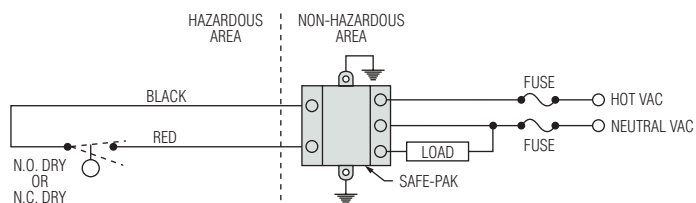
Relay Style	Operating & Load Voltage Range	Load Current Maximum	Turn-On Sensitivity (Typical) ¹	Turn-Off Sensitivity (Typical) ¹	Voltage Loss	Operating Temperature Range	Output Leakage Current Maximum	Switching Operation	Part Number
SAFE-PAK®	95 to 135 VAC	5A	400 K Ω	1 M Ω	2 VAC	0°F to +120°F (-17.8°C to +48.9°C)	6 mA @ 120 VAC	SPST N.O.	22445 ⁵ ⚡
	100 to 135 VAC						6 mA @ 120 VAC	SPST N.C.	25872 ⁵ ⚡
	200 to 250 VAC						12 mA @ 250 VAC	SPST N.O.	25873 ⚡
Low Sensitivity SAFE-PAK®	110 to 130 VAC	.5A @ 20 VAC ² .05A @ 200 VAC ²	300 Ω	1000 Ω	—	-10°F to +140°F (-23.3°C to +60°C)	0	SPST N.O.	64101* ⚡
	105 to 125 VAC	5A	500 Ω	2000 Ω	2 VAC	-40°F to +120°F (-40°C to +48.9°C)	6 mA @ 120 VAC	SPST N.O.	144600* ⚡

Notes:

1. Temperature Dependent.
2. 50-60 Hz
3. All AC voltage and current specifications are RMS values unless otherwise stated.
4. Housing material is Polysulfone.
5. Certified intrinsically safe under MSHA certification No. 1662 for use on permissible equipment. For Group D use only.

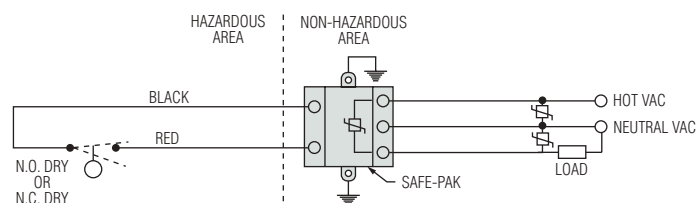
⚡ – Stock Items.
*Not CSA-Approved

Typical Wiring Diagrams



SAFE-PAK, Part Numbers 25872, 25873, 64101 or 144600 with sensor switch in hazardous location.

Transient Protection for SAFE-PAK (AC Loads) Use a properly sized metal oxide varistor (MOV) as shown below.



Supply and Return Manifold Kits

For Gems A & B Series Valves

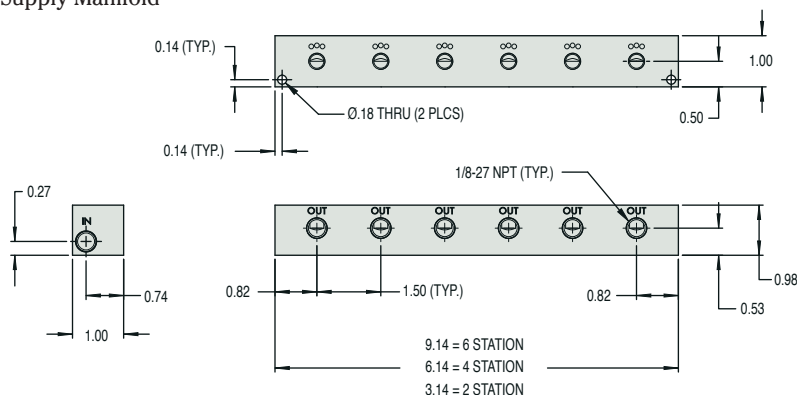
- ▶ 303 Stainless Steel
- ▶ 2-, 4-, and 6-Port Configurations

These 303 stainless steel manifolds can be used with any Gems manifold mount type A Series or B Series valves. Specify the "MM3" Body Port Configuration code when ordering valves to mate with these manifolds. To complete a manifold assembly please order a manifold below and then order the valves separately. You just screw the valves onto the manifold. If needed, a spanner tool for installing the valves is available in the Ordering Table below. Blank plugs to block off unused ports, with a variety of O-ring material options, are also available.

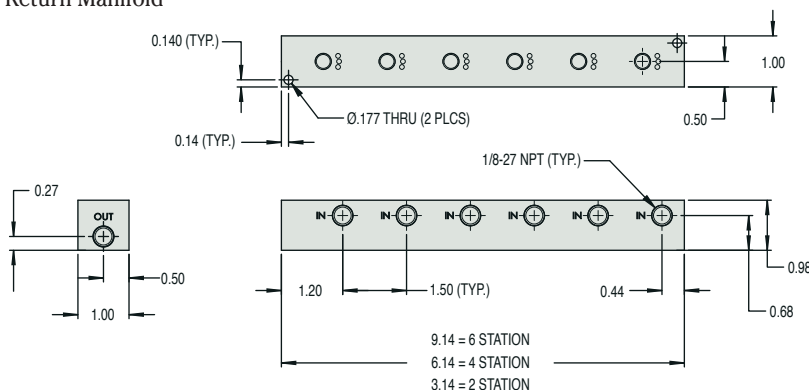
The supply manifold has a common supply inlet and discrete outlets. The return manifold has discrete inlets and one common outlet or return. The inlets connect to the outer holes on the manifold mounted valve while the outlets are connected to the center hole of the manifold mounted valves on both types of manifolds.

Dimensions

Supply Manifold



Return Manifold



4-Port Return 303 SS manifold. Pictured with Gems manifold mount solenoid valves—sold separately. Select from Gems A Series or B Series for use with these manifolds.



303 SS manifolds are available with either Supply or Return functionality in 2-, 4-, or 6-Port configurations.



Spanner Tool

Manifold Plug

Accessories for 303 SS manifolds include Manifold Plugs, with a variety of O-Ring seal materials, and the Spanner Tool used to install valves and plugs into the manifold.

How To Order

Specify Part Number based on Supply/Return function (valves sold separately).

Valve Capacity	Part Number	
	Supply Manifold	Return Manifold
2 Valve	2AB100	2AB000
4 Valve	4AB100	4AB000
6 Valve	6AB100	6AB000

Ordering Example:

- 1x - M4AB100
(4-Port Supply Manifold)
- 4x - A2016-MM3-C204
(N.C., 1/8" orifice, 100PSI, A Series Valves)
- 1x - MFG-115 (Spanner Tool)

Fluid supply is common to all 4 valves. When any of the four valves is energized (opened) fluid will flow out through its discrete outlet port.

Accessories

Description	Part Number
Spanner Tool (Recommended)	MFG-115

Manifold Plugs – Choose O-Ring Material

Nitrile O-ring	252986-B
EPR O-ring	252986-E
Viton® O-ring	252986-V
Neoprene O-ring	252986-N
Perfluoroelastomer O-ring	252986-P

FS-480 Series – Stainless Steel Flow Switch for Large Flow, Low Pressure Drop

Flow Rate Settings: 0.50 GPM to 3.00 GPM

Port Size: 1/2" NPT, 3/4" NPT, 1/2" Tube Compression Fitting

Primary Construction Material: 316 Stainless Steel

Setting Type: Fixed

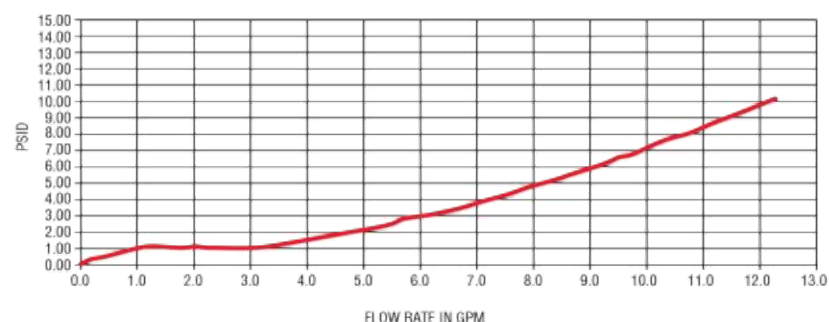
The FS-480 large-body inline flow switch delivers ample flow rates with minimal pressure drop. 25% larger than its FS-380 sibling, the FS-480 is ideal for processes that push more fluid through their systems and demand low pressure drops. Designed to accommodate the Semiconductor Industry's move to larger 300 mm wafer and cross-over equipment, this switch is also perfect for critical medical equipment applications. A glass-reinforced PPS piston and forged 316 stainless steel body make this sensor rugged enough for high pressure lubrication and cooling systems as well. This simple, yet meticulously perfected design provides the reliability required in critical applications while allowing for much lower pressure drop rates than other available switches.

Specifications

Wetted Materials	
Housing/End Fitting	316 Stainless Steel
Piston	PPS, Epoxy
Spring	316 Stainless Steel
O-Ring	Fluorocarbon
Operating Pressure, Maximum	1000 PSI (69 bar)
Operating Temperature	-20°F to +250°F (-28.8°C to +121°C)
Set Point Accuracy	±20% Maximum
Set Point Differential	20% Maximum
Recommended Filtration	100 Micron or better
Switch*	SPST, 20VA, 120/240 VAC, N.O. at no Flow
Electrical Termination	No. 22 AWG, 24" PVC Cable

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

Pressure Drop – Typical 1.0 GPM Set Point

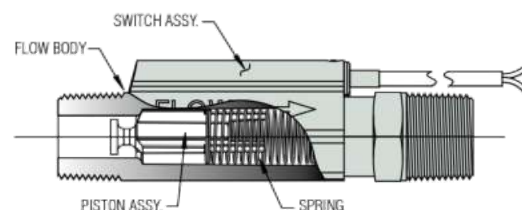
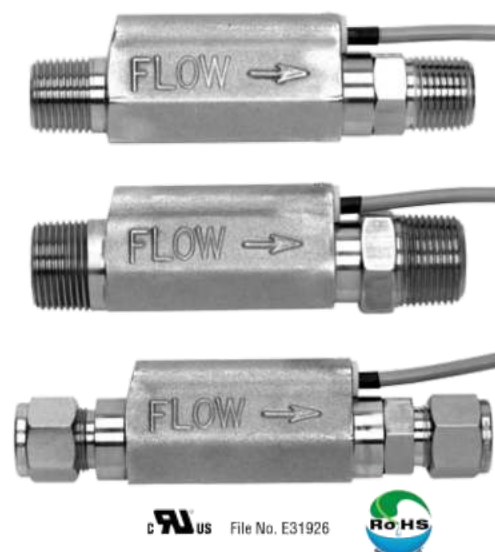


How To Order – Standard Models

Specify Part Number based on flow settings.

Flow Settings* GPM	1/2" NPT Port	3/4" NPT Port	1/2" Tube Compression Fitting
0.50	206915	204715	204710
1.00	206916	204716	204711
1.50	206917	204717	204712
2.00	206918	204718	204713
3.00	206919	204719	204714

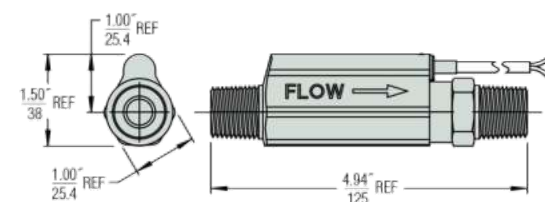
* Calibrated with unit in horizontal position.



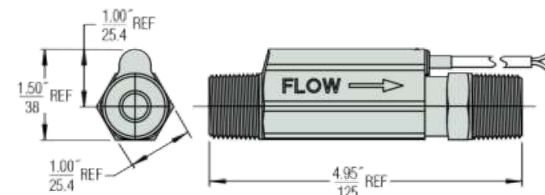
Straight design and large bore body minimizes pressure drop.

Dimensions

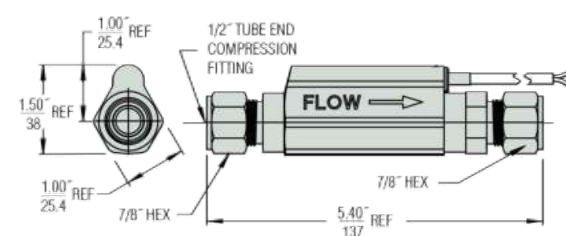
1/2" NPT Ports



3/4" NPT Ports



1/2" Tube End Compression Fitting



UCL-520 — 2-Wire Transmitter for Midsize Tanks

- ▶ To 26-feet (8m) range with 2" transducer
- ▶ 2" NPT mounting
- ▶ Setup is fast and easy. Incorporates push button calibration and LCD display
- ▶ 6-segment LCD display indicates level in inch or centimeter values
- ▶ 7.6 cm minimum beam width for applications with restricted space
- ▶ Fail-safe intelligence with diagnostic feedback for easy troubleshooting

The UCL-520 is a general purpose two-wire ultrasonic transmitter providing non-contact level measurement up to 26.2' or 8m. It is ideally suited for challenging ultrapure, corrosive or waste liquids.

Push button calibrated, the UCL-520 is broadly selected for atmospheric bulk storage, day tank and waste sump applications. Media examples include wastewater and sodium hydroxide. The PC/ABS enclosure is rated NEMA 4X, and the transducer is housed in rugged PVDF.

Specifications

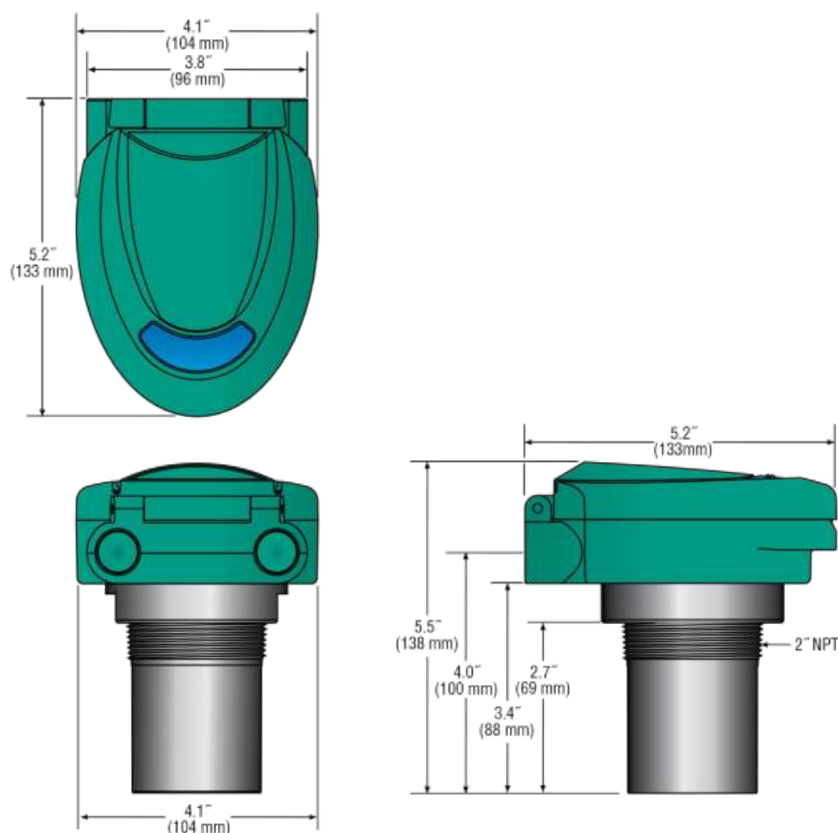
Range	6' to 26.2' (1.8 m to 8 m)
Accuracy	± 0.2% of span in air
Resolution	0.039" (1 mm)
Beam Width	3" (7.6 cm) dia.
Dead Band	8" (20 cm)
Display Type	LCD, 6-digit
Display Units	Inch, cm or percent
Display Mode	Air gap or liquid height
Memory	Non-volatile
Supply Voltage	12-28 VDC
Loop Resistance	500 Ohms @ 24 VDC
Signal Output	4-20 mA, two-wire
Signal Invert	4-20 mA or 20-4 mA
Calibration	Push button
Fail-Safety	Selectable 4 mA, 20 mA, 21 mA, 22 mA or hold
Process Temp.	-7°F to +140°F (-20°C to +71°C)
Temp. Comp.	Automatic
Electronics Temp.	-40°F to +160°F (-40°C to +71°C)
Pressure	30 PSI (2 bar) @ 25°C, derated @ 1.667 PSI (0.113 bar) per °C above 25°C
Enclosure Rating	NEMA 4X (IP65)
Enclosure Vent	Water tight membrane
Enclosure Material	PC/ABS FR
Trans. Material	PVDF
Process Mount	2" NPT (2" G)
Mount. Gasket	Viton®
Conduit Entrance	Dual, 1/2" NPT
Classification	General Purpose
CE Compliance	EN 61326 EMC



Typical Applications

- Water and Waste Water
- Petrochemical
- Health Care
- Mining
- Cleaning
- HVAC
- Chemical
- Semiconductor
- Agriculture
- Electric Power
- Water Parks/Swimming Pools

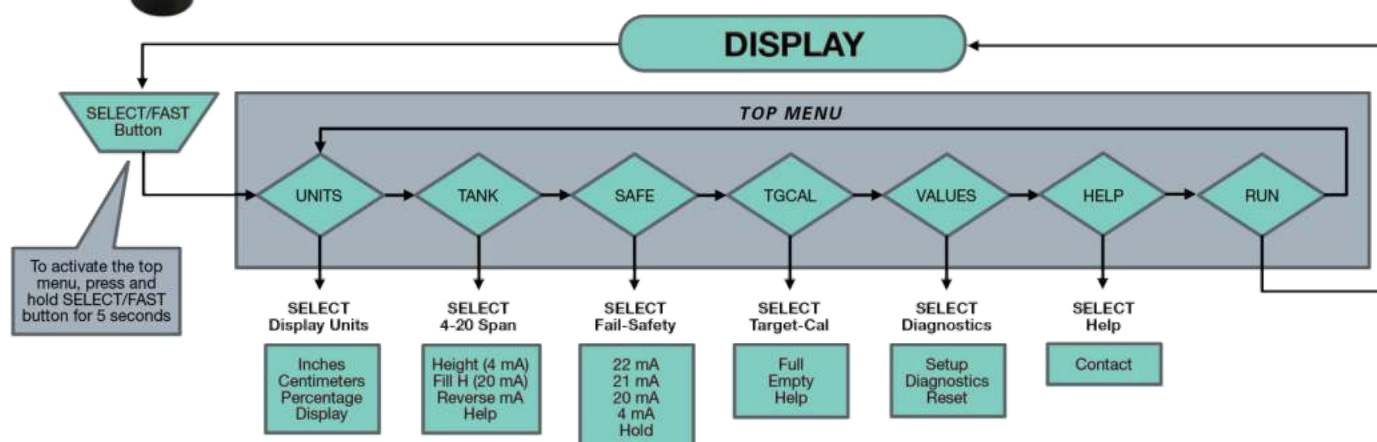
Dimensions



Easy Calibration



Calibration is fast and simple with our scrolling single layer menu, three button interface and 6-segment LCD display. Troubleshooting is easy with our unique Setup and Diagnostic feedback modes. Setup displays the transmitter's calibration set points. Diagnostics provides users with a snapshot of sensor performance and application variables. Gems UCL-520 is full feature level sensing made simple.



How To Order

Select by Part Number.

Description	Part Number
UCL-520 2-Wire Transmitter	225200

Large Size – Alloys

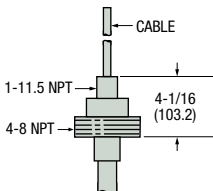
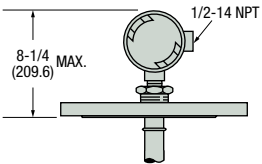
Sized for Deep Tanks and Rugged Duty

- ▶ Stainless Steel Construction
- ▶ Standard Lengths to 18 feet (549 cm)

These rugged transmitters are designed for tanks up to 18 feet (549 cm) in depth. Heavy duty stems resist turbulence, and float options accommodate liquids with minimum specific gravity as low as 0.53. Standard resolution is 1/2 inch; higher resolutions are available on request.

* Contact GEMS about solutions for deeper tanks.

1. Mounting Types

Series	XM/XT-66400	XM/XT-36490
Mounting	4-8 NPT	5" ANSI Flanges; 150#, 300#, or 600#
		
Stem Material	316L Stainless Steel	316L Stainless Steel
Mounting Material	316L Stainless Steel; or Carbon Steel	316L Stainless Steel; or Carbon Steel Flange
Float Stop Material	316L Stainless Steel	316L Stainless Steel
Maximum Overall Length	216" (549 cm)	

Note: XM/XT-36490 will be manufactured with matching Stem and Float Stop material.
Consult factory for longer lengths.

Got Mud?

These Gems Alloy Float Level Sensors are the best, most reliable method to monitor mud pits. The large diameter, stainless steel stems are rugged and strong to handle heavily viscous mud and slurries. Use with the exceptionally-buoyant 8" float for best results.

ORDER IT!

Ordering is Easy! See Page C-21.
Easy online ordering too!



2. Float Types

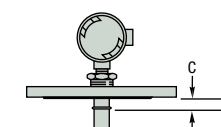
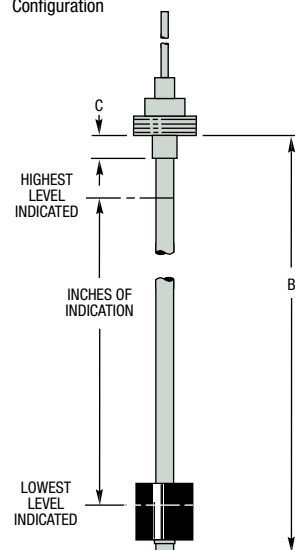
	Buna-N	Ø 4" Syntactic Foam	Ø 4" Stainless Steel	Ø 4-1/2" Stainless Steel	Ø 8" Stainless Steel**
Part Number	32230	31830	125520	35560	38609
Minimum Liquid Specific Gravity	0.59	0.87	0.57	0.78	0.53
Operating Temperature	-40 °F to +180 °F (-40 °C to +82 °C)	-40 °F to +225 °F (-40 °C to +107 °C)	-40 °F to +230 °F (-40 °C to +110 °C)		
Maximum Operating Pressure*	150 psi (10 bar)	2000 psi (138 bar)	15 psi (1 bar)	500 psi (35 bar)	150 psi (10 bar)

* Unit pressure rating is determined by the flange and float selected. Consult factory for higher pressure ratings.

** Float P/N 38609 must be installed on the transmitter stem from within the tank; or consult factory for larger flanges.

3. Dimensions

Typical Configuration



B: Overall Length = Inches of Indication + C + X (See Table at Right)

C: Distance From Bottom of Mounting to Float Stop (Customer Specified):

- 1/2" (12.7 mm) Minimum

Calculating Length

To find Overall Length when Inches or Indication is known:

- Inches of Indication + C* + X = Overall Length

To find Maximum Inches of Indication when Overall Length is known:

- Overall Length - C* - X = Maximum Inches of Indication

*C dimension is determined by customer.

Float Factor - X

Float Part Number	X
32230	6.75" (171.5 mm)
31830	6.75" (171.5 mm)
125520	7.75" (196.5 mm)
35560	6.75" (171.5 mm)
38609	11.375" (288.9 mm)

4. Input/Output

For XM- Series, no special output designation is necessary.

For XT- Series, specify the desired signal conditioning by Part Number.

Additional information about GEMS signal conditioning modules is found on Page C-26.

Series	Input Voltage	Output Signal	Part Number	Electrical Termination
XM-36490	10-30 VDC	Proportional Voltage	—	Junction Box
XM-66400				Cable, (4) Conductor, 30 ft. long, Nitrile Jacket
XT-Series	8-24 VDC	0-5 VDC	52532	Junction Box
	15-30 VDC	0-12 VDC	52533	
	10-40 VDC	4-20 mA	52550	
		4-20 mA	112300 ⚡	Panel Mount with Plug-In Base

⚡ Stock item

Small Size – Engineered Plastics

XMP/XTP-800 Series Delivers Excellent Chemical Compatibility

- ▶ PVC or Polypropylene Materials
- ▶ 1/4" Resolution
- ▶ Lengths to 70 inches (177.8 cm)

Specifically designed to monitor chemical tanks and vats, the XMP-800 Series provides superb resistance to corrosive liquids and vapors. Use XMP-800 transmitters with GEMS Digital Bargraph Display Receiver or Level Cube Receivers described in this catalog. The XTP-800 Series adds a choice of signal conditioning for use with GEMS digital bargraph display receivers or other digital instrumentation and control equipment.



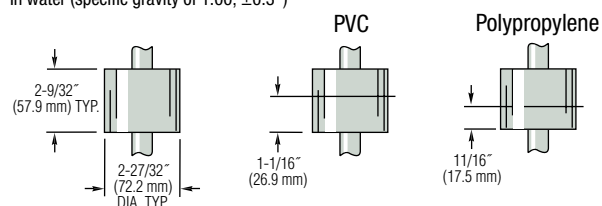
ORDER IT!

Ordering is Easy! See Page C-18.
Easy online ordering too!

	Type A 1" NPT	Type B 3" NPT	Type C 3" 150# Flange
XMP-800 Dimensions			
XTP-800 Dimensions			
Stem, Mounting and Float Stop Material	PVC or Polypropylene		
Operating Temperature	See Chart, Next Page		
Operating Voltage	10-30 VDC		
Overall Length, Max.	70" (177.8 cm); please consult factory for longer lengths		

2. Float Types

Float submersion depths:
In water (specific gravity of 1.00; $\pm 0.3''$)

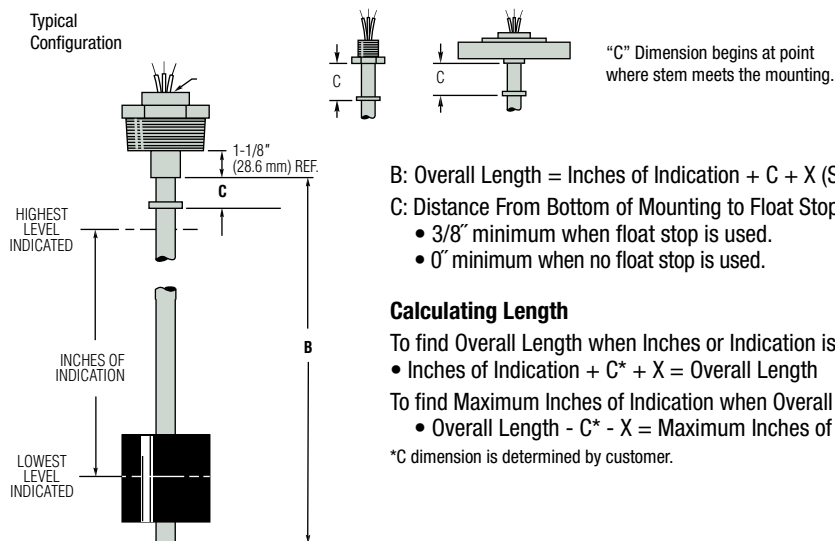


Material	Min. Liq. Specific Gravity	Part Number	Maximum Pressure vs. Temperature					
			0°F (17.8°C)	70°F (21.1°C)	100°F (37.8°C)	125°F (51.7°C)	140°F (60.0°C)	170°F (76.7°C)
PVC	.60	61326	50 PSI	50 PSI	35 PSI	20 PSI	10 PSI	-
Polypropylene	.40	61327	50 PSI	50 PSI	40 PSI	35 PSI	30 PSI	25 PSI

■ = Not recommended at these temperatures

3. Dimensions

Typical Configuration



B: Overall Length = Inches of Indication + C + X (See Table at Right)

C: Distance From Bottom of Mounting to Float Stop (Customer Specified):

- 3/8" minimum when float stop is used.
- 0" minimum when no float stop is used.

Calculating Length

To find Overall Length when Inches or Indication is known:

- Inches of Indication + C* + X = Overall Length

To find Maximum Inches of Indication when Overall Length is known:

- Overall Length - C* - X = Maximum Inches of Indication

*C dimension is determined by customer.

Float Factor – X

Float Part Number	X
61326	3.5" (88.9)
61327	3.5" (88.9)

Inch (mm)

4. Input/Output

For XM Series, no special output designation is necessary.

For XT Series, specify the desired signal conditioning by Part Number.

Additional information about GEMS signal conditioning modules is found on Page C-26.

Series	Input Voltage	Output Signal	Part Number	Electrical Termination	Compatible Mountings		
					Type A	Type B	Type C
XMP-800	10 to 30 VDC	Proportional Voltage	—	Lead Wires (3), #22 AWG, 24" (60.9 cm), Polymeric Jacket	●	●	●
XTP-800	8 to 24 VDC	0-5 VDC*	51965	Lead Wires, #22 AWG, 24" (60.9 cm), PTFE Jacket	●	●	●
	14 to 30 VDC	0-12 VDC*	51970		●	●	●
	8 to 24 VDC	0-5 VDC	154687			●	●
	15 to 30 VDC	0-12 VDC	154685	ABS Junction Box		●	●
	10 to 40 VDC	4-20 mA	116970			●	●
		4-20 mA	112300 ⚡	Panel Mount with Plug-in Base	●	●	●

* Stem mounted.

⚡ = Stock item

Part Prefix Table ①

Power Rating	Orifice		MOPD		C _v	K _v	① Primary Prefix
	inches	mm	psi	bar	Body		
0.5 Watt	0.031	0.787	25	1.7	0.018	0.015	MA
	0.052	1.321	10	0.7	0.037	0.032	MA
1 Watt	0.031	0.787	50	3.4	0.018	0.015	MB
	0.052	1.321	25	1.7	0.037	0.032	MB
2 Watts	0.031	0.787	100	6.9	0.018	0.015	MC
	0.052	1.321	50	3.4	0.037	0.032	MC

② Valve Type

- 20 = 2-Way normally closed
- 22 = 2-Way normally open
- 30 = 3-Way normally closed (free vent)
- 31 = 3-Way normally closed (line connection)
- 32 = 3-Way normally open
- 33 = 3-Way multi-purpose
- 34 = 3-Way directional control

③ Orifice Size

- 2 = 0.031" (0.79mm)
- 5 = 0.052" (1.32mm)

④ Plunger Seal / O-Ring Material

- V = Viton®
- N = Nitrile
- E = EPDM

⑤ Body Material

- B = Brass
- A = Aluminum

⑥ Body Port Configuration¹

- 0 = Face mount
- 1 = 1/16" (1.6mm) barb
- 2 = 5/64" (2.0mm) or 3/32" (2.4mm) barb
- 3 = 1/8" (3.2mm) barb
- 4 = Manifold mount, #10-32 UNF-2A stud¹
- 5 = #10-32 UNF-2B female thread (180° apart only)
- 6 = 1/8"-27 NPT ports (180° apart only)

⑦ Stop Port Configuration¹

- 0 = No barb (Standard for 2-way NC & 3-way free vent)²³
- 1 = 1/16" (1.6mm) barb (.031" orifice only)
- 2 = 5/64" (2.0mm) or 3/32" (2.4mm) barb
- 3 = 1/8" (3.2mm) barb

⑧ Coil Construction (Tape-Wrapped, 130°C Class B)

- L = Lead-wires, #26 AWG, 18" (45.7cm) long
- W = Lead wires, non-standard length (specify length in inches)
- P = P.C. board mount (4-pin)⁴
- Q = Quick connect 0.110" (2.79mm) spade

⑨ Voltage

- 200 = 3 VDC
- 201 = 5 VDC
- 203 = 12 VDC
- 204 = 24 VDC
- VDC = DC (specify voltage)
- VAC = AC Rectified 2-watt coil only (specify voltage, lead-wires only)

⑩ Additional Options

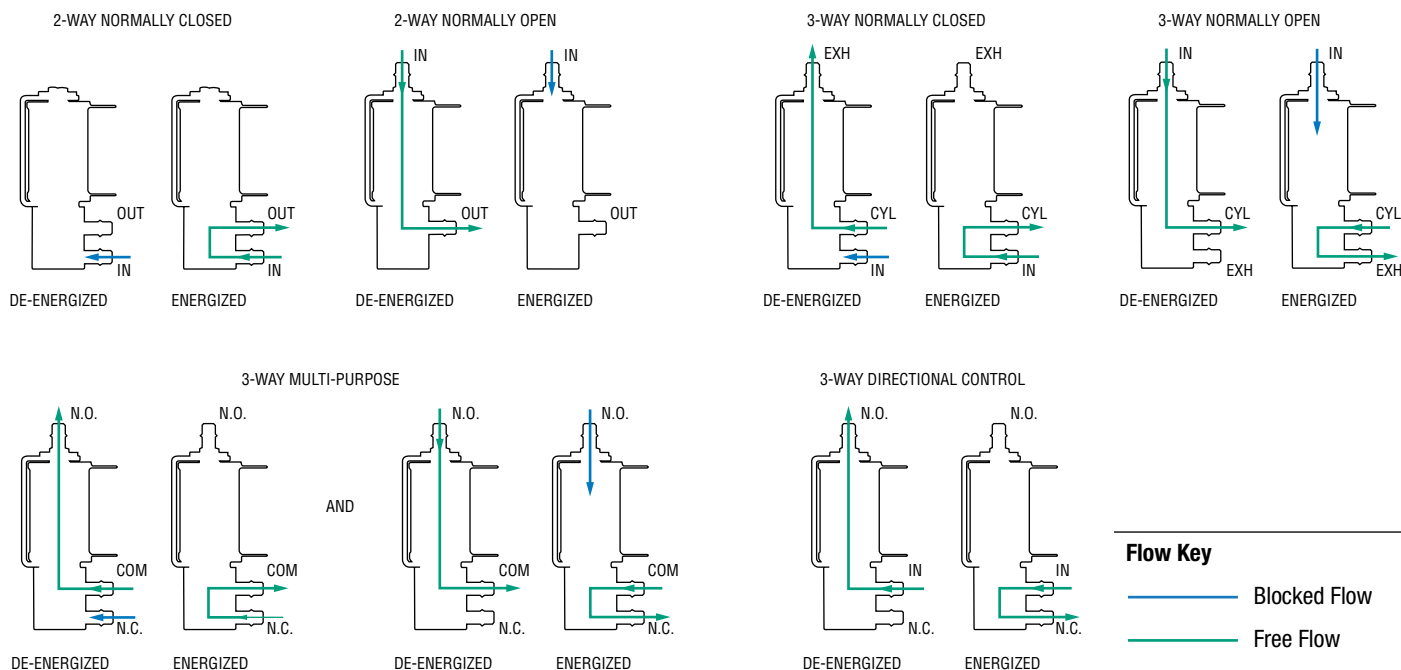
- OC = Cleaned for oxygen use
- VAC = Vacuum application – 0 to 27" Hg (0 to 914 mBar)

Notes

- Barbs are brass.
- For Stop Port Configuration, must select "0" for valve type 20 (2-way NC) and for type 30 (3-way NC Free Vent).
- For Stop Port Configuration, must select "1" or "2" or "3" for valve types 22 (2-way NO), 31 (3-way NC Line Connect), 32 (3-way NO), 33 (3-way MP), and 34 (3-way DC). Selection "0" can not be used.
- 2 pins near stop are active.

¹ Teflon® o-ring not suitable for manifold mount.

Flow Schematic



XLS-1 — Ultrasonic Level Sensor

- ▶ No Moving Parts
- ▶ Zero Maintenance
- ▶ Ignores Condensation on Sensor
- ▶ Will Not Sense Foam as Liquid
- ▶ Microcontroller-Based Electronics

XLS-1 ultrasonic level sensors are compatible with water-based and hydrocarbon-based liquids, and are perfect for applications where condensation may affect other sensing technologies. The XLS-1 is an ideal solution for sensing liquid level in generators, water tanks, radiators, printers, and other industrial applications. XLS-1 ultrasonic level switches expand the Gems catalog of solid-state level sensors.

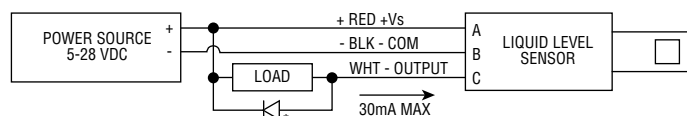
Specifications

Probe Length	1.25" (including threads)
Fluid Compatibility	Water, Water-based medias, Hydrocarbon-based chemicals, not compatible with high-viscosity liquids
Materials	
Housing	316L Stainless Steel
O-Ring Seal*	EPDM; NBR, Silicon, Kalrez® or Chemraz® available (Consult Factory)
Connector Housing	30% Glass-filled Polyester
Performance	
Accuracy	±1 mm from centerline
Repeatability	±1 mm
Temperatures	
Fluid	-40°F to +257°F (-40°C to +125°C)
Ambient	-40°F to +185°F (-40°C to +85°C)
Pressures	
Operating	0 to 250 psig
Burst	1000 psig
Environmental	
Ingress	IP67 Per IEC60529 IP6K9K Per DIN40050-9 (sensor only)
Vibration	Per IEC 60068-2-6; 20 m/s², 10-55 Hz; MIL-STD-202G, Method 204D, 10G, 57-2000 Hz
Shock	Per IEC 60068-2-27; 15G, 11ms
Audio Frequency Immunity	Per MIL 461D, CS101
EMC Immunity	IEC 61326-1; EN61000-4-(2 thru 6)
Input Power	5-28 VDC regulated power, max supply current 20 mA
Outputs	Open collector, sinking or sourcing output Open collector specs 30 VDC, 30mA max
Electrical Interface	3 Pin Deutsch DT Series Connector, 18 AWG wire or cable
Mechanical Interface	1/4" NPT, 1/2" NPT, M12x1.0, M12x1.5, 1/2"-20, G1/4", others available upon request
Mounting Orientation	Mounted Horizontally ±60 degrees
Approvals	CE (EMC 2004/108/EC) and RoHS, UL/cUL Recognized
Calibration	None required

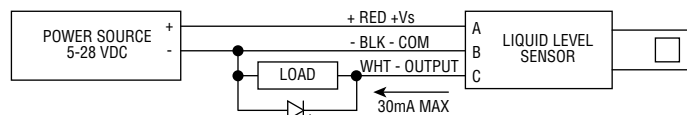
* Where applicable.

Wiring Diagram

Sinking



Sourcing

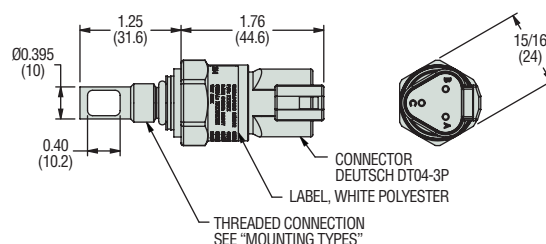


* For inductive loads, use diode suppression.

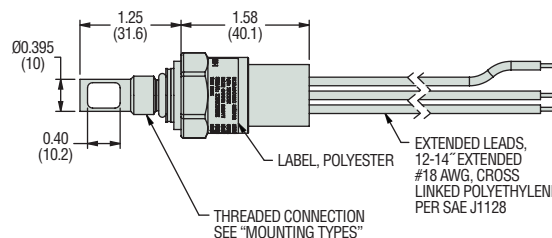


Dimensions

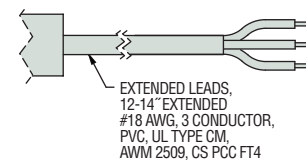
3-PIN Deutsch Connector



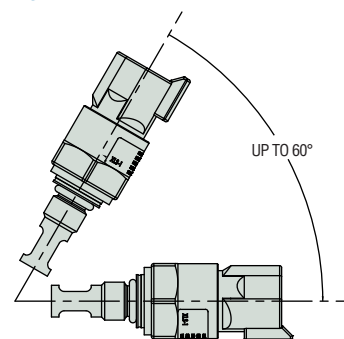
3-Wire Output



PVC Cable



Mounting Attitude



Mounting Types

SAE

1/2"-14 NPT	1/4"-18 NPT	1/2"-20 per SAE J1926-3

BSP & Metric

M12 x 1.0	M12 x 1.5 per ISO6149-3	G1/4"-19 BSPP

inch
(mm)

How To Order

Select a Part Number based on mounting type, connection and actuation condition.

Actuation Condition	Electrical Connection	Mounting Type					
		M12 x 1.0 (TYPE 10) ¹	1/2"-14 NPT (TYPE 12)	1/4"-18 NPT (TYPE 14)	M12 x 1.5 per ISO6149-3 (TYPE 15) ¹	1/2"-20 per SAE J1926-3 (TYPE 20) ¹	G1/4"-19 BSPP (TYPE 24) ²
Wet Sink	Integral 3-pin Deutsch® Connector	247670	247690	247700	247680	247660	250010
	18 AWG, 12"-14" Extended Flying Leads	247740	247780	247800	247760	247720	250020
	12"-14" PVC Cable	247750	247790	247810	247770	247730	250030
Dry Sink	Integral 3-pin Deutsch® Connector	247675	247695	247715	247685	247665	250005
	18 AWG, 12"-14" Extended Flying Leads	247745	247785	247805	247765	247725	250015
	12"-14" PVC Cable	247755	247795	247815	247775	247735	250025
Wet Source	Integral 3-pin Deutsch® Connector	250830	250820	250840	250850	250870	250890
	18 AWG, 12"-14" Extended Flying Leads	250930	250920	250940	250950	250970	250990
	12"-14" PVC Cable	251030	251020	251040	251050	251070	251090
Dry Source	Integral 3-pin Deutsch® Connector	250835	250825	250845	250815	250875	250895
	18 AWG, 12"-14" Extended Flying Leads	250935	250925	250945	250855	250975	250995
	12"-14" PVC Cable	251035	251025	251045	250915	251005	250955

Notes:

1. Supplied with EPDM O-ring. Consult factory for alternate O-ring materials.
2. Designed for use with Dowty Bonded Seal. Not supplied.

4000 Series – High Performance, Long Term Stability Pressure Transducers

- ▶ Gauge, Sealed, Absolute, and Differential Pressure Models
- ▶ Submersible, High Temperature and Weather Proof Enclosures
- ▶ High Stability Achieved by Sputtered Sensing Element

The 4000 series provides exceptional levels of stability and other performance specifications in a wide variety of enclosures from submersible to differential styles. By using a sputtered sensing element, which achieves a molecular fusion of a strain gauge material, an insulating material, and the 17-4 PH ss sensing element, the 4000 series provides the most stable sensor construction possible. These sputtered sensors are packaged for harsh applications requiring long term service where precise laboratory type measurements are required.

Also in the 4000 series is a range of high performance amplified sensors with voltage and current outputs. These laboratory specification sensors utilize the same thin film sensor as 4000.

Specifications

Input		
Pressure Range	4000 series: 1 to 690 bar; 4010 series: 15 to 10,000 psi	
Proof Pressure	2 x Full Scale (FS) (1.5 x FS for Inconel ports)	
Burst Pressure	>35 x Fs ≤ 150 psi (10 bar) ranges >15 x FS ≤ 1500 psi (100 bar) ranges >8 FS ≤ 10,000 psi (690 bar) ranges	
Fatigue Life	3 million FS cycles	
Common Line Pressure	max. 850 psia absolute (60 bar) differential units only	
Performance		
Output*	30mV ±1% (certificate supplied) (4010, 25 to 33 mV)	
Supply Voltage (Vs)	10 VDC Regulated (15 VDC max)	
Long Term Drift	0.06% per year non-cumulative	
Performance Code	Accuracy typical	Thermal Error typical
J	0.1 % span	1.2 % span
K	0.1 % span	0.6 % span
L	0.08 % span	0.6 % span
M	0.08 % span	0.3 % span
Compensated Temperatures	-65°F to +250°F (-54°C to +120°C)	
Operating Temperatures	-65°F to +275°F (-54°C to +135°C) for twist lock conn. "C" -65°F to +250°F (-54°C to +120°C) for cable units "D" -4°F to +122°F (-20°C to +50°C) for submersible unit "M"	
Zero Tolerance	0 mV +/- 1 mV for performance codes J & K 0 mV +/- 0.6 mV for performance codes L & M	
Bridge Resistance	2200 to 5250 ohms	
Mechanical Configuration		
Pressure Port	See ordering chart	
Wetted Parts	17-4 PH ss (optional Inconel) [17-4 PH and 15-7 Mo Stainless Steel ≤ 30 psi (1.6 bar)] Differential: dry non corrosive gas only on reference port	
Electrical Connection	See ordering chart	
Enclosure	321 ss case IP40 for elec. Code "C" gauge datum IP65 for elec. Code "C" Absolute or Sealed Datum IP66 (weatherproof) for elec. code "D" IP68 (submersible) for elec. code "M"	
Vibration	35g peak sinusoidal, 5 to 2000 Hz	
Shock	Withstands free fall to EIC 68-2-32 proc 1	
Approvals	CE	
Weight	150 grams max (excluding cable)	

Note:

* Inconel 30 psi (2.5 bar) range output is 25 mV ±1%

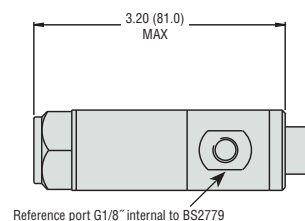


CE

Dimensions in. (mm)

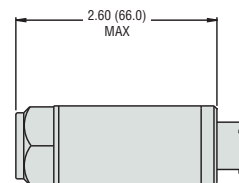
Differential

Code C



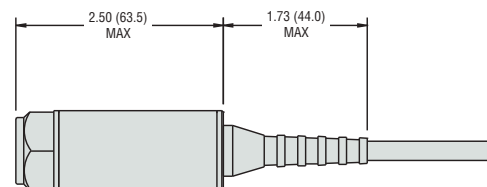
Absolute and Gauge

Code C



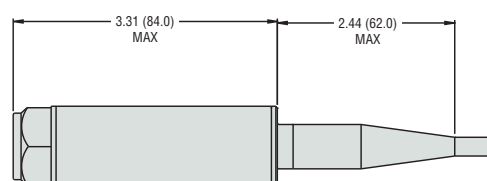
Absolute and Gauge

Code D



Absolute and Gauge

Code M



Maximum diameter 1" (25.7 mm)

How to Order

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

SELECT:

1. **4000** bar units, **4010** psi units, **40AB** seawater units**

2. Bridge Resistance: **K** is 3500 ohms*

3. Pressure Datum: **G** gauge; **A** absolute; **S** sealed; **U** uni-directional differential *

4. Insert pressure range code from table below

5. Pressure Port see chart

6. Electrical Connection **C** Fixed plug size 10-6, mate sold separately part # 499532-0006
D Weatherproof Cable IP 66
M Immersible Moulded Cable IP68 (max depth 200 M H₂O)

7. Approvals/Protection **2** CE

8. Cable Length in meters (requires electrical connection to be cable codes D or M)
U no cable **E** 3 **G** 10 **J** 20 **L** 30 **N** 50 **Q** 100 **S** 150
D 1 **F** 5 **H** 15 **K** 25 **M** 40 **P** 75 **R** 125

9. Static/Thermal Performance (Typical)
J 0.1%/1.2%; **K** 0.1%/0.6%; **L** 0.08%/0.6%; **M** 0.08%/0.3%

4000 K G B10 00 D 2 D J

* Differential datum units are available in electrical code "C" only and performance codes either "L" or "M" only.

** 40AB seawater sensors are a hastelloy case and require Inconel pressure ports.

Pressure Range Code

4000 Model Bar Ranges	Range Code	Gauge (G) Absolute (A) Sealed (S) Differential (U)
0 to 1	A10	G, A, U
0 to 1.6	A16	G, A, U
0 to 2.5	A25	G, A, U
0 to 4	A40	G, A, U
0 to 6	A60	G, A, U
0 to 10	B10	G, A, U, S
0 to 16	B16	G, A, S
0 to 25	B25	G, A, S
0 to 40	B40	G, A, S
0 to 60	B60	G, A, S
0 to 100	C10	G, A, S
0 to 160	C16	G, A, S
0 to 250	C25	G, A, S
0 to 400	C40	G, A, S
0 to 600	C60	G, A, S*
0 to 690	C69	G, A, S*

4010 Model PSI Ranges	Range Code	Gauge (G) Absolute (A) Sealed (S) Differential (U)
0 to 15	F15	G, A, U
0 to 30	F30	G, A, U
0 to 60	F60	G, A, U
0 to 100	G10	G, A, U
0 to 150	G15	G, A, U
0 to 300	G30	G, A, U, S
0 to 500	G50	G, A, S
0 to 1000	H10	G, A, S
0 to 1500	H15	G, A, S
0 to 3000	H30	G, A, S
0 to 6000	H60	G, A, S
0 to 10000	J10	G, A, S*

* Diaphragm and internal port Inconel, external adaptors are available in stainless steel

Pressure Ports - See Page H-50 for Dimensions

Codes		Description
SS	Inconel	
00	OK	G 1/4 internal
AO	AK	G 1/4 AT external
KO	KK	7/16-20 UNF-3A external
MO	MK	M14 x 1.5 external
PO	PK	G1/2 AT external
BO	BK	1/4-18 NPT external
GO	GK	1/2-14 NPT external
SO	SK	7/16-20 UNJF-3A, MS 33656F4
10	10	Plastic nosecone
20	20	Plastic nosecone with restrictor
30	30	Sink weight nose cone

Differential Units	
OD	G1/4 internal ss, G1/8 internal ss
OL	G1/4 internal Inconel, G1/8 internal ss

Electrical Connections

Electrical Connection Code	4000K Units				
	IN+	OUT+	OUT-	IN-	Case Earth
C "10-6 Bayonet"	A	B	C/F	D/E	—
D Weatherproof cable	Red	Yellow	Blue	White	Screen
M IP 68 cable	Red	Yellow	Blue	White	Screen

3100 Series and 3200 Heavy Duty Series

Compact OEM Pressure Transmitters

- ▶ Exceptional Long Term Stability
- ▶ 0–100 psi to 0–30,000 psi Ranges (0–7 bar to 0–2,200 bar)
- ▶ High Proof Pressures with All Stainless Steel Wetted Parts
- ▶ Broad Choice of Outputs, Electrical Connectors, and Pressure Ports
- ▶ Dual Pressure and Temperature Sensing option

3100 and 3200 Series offer high levels of stability and reliability with proven sputtered thin film technology and unbeatable price performance ratio in a small package size. A broad choice of electrical and pressure connections allow stock configurations to suit most applications without modification.

Specifications

Performance	
Long Term Drift	0.2% FS/YR (non-cumulative)
Accuracy	
3100	0.25% FS
3200	0.25% FS for >1000 psi (60 bar) 0.50% FS for <1000 psi (60 bar)
Thermal Error	
3100	0.83% FS/100°F (1.5% FS/100°C)
3200	2% FS/100°C for <1000 psi (60 bar)
Compensated Temperatures	–40°F to +257°F (–40°C to +125°C)
Operating Temperatures	–40°F to +257°F (–40°C to +125°C) for elec. codes B, E, G, 6, 8, 9, Y –5°F to +180°F (–20°C to +80°C) for elec. code W
Zero Tolerance	
3100	0.5% of span
3200	0.50% of span for >1000 psi (60 bar) 1.00% of span for <1000 psi (60 bar)
Span Tolerance	
3100	0.5% of span
3200	0.50% of span for >1000 psi (60 bar) 1.00% of span for <1000 psi (60 bar)
Response Time	1 ms
Fatigue Life	Designed for more than 100 M cycles
Mechanical Configuration	
Pressure Port	See under “How to Order,” last page
Wetted Parts	17-4 PH Stainless Steel
Housing	304 Stainless Steel
Electrical Connection	See under “How to Order,” last page
Enclosure	IP67 (IP65 for electrical codes G & W)
Vibration	40 G peak to peak sinusoidal, (Random Vibration: 20 to 1000 Hz @ approx. 40 G peak per MIL-STD-810E)
Shock	Withstands free fall to IEC 68-2-32 procedure 1
EMC (Radiated Immunity)	100 V/m
Approvals	CE, conforms to European Pressure Directive, Fully RoHS compliant, CRN Registered to ANSI/ASME B31.3, UL recognized files # E219842 & E174228
Weight	1.8–5.3 ounces (50–150 grams). Configuration dependent.
Voltage	
Output (3-wire)	0 V min. to 10 V max. See under “How to Order,” last page
Supply Voltage	2 Volts above full scale to 30 VDC max @ 4.5 mA (6.5 mA on dual output version)
Source and Sinks	2 mA
Current	
Output (2-wire)	4–20 mA
Supply Voltage	8–30 VDC
Maximum Loop Resistance	(Supply Voltage–8) × 50 ohms
Ratiometric	
Output	0.5–4.5 VDC @ 4 mA (6.5 mA on dual output version)
Supply Voltage	5 VDC ±10%



Integral Connector Versions



Wire Options

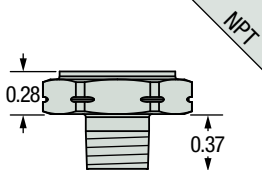
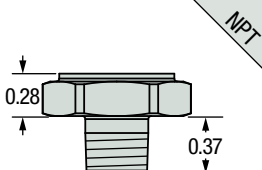
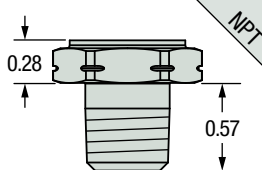
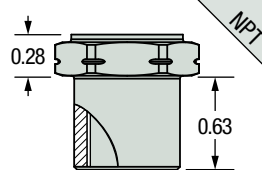
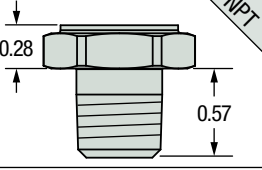
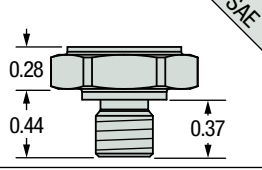
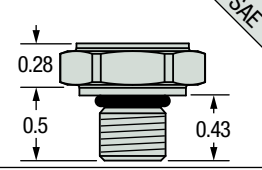
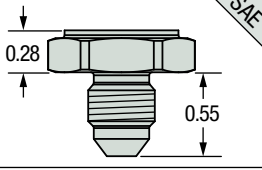
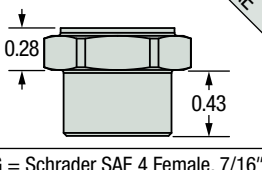
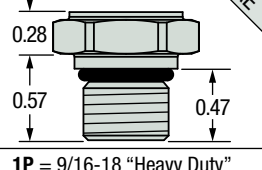
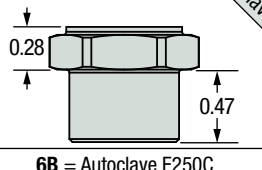
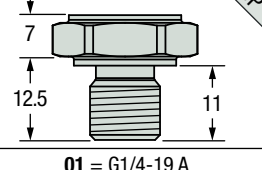
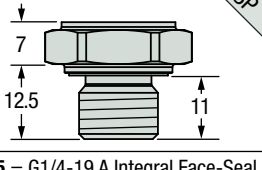
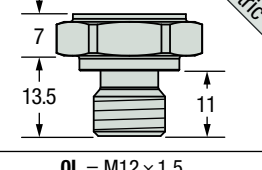
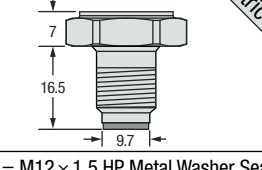
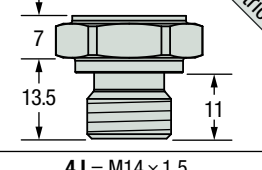


Pressure Capability

Pressure Range psi (bar)	Proof Pressure (× Full Scale)		Burst Pressure (× Full Scale)	
	3100	3200	3100	3200
100–300 (7–25)	3.00 × FS	3.00 × FS	40 × FS	
500–1,500 (40–100)	2.00 × FS		20 × FS	
2,000–6,000 (160–400)			10 × FS	
7,500–9,000 (600)			4 × FS	10 × FS
10,000 (700)		>60,000 psi (4,000 bar)		
15,000 (1,000)	2.50 × FS		1.8 × FS	
25,000 (1,800)	1.40 × FS	—	1.5 × FS	—
30,000 (2,200)				

Pressure Ports

NPT, SAE, and BSP dimensions in inches. Metric dimensions in millimeters.

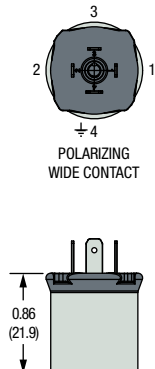
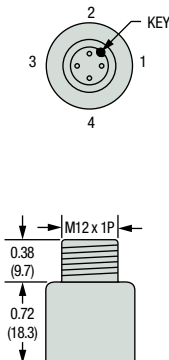
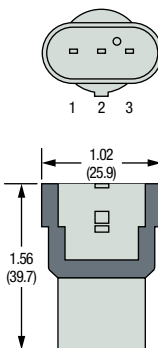
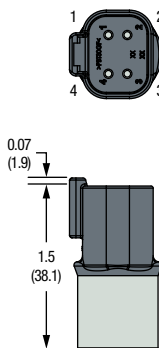
				
Fitting Code	08 = 1/8-27 NPT	4D = 1/8-27 NPT Dryseal	02 = 1/4-18 NPT	0E = 1/4-18 NPT Internal
Torque	2–3 TFFT*	2–3 TFFT*	2–3 TFFT*	2–3 TFFT*
				
Fitting Code	4C = 1/4-18 NPT Dryseal	4N = 3/8-24 UNF	1J = 7/16-20 UNF	04 = 7/16-20 UNF with 37° Flare
Torque	2–3 TFFT*	18–20 NM	18–20 NM	15–16 NM
				
Fitting Code	1G = Schrader SAE 4 Female, 7/16"	1P = 9/16-18 "Heavy Duty"	6B = Autoclave F250C	01 = G1/4-19 A
Torque	18–20 NM	18–20 NM	18–20 NM	30–35 NM
				
Fitting Code	05 = G1/4-19 A Integral Face-Seal	0L = M12 x 1.5	2T = M12 x 1.5 HP Metal Washer Seal	4J = M14 x 1.5
Torque	30–35 NM	28–30 NM	30–35 NM	30–35 NM

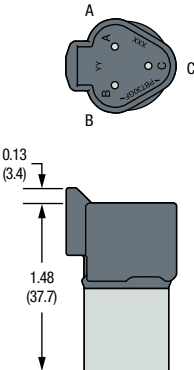
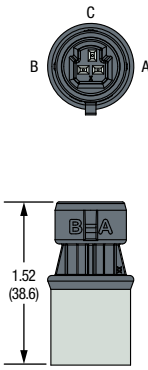
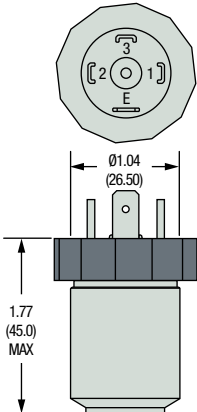
* NPT Threads 2–3 turns from finger tight. Wrench tighten 2–3 turns.

General Notes:

1. The diameter of all cans is 19 mm (0.748")
2. Hex is 22 mm (0.866") Across Flats (A/F) for deep socket mounting.
3. O-Ring material, where applicable, is Viton® unless otherwise specified.

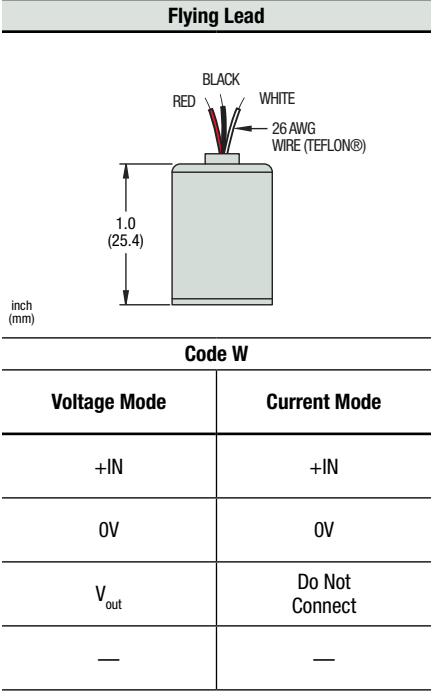
Integral Connector Options

DIN 9.4 mm				M12 × 1P		Amp Superseal 1.5		Deutsch DT04-4P		
										
Code B		Code R		Code E		Code 6		Code 8		
Pin #	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode
1	V _{out} 1 (pressure)	Do Not Connect	+IN	+IN	+IN	+IN	V _{out}	Do Not Connect	0V	0V
2	+IN	+IN	0V	0V	V _{out} 1 (pressure)	Do Not Connect	0V	0V	+IN	+IN
3	PE or V _{out} 2 (temp)*	PE	V _{out}	Do Not Connect	0V	0V	+IN	+IN	PE or V _{out} 2 (temp)*	PE
4	0V	0V	PE	PE	PE or V _{out} 2 (temp)*	PE	—	—	V _{out} 1 (pressure)	Do Not Connect

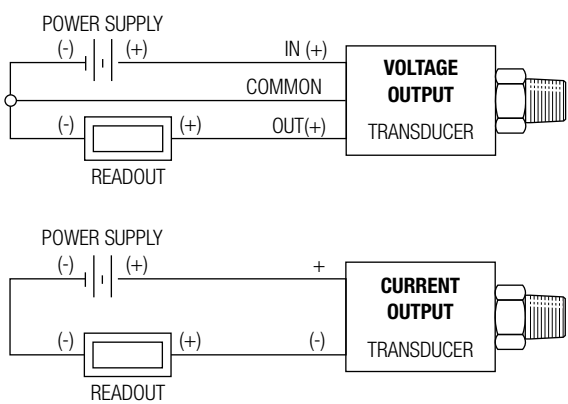
Deutsch DT04-3P			Packard Metri-Pack		DIN 43650A		
							
Code Y			Code 9			Code G	
Pin ID	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Pin #	Voltage Mode	Current Mode
A	+IN	+IN	0V	0V	1	+IN	+IN
B	0V	0V	+IN	+IN	2	0V	0V
C	V _{out}	Do Not Connect	V _{out}	Do Not Connect	3	V _{out} 1 (pressure)	Do Not Connect
E	—	—	—	—	E	PE or V _{out} 2 (temp)*	PE

* This pin is used for temperature sensing output when this option is utilized. Otherwise, the pin is used for PE.

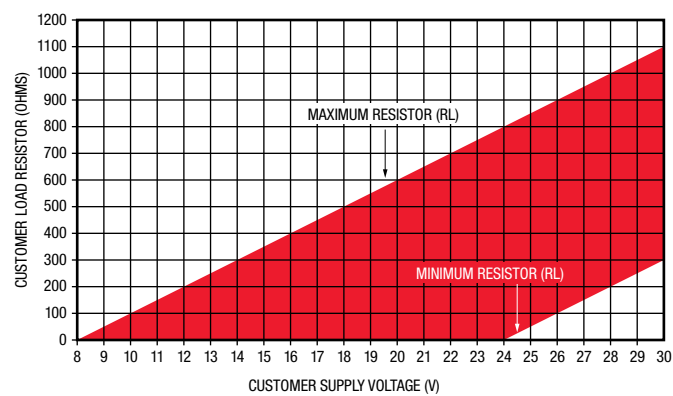
Wire Options



Wiring Diagram



Current Output Mode (Load Resistor Range)



Minimum Resistor Value = $50 \times (+V - 24)$ for $+V > 24V$
Maximum Resistor Value = $50 \times (+V - 8)$ for $+V > 8V$

Note: Mating connectors available upon request - contact factory.

How to Order

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

XXXX			X	XXXXX	XX	X	X	
Series								Optional Restrictor
3100 / 3200 - Pressure Transducer								R - Restrictor
Combination Pressure and Temperature ¹								O - No Restrictor
3101 / 3201 - Temp. Output Range -40°C to 125°C								Electrical Connection
3102 / 3202 - Temp. Output Range 0°C to 100°C								B - Industrial DIN 9.4 mm
3103 / 3203 - Temp. Output Range 0°C to 80°C								(mating connector not supplied)
Output								E - M12 × 1P (4-Pin)
B - 4–20 mA	C - 1–6 V	H - 1–5 V						G - Large DIN
N - 0.5–4.5 V	R - 0–5 V ²	S - 0–10 V ²						R - Industrial DIN 9.4 mm (alternate pin out)
T - 0.5–4.5 V Ratioetric								W - Flying lead (12 inches/300mm)
Pressure Range – psi								Y - Deutsch DT04-3P
100PG - 0–100 psiG	10CPG - 0–1,000 psiG	10KPS - 0–10,000 psiS						6 - Amp - Superseal 1.5 Series
150PG - 0–150 psiG	15CPS - 0–1,500 psiS	15KPS - 0–15,000 psiS ⁴						8 - Deutsch DT04-4P
200PG - 0–200 psiG	20CPS - 0–2,000 psiS	20KPS - 0–20,000 psiS ⁴						9 - Packard Metri-Pack
300PG - 0–300 psiG	25CPS - 0–2,500 psiS	25KPS - 0–25,000 psiS ⁴						Pressure Port ⁵
500PG - 0–500 psiG ³	30CPS - 0–3,000 psiS	32KPS - 0–32,000 psiS ⁴						08 - 1/8-27 NPT External
600PG - 0–600 psiG	35CPS - 0–3,500 psiS							02 - 1/4-18 NPT External
750PG - 0–750 psiG	40CPS - 0–4,000 psiS							04 - 7/16-20 External (SAE #4, J514)
	50CPS - 0–5,000 psiS							0E - 1/4-18 NPT Internal
	60CPS - 0–6,000 psiS							1G - Schrader SAE #4, 7/16" Internal
	75CPS - 0–7,500 psiS							1J - 7/16-20 External (SAE #4, J1926-2)
Pressure Range - bar								1P - SAE 6 (9/16-18 UNF 2A)
0007G - 0–7 barG	0160S - 0–160 barS	1000S - 1,000 barS ⁴						4C - 1/4-18 NPTF External (Dryseal)
0010G - 0–10 barG	0250S - 0–250 barS	1600S - 1,600 barS ⁴						4D - 1/8-27 NPTF External (Dryseal)
0016G - 0–16 barG	0400S - 0–400 barS	2200S - 2,200 barS ⁴						4N - 3/8-24 UNF External (SAE J1926)
0025G - 0–25 barG	0600S - 0–600 barS							6B - Autoclave 250C Internal (15,000 psi, >1000 bar)
0040G - 0–40 barG								European Threads
0060G - 0–60 barG								01 - G1/4 A External
0100S - 0–100 barS								05 - G1/4 A External Soft Seal
								0L - M12 × 1.5 (<1,000 bar, 15,000 psi)
								2T - M12 × 1.5 (6g) (≥1,000 bar, 15,000 psi)
								4J - M14 × 1.5 Straight

Notes:

1. Temperature outputs are for voltage output pressure sensors only (applies to codes **-C**, **-H**, **-N**, and **-T** only) and limited to electrical codes **-B**, **-E**, **-G**, and **-8**. Accuracy is 3.5% of temperature span. Requires additional 2 mA of power.
2. For use with pull-up or pull-down resistors, contact factory.
3. **500PG** - 0–500 psiG not available as 3200 Series in output code **-B** (4–20 mA) and **-S** (0–10V).
4. Ranges 15,000 psi (1,000 bar) and above available with **-2T** and **-6B** pressure ports only.
5. Pressure ports **0E**, **6B**, and **1G** are not available with the **-R** Restrictor option.

FS-150 Series – Straight Flow Path with Low Pressure Drop

Flow Rate Settings: Liquids: 0.5 GPM to 5 GPM

Port Size: 1/2" NPT

Primary Construction Material: Polypropylene

Setting Type: Fixed

These slim, inline switches reduce pressure drop to a minimum. They incorporate a unique, dual-diameter, internal bore and piston configuration to minimize 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

Wetted Materials	
Housing	Polypropylene, Hydrolytically Stable, Glass Reinforced
Piston	Ryton® -R4, 316 Stainless Steel
O-Ring	Viton®
Spring	316 Stainless Steel
Operating Pressure, Maximum	200 PSIG (13.8 bar) @+70°F to +150°F (+21.1°C to 65.5°C) 150 PSIG (10.3 bar) @+150°F to +212°F (+65.5°C to +100°C)
Operating Temperature	0°F to 212°F (-17.8°C to +100°C)
Set Point Accuracy	±15%
Set Point Differential	20% Maximum
Switch*	SPST, 20 VA
Inlet/Outlet Ports	1/2" NPT Male
Electrical Termination	1/4" Male Quick Connect Terminals (2)

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

How To Order – Standard Models

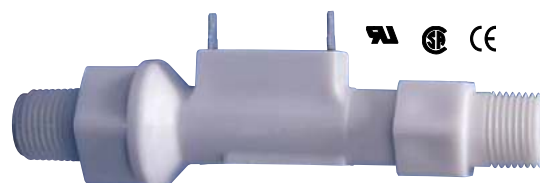
Specify Part Number based on flow setting and switch operation.

Flow Settings GPM	Part Numbers	
	Normally Open @ No Flow	Normally Closed @ No Flow
0.5	129660 ⚡	129666
1.0	129661 ⚡	129667
2.0	129662 ⚡	129668
3.0	129663	129669
4.0	129664	129670
5.0	129665	129671

Notes:

- Flow settings are calibrated using water @ +70°F on increasing flow, with units in a horizontal position (terminals up).
- Care should be taken by specifiers to ensure fluid compatibility with the above listed wetted materials.
- Use of 150 micron filtration is recommended.

⚡ – Stock Items.

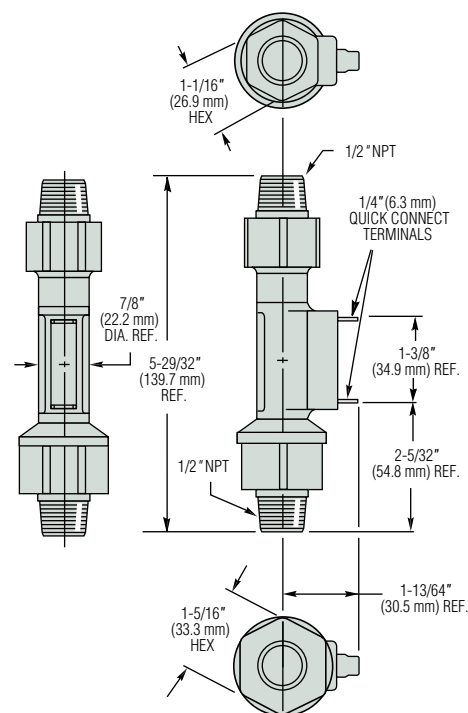


U.L. RECOGNIZED —
FILE NO. E31926
CSA Listed —
File No. LR30200



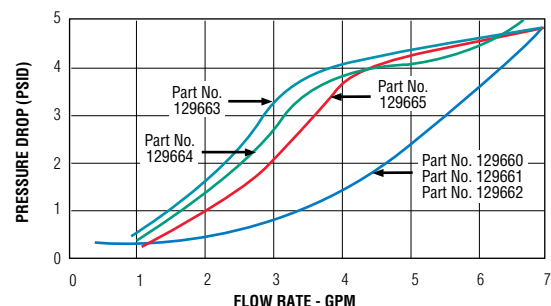
Patent #
4.996.396

Dimensions



Note: Cable output available. Please consult factory.

Pressure Drop - Typical



Tests conducted with units in a horizontal position with water at +70°F (21°C). Data will vary slightly for vertically mounted units.

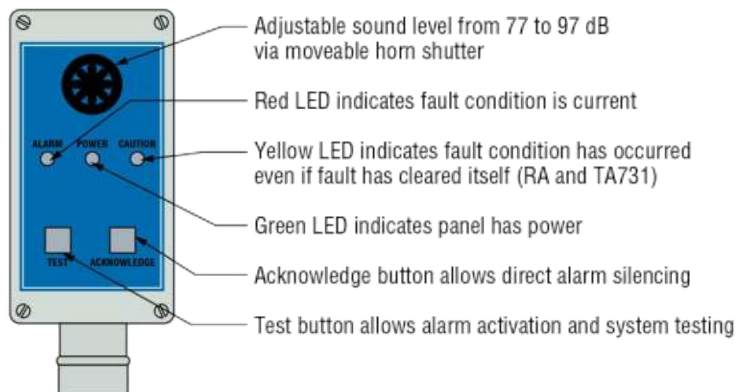
RA431 and TA73x Alarm Panels Scream Warning @ 97 dB

RA Features

- Can be used with conductivity probes
- Small footprint design
- Size 6 pan head screw connections

TA Features

- Intrinsically safe approved
- Auxiliary contact for remote annunciation or cutoff
- One or two channels
- Two conduit connection hubs



Specifications

Supply Voltage	120 VAC +10%/-15%, 4.8 VA Max.
Indicators	Red, Green and Yellow Solid-State LED's
Audible Alarm	Field Adjustable From 77 to 97 dB @ 2 Feet
Enclosure	
TA Series	Polycarbonate
RA Series	NEMA 4 – Weather tight polycarbonate
Sensor Voltage	12 VAC or 12 VDC
Terminals	Size 6 Pan Head Screws with Captive Wire Clamping Plate
Temperature	-22°F to +150°F (-5.5°C to +65.5°C)
Sensitivity	0-26K Ohm Maximum Specific Resistance
Maximum Wire Run	1000 Feet (14 or 16 Gauge MTW or THHN Wire)
Conduit Connection	3/4" FNPT, PVC Material
Listings	
TA Series	U.L. 913 Intrinsically Safe, File # E44570
RA Series	U.L. 508 Motor Control, File # E138209

How To Order

Select Part Number based on switch logic and number of channels.

RA Series

Used for non-hazardous liquid monitoring applications.

Interface Contacts	Part Number
N.O. Dry (Sensor Normally Dry)	RA-431A-0
N.C. Dry (Sensor Normally Wet)	RA-431B-0

TA Series

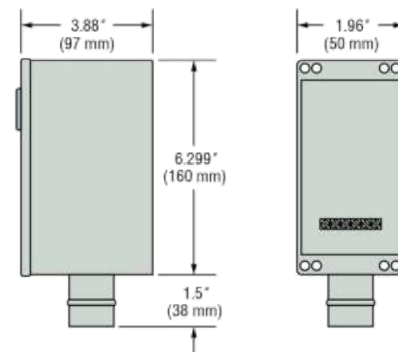
Intrinsically-safe for hazardous locations.

Interface Contacts	Number of Channels	Part Number
N.O. Dry (Sensor Normally Dry)	1	TA-731A-0
	2	TA-732A-0
N.C. Dry (Sensor Normally Wet)	1	TA-731B-0
	2	TA-732B-0

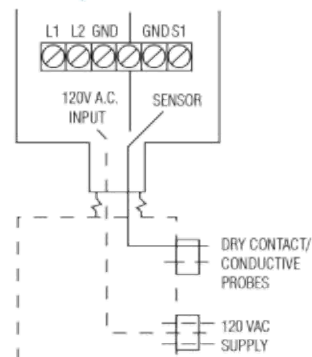


RA-431 shown.
TA Series includes an additional 1/2" NPT conduit connection for power.

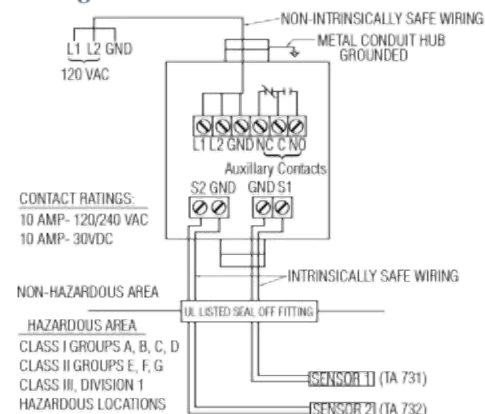
Dimensions



Wiring – RA Series



Wiring – TA Series



BS Series – Higher Flow

- ▶ MOPD: 150 PSI (10 Bar)
- ▶ C_v Range: 0.035 to 0.300 (K_v Range: 0.030 to 0.256)
- ▶ 7 Watts

The BS Series is a 2-way, high flow, isolation valve that is designed to be virtually impervious to chemical attack and to protect high purity media. When your media cannot come in contact with any metallic materials, this highly versatile, modular valve delivers the protection you need for accurate and reliable flow control for millions of cycles. With a variety of body, and diaphragm materials, plus numerous port configurations, voltage options, and coil constructions, the BS Series is truly a miniature inert isolation valve that can be built to your exact applications requirements.

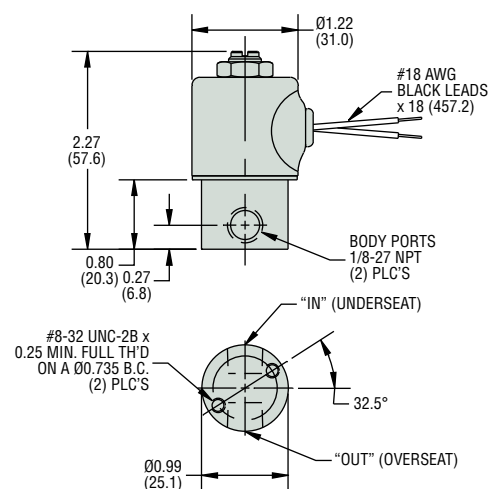
Typical Applications

- Remediation Equipment
- Clinical Chemistry Equipment
- Analytical Instrumentation

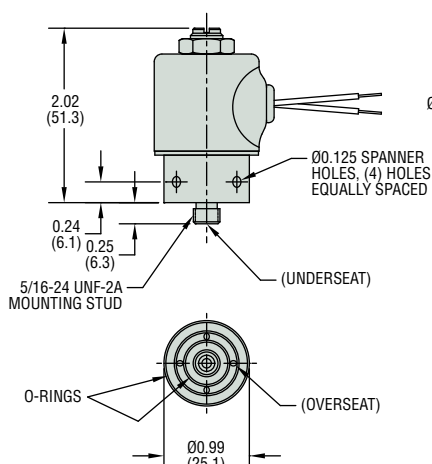


Dimensions

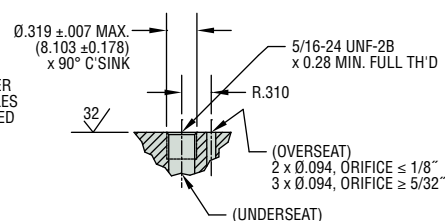
Threaded Port Body



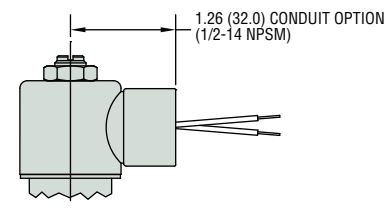
Manifold Mount Body



MANIFOLD MATING DIMENSIONS



Alternate 1/2" Conduit Housing Available on all body configurations



How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

BS2010 - W25 - E - 28VDC

1

Primary Prefix

2

Coil Construction

3

Body Material*

4

Diaphragm Seal Material

5

Body Port Configuration*

6

Voltage

7

Additional Options*

* Blank entry indicates a "Standard" selection (303 Stainless Steel in the case of Body Material).

Example:

BS2010-W25-E-28VDC

303 Stainless Steel (grommet housing) solenoid valve with a 3/64" orifice, 25" (63.5cm) tape-wrapped coil, lead-wires, EPR diaphragm seal, 1/8-27 NPT female thread, operating at 28 VDC.

Part Prefix Table ①

Body Material	Orifice		MOPD*		C _v	K _v	① Primary Prefix	
	Body		psig	bar	Body		Grommet Housing	Conduit Housing
	inches	mm						
303 Stainless Steel	3/64	1.19	150	10	0.035	0.030	BS2010	BS2020
	1/16	1.59	110	7.6	0.065	0.055	BS2011	BS2021
	5/64	1.98	85	6.2	0.090	0.077	BS2012	BS2022
	3/32	2.38	70	4.8	0.155	0.132	BS2013	BS2023
	7/64	2.78	25	3.1	0.200	0.171	BS2014	BS2024
	1/8	3.18	10	1.0	0.240	0.205	BS2015	BS2025
	5/32	3.97	5	0.3	0.300	0.256	BS2016	BS2026

* Excessive downstream pressure and/or restrictions may increase closing time.

② Coil Construction

(blank) = Tape-wrapped, Class B (130°C), with 18" (45.7cm) lead wires*

W___ = Tape-wrapped coil, lead wires, non-standard length
(specify length in inches)

10 = Externally rectified coil (AC voltages and lead wires only)

1 = Encapsulated coil, Class B (130°C), lead wires

3 = Encapsulated coil, Class H (180°C), lead wires

4 = Encapsulated coil, Class B (130°C), 3/16" (4.76mm) spade terminals
(1/4" (6.35mm) spade terminal optional)

11 = Tape-wrapped coil, Class H (180°C), lead wires

HC2 = Encapsulated coil, Class B (130°C), 9.4mm DIN
(EN175301-803 Style C Industrial 2+1 poles)

③ Body Material

(blank) = 303 Stainless Steel*

BB = Brass

SB = 304 Stainless Steel

SB5 = 316 Stainless Steel

④ Diaphragm Seal Material

(blank) = Viton® diaphragm*

E = EPDM diaphragm

NS = Nitrile (NSF/FDA) diaphragm

PF = Perfluoroelastomer diaphragm

⑤ Body Port Configuration

(blank) = 1/8-27 NPT female thread*

LB = 1/4-18 NPT female thread

BD = #10-32 female straight thread

– max. orifice = 1/8" (3.18mm)

LT = 1/8-28 BSPT female thread

LU = 1/4-19 BSPT female thread

MM = Manifold mount (1/4-28 UNF-2A mounting stud)†

MM3 = Manifold mount (5/16-24 UNF-2A mounting stud)†

OB = Omit body (operator style)

BI = Bottom Inlet (3/32" Orifice, Max.)

BIM = Bottom Inlet Male (1/8" NPT porting only; 5/64" Orifice, Max.)

BO = Bottom Outlet

BOM = Bottom Outlet Male (1/8" NPT porting only; 3/32" Orifice, Max.)

RL = 90° porting - left hand

⑥ Voltage

___VDC = DC (specify voltage)

___VAC = AC Rectified only (specify voltage)

⑦ Additional Options*

(blank) = No additional option

WM = Mounting bracket

OC = Cleaned for oxygen use

* Standard selection; will be used unless otherwise specified. Standard selections are not referenced in final part number.

† Teflon® o-ring not suitable for manifold mount.

AS Series

- ▶ MOPD: 150 PSI (10 Bar)
- ▶ C_v Range: 0.02 to 0.30 (K_v Range: 0.017 to 0.256)
- ▶ 7 Watts

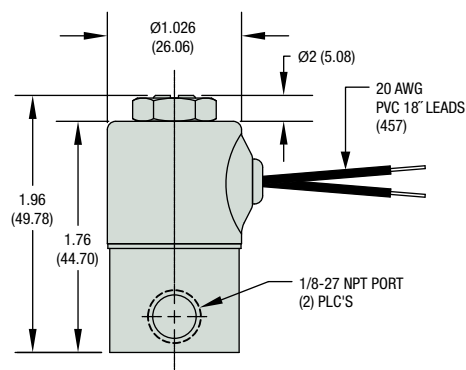
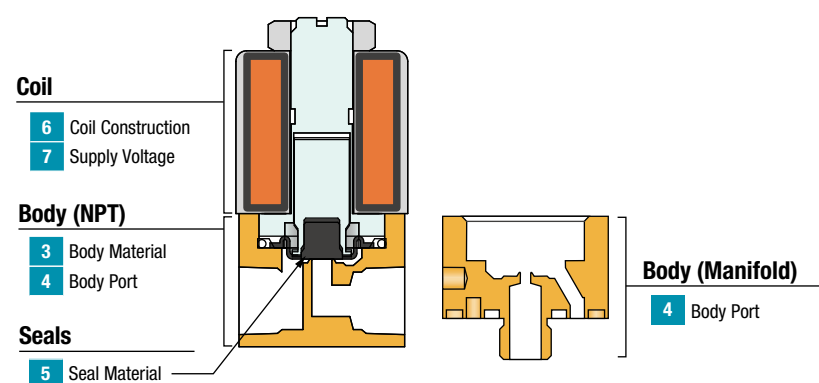
The AS Series is a 2-way isolation valve, designed to control the flow of various aggressive liquids and gases with several body and diaphragm materials. With a modular design, the AS offers performance flexibility and the protection your media needs from the solenoid's internal components. Numerous port configurations, voltage options, and coil constructions enable the AS Series to be a truly versatile miniature inert isolation valve, easily integrated into any complex or demanding system.

Typical Applications

- Analytical Instruments
- Clinical Diagnostic Analyzers
- Bio-Instrumentation

Reference

2-Way Valve



Example Shown

Part Number: AS2036-01LC-V-G1-204
From How to Order example below.

How To Order

Valve Part Numbers are built from a series product codes. Use the **Bold** product codes from the choices listed on the following page to construct a complete Part Number.

AS	20	36	-	01	LC	-	V	-	G1	-	204
Series	Function	MOPD	-	Body Material	Body Port	-	Seal Material	-	Coil Construction	-	Supply Voltage

Product Description from Example Shown Above:

AS2036-01LC-V-G1-204

AS2036 = AS Series with 2-Way Normally Closed Valve Function; 15 MOPD

-01LC = 303 Stainless Steel Body Material; 1/8" NPT Female Body Port

-V = Viton® Seal Material

-G1 = Grommet Housing, Tape-Wrapped (Class B) Coil Construction

-204 = 24 VDC Supply Voltage

AS Series – Part Number Build

Build a Valve Part Number by filling in the boxes below using the related code numbers on this page.

AS			-			-		-			-	
Series	1	2		3	4		5		6		7	

1 + 2 Valve Function & Maximum Operating Pressure Differential

Valve Function	Code	MOPD		Max Back Pressure		C _v	K _v	Orifice	
		psig	bar	psig	bar			Body	Body
								inches	mm
2-WAY Normally Closed	2017	150	10	5	0.3	0.020	0.017	1/32	0.79
	2021	110	7.6	5	0.3	0.035	0.030	3/64	1.19
	2023	90	6.2	5	0.3	0.065	0.055	1/16	1.59
	2027	70	4.8	5	0.3	0.090	0.077	5/64	1.98
	2030	45	3.1	5	0.3	0.155	0.132	3/32	2.38
	2036	15	1.0	5	0.3	0.240	0.205	1/8	3.18
	2038	5	0.3	5	0.3	0.300	0.256	5/32	3.97

3 Body Material

- 01** 303 Stainless Steel
- 03** Brass
- 05** 316 Stainless Steel
- XX** No Body
(4 Body Port **OB** only)

6 Coil Construction

- G1** Grommet Housing,
Tape-Wrapped (Class B) Lead Wires
- G5** Grommet Housing,
Epoxy Encapsulated (Class B) Lead Wires

4 Body Port

- LC** 1/8" NPT Female
- MM** Manifold Mount
(1/4"-28 Stud)
- OB** Omit Body (operator only)*
(3 Body Material **XX** only)

7 Supply Voltages

- 203** 12 VDC
- 204** 24 VDC

5 Seal Material

- E** EPR
- V** Viton®

* Contact Gems for the operator orifice drawings

AS Series – Additional Component Details & Dimensions

1 Valve Function

Flow Schematic

Flow Key

- Blocked Flow
- Free Flow
- O/S = Over Seat
- U/S = Under Seat

Valve Type	De-Energized	Energized
2-Way Normally Closed		

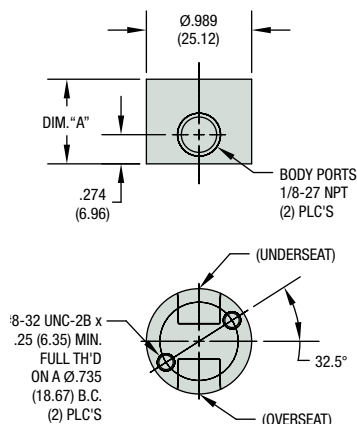
AS Series – Additional Component Details & Dimensions, cont.

4 Body Port

Note: Contact Gems for the operator orifice drawings

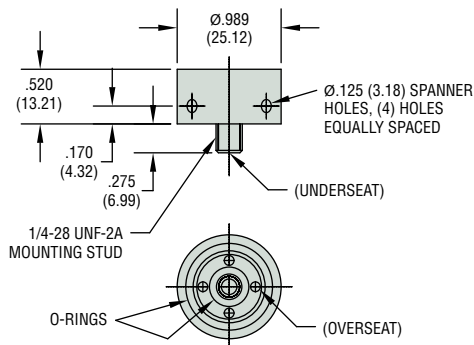
Ported Bodies

1/8" NPT Port (LC)

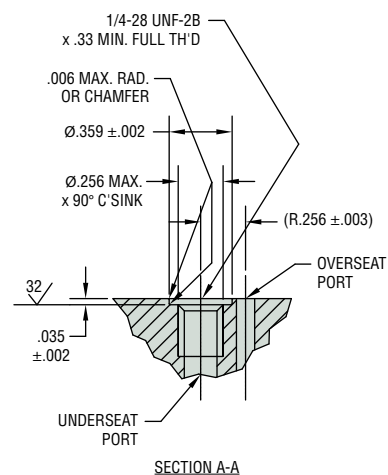
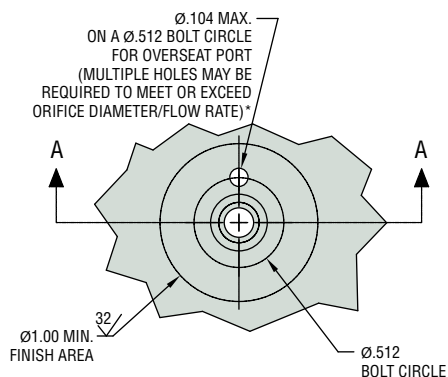


Orifice Size Range	Dim. "A"
1/32" – 3/32"	.795 (20.19)
1/8" & 5/32"	.820 (20.83)

Manifold Mount 1/4"-28 Stud Body (MM)



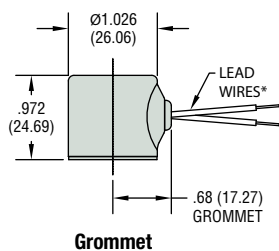
Manifold Preparation



* If the total area of overseat port is less than the orifice diameter, then the overseat is the restrictor.

Valve Type	Overseat Port	Underseat Port
2-Way N.C.	OUT	IN

6 Coil Construction



Grommet

Small Size – Engineered Plastics

XM/XT-300 Engineered Plastics Series

Brings Continuous Output to Shallow Tanks

Your most complete line of small, polysulfone liquid level sensors...all from Gems Sensors.

- ▶ All-Plastic Wetted Parts
- ▶ 4mm Resolution
- ▶ Indicating Length to 14" (356 mm)

Designed for the needs of the OEM, XM/XT-300 Series transmitters are the ideal level sensor for shallow tanks and reservoirs. Compact and versatile, these plastic level sensors offer a broad choice of mountings and float materials. The following pages illustrate the various design parameters available to configure the versatile XM/XT-300 Series Sensors.

1. Mounting Types

Each mounting type can be configured with stem lengths (L_0) and float materials indicated in this bulletin.





NPT Threads		Straight Threads		
Type 21 1/8" NPT	Type 22 1" NPT	Type 31 3/8" - 24	Type 32 1-5/16" - 12	Type 33 5/8" - 11
Metric Threads			Compression Types	
Type 41 G 1/4" (1/4" - 19 BSP)	Type 42 G 1" (1" - 11 BSP)	Type 51 M12 x 1.5 Straight Thread	Type 71 ¹ 5/8" - 11	Type 11 No Mounting
Flange Mountings ²				
Type 61 2" O.D. Flange		Type 63 Pop Flange		
Ø0.156/4 (4) HOLES EQUALLY SPACED AS SHOWN ON A 1.50" 738 B.C.		MOUNT IN Ø1.31" - 1.32" OPENING		
Stem, Mounting and Collar Material	Polysulfone			
Max Length (L_0)	20 inches (508 mm), Tolerance of $L_0 = \pm 1/16"$ (1.6 mm)			
Mounting Position	Vertical $\pm 30^\circ$ Inclination			

Notes:

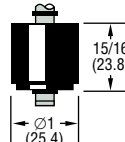
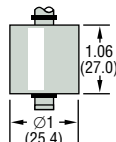
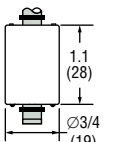
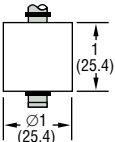
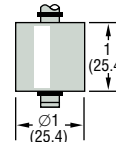
1. Type 71 mounting to be used with 3/4" diameter float only.
2. Not recommended for pressure applications.

Dimensions expressed as: inches (millimeters)

2. Electrical Connections

	Type 1 Leadwire	Type 2 Cable
		
Compatible Mounting Type(s)	All	
Protection Rating	IP64	
Extended Leads	#22 AWG PVC Wire, 24" (610mm) Min.	#22 AWG PVC Jacketed Cable, 24" (610mm) Min.

3. Float Types

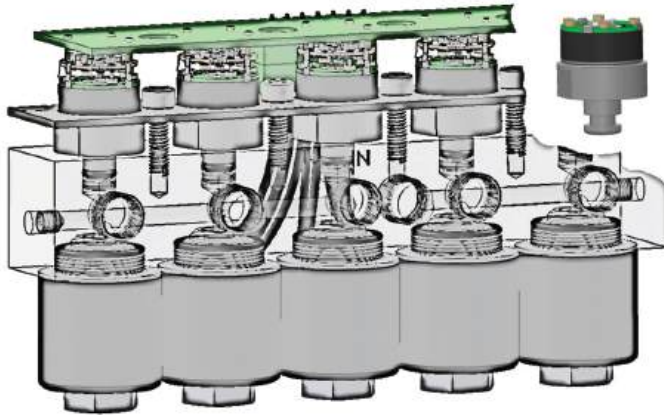
Float Material	Buna N	Polysulfone	Polypropylene		PVDF	
			Solid Foamed	Hollow – 20% Glass Filled		
Float Dimensions						
Part Number	245900	39005	231500	119455	259125	174515
Float Material Suitable for...	Oil, Fuels	Water-based Liquids	Broad Chemical Use		Low Specific Gravity Liquids	Broad Chemical Use
Operating Temperature ¹	Water: to 180°F (80°C) Oil: -40°F to +221°F (-40°C to +105°C)	-40°F to +221°F (-40°C to +105°C)	-40°F to +212°F (-40°C to +100°C)		-40°F to +221°F (-40°C to +105°C)	-40°F to +250°F (-40°C to +121°C)
Pressure, psi (bar) Max. ²	250 (17)	50 (3.5)	Atmospheric	250 (17)	50 (3.5)	50 (3.5)
Min. Media Specific Gravity	0.45	0.75	0.95	0.90	0.65	0.86

Notes:

- Operating temperature range based on float ratings.
- When used with mounting Type 21, 32 or 22 only; Mounting Type 61, and 63 are not recommended for pressure applications. Pressures are derated with increasing temperature above 70°F

Dimensions expressed as: ^{inches}
(millimeters)

3100 PRESSURE PACKS



Specifications

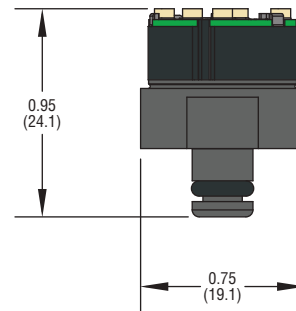
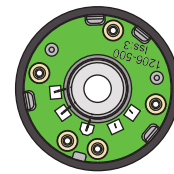
All specifications listed are of "typical applications" and do not represent the extreme ranges of applications. For extreme applications consultations are encouraged.

Long Term Drift	0.2% FS/YR
Accuracy	.25% FS
Thermal Error	.83% FS/100°F (38°C)
Compensated Temperatures	-40°F to +257°F (-40°C to 125°C)
Operating Temperatures	-40°F to +257°F (-40°C to 125°C)
Zero Tolerance	1%
Span Tolerance	1%
Response Time	1ms
Fatigue Life	100,000,000 Cycles
Wetted Parts	17-4 PH Stainless Steel
Voltage Output	
Output (3 wire)	0V Min to 10V Max
Supply Voltage	2 Volts above full scale (30 Vdc Max)
Source and Sinks	2mA
Current Output	
Output (2 wire)	4-20mA
Supply Voltage	8-30Vdc
Max Loop Resistance	(Supply Voltage – 8) x 50 Ohms
Ratiometric Output	
Output	0.5-4.5Vdc
Supply Voltage	5Vdc ±10%

Pressure Solutions

When space is a premium but you can't compromise on: accuracy, stability, reliability, media compatibility or vibration resistance; choose to integrate the industry leading pressure transducer.

Typical Space Requirements



inch
(mm)

PM/PL Series

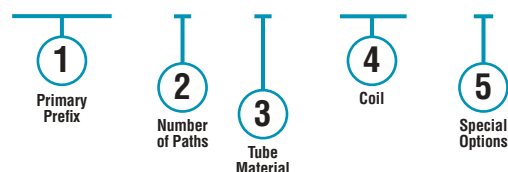
- ▶ 2-Way Normally Open/Closed; 3-Way Directional
- ▶ MOPD: 15 PSIG to 30 PSIG (1.03 bar to 2.07 bar)
- ▶ As Low as 2.8 Watts; Based on Configuration

These pinch valves offer 2-way Normally Open (NO) and Closed (NC), or 3-way Directional Control operation. While sharing similar configurations with the PM Series, the PL Series features larger tubing sizes. Their design ensures that only the inside of the tubing contacts the fluid.

How To Order

Use the **Bold** characters from the choices listed on the following page to construct a product code.

PM224 - 1 - S - C203 - H



Example: PM224-1-S-C203-H

2-Way N.O. solenoid valve with a single path and silicone tube, optional mounting holes, and operating at 12 VDC.



Part Prefix Table ①

	Tube Size		Min Pressure (psig)	Max Pressure (psig)	① Primary Prefix
	I.D. (inches)	O.D. (inches)			
2-WAY N.C.	0.01	0.093	vacuum	30	PM200
	0.023	0.093	vacuum	20	PM201
	1/32	3/32	vacuum	15	PM202
	0.05	0.134	vacuum	15	PM203
	1/16	1/8	0	15	PM204
	1/32	3/32	vacuum	25	PL202
	1/16	1/8	0	25	PL204
	1/16	3/16	vacuum	25	PL205
2-WAY N.O.	1/8	1/4	vacuum	20	PL206
	0.01	0.093	vacuum	30	PM220
	0.023	0.093	vacuum	20	PM221
	1/32	3/32	vacuum	15	PM222
	0.05	0.134	vacuum	15	PM223
	1/16	1/8	0	15	PM224
	1/32	3/32	vacuum	25	PL222
	1/16	1/8	0	25	PL224
3-WAY Directional Control	1/16	3/16	vacuum	25	PL225
	1/8	1/4	vacuum	20	PL226
	0.023	0.093	vacuum	20	PM341
	1/32	3/32	vacuum	15	PM342
	0.05	0.134	vacuum	15	PM343
	1/16	1/8	0	15	PM344
	1/32	3/32	vacuum	25	PL342
	1/16	1/8	0	25	PL344
	1/16	3/16	vacuum	25	PL345
	1/8	1/4	vacuum	20	PL346

② Number of Paths

- 1 = Single Path
- 2 = Dual Path (Prefixes PLXX2 and PLXX4 only)
- 4 = 4 (Prefix PL222 only)
- 6 = 6 (Prefix PL222 only)
- 8 = 8 (Prefix PL222 only)

③ Tube Material

- S = Silicone
- C = C-Flex (Not available in Prefixes XXXX0, XXXX3, XXXX7)

④ Coil

- C203 = 12 VDC
- C204 = 24 VDC

⑤ Special Options

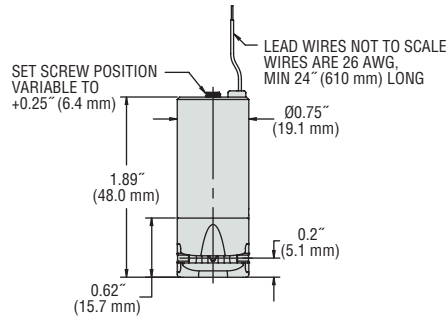
- Q = Quiet Operation
- F = Position Feedback Sensor
- H = Bottom Mounting Holes
- L = Low Power Consumption

* Standard selection; will be used unless otherwise specified.

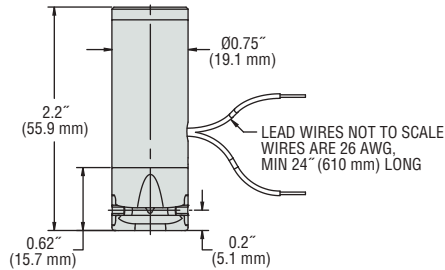
Dimensions

PM Series – 1/8" O.D. Tubing, Max.

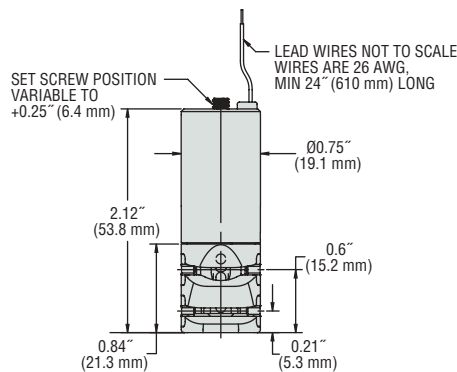
2-Way N.C.



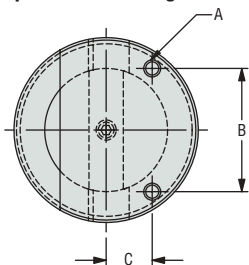
2-Way N.O.



3-Way



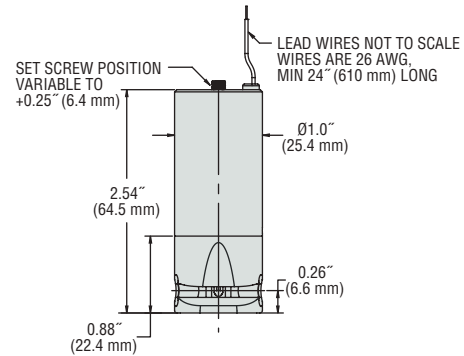
Optional Mounting Holes



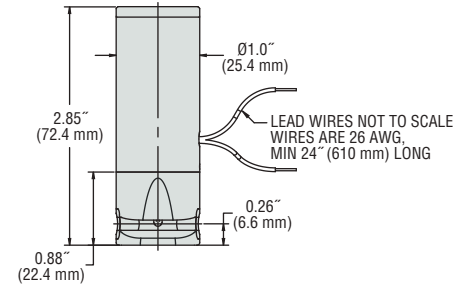
Valve Series	"A" Thread	"B" Center	"C"
PM20 / PM22	#2-56	0.5" (12.7 mm)	0.125" (3.2 mm)
PM34			0.132" (3.4 mm)
PL20 / PL22 / PL34	#4-40	0.687" (17 mm)	0.218" (6 mm)

PL Series – 1/4" O.D. Tubing, Max.

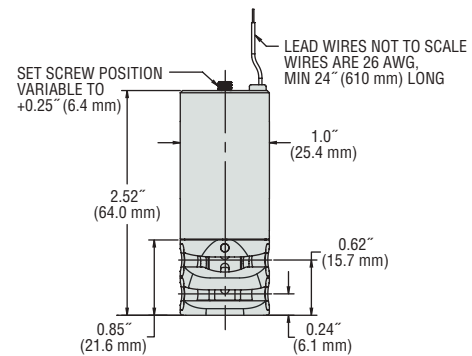
2-Way N.C.



2-Way N.O.



3-Way



809 Series – Industrial OEM Pressure Transducer

- ▶ Sensing Ranges from Vacuum to 10,000 psi (-1 to 690 bar)
- ▶ Rugged Stainless Steel & Valox® Housings
- ▶ Ideal for High Shock & Vibration Applications

The 809 Series pressure transducers are designed specifically for industrial applications with demanding price and performance requirements. They offer exceptional reliability in typical industrial grade environments. 809 Series transducers operate on low-cost, unregulated DC power, and over a wide temperature band with both liquids and gases. Designed for harsh environments, they are suitable for use in high shock and vibration applications. Stainless steel and Valox® housings are small and lightweight for easy integration into compact systems. The standard feature set of the 809 Series delivers exceptional performance in extreme environmental conditions at a price that OEMs will appreciate.

Common Specifications

Input	
Pressure Range	-14.7 to 10,000 psi (-1 to 690 bar)
Proof Pressure	See ordering chart
Burst Pressure	See ordering chart
Fatigue Life	>1 million cycles
Performance	
Supply Voltage (Vs)	9-30 VDC (5 VDC on 0.5-4.5 VDC units)
Long Term Drift	0.5% FS/year
Accuracy	±0.25% FS
Thermal Error Zero	±0.02% FS/°F (±0.036% FS/°C)
Thermal Error Span	±0.015% FS/°F (±0.030% FS/°C)
Compensated Temperatures	-4°F to +176°F (-20°C to +80°C)
Operating Temperatures	-40°F to +185°F (-40°C to +85°C)
Storage Temperatures	-40°F to +185°F (-40°C to +85°C)
Zero Tolerance	1% of span
Span Tolerance	1% of span
Response Time	5 ms
Mechanical Configuration	
Pressure Port	See ordering chart
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See Dimensions chart, next page
Enclosure	Weather-Resistant (Stainless Steel and Valox®)
Vibration	20g (MIL STD 202, Method 204, Condition C)
Shock	200g (MIL STD 202, Method 213B, Condition C)
Weight	2.3 oz

Individual Specifications

Voltage Output Units	
Output	3 Wire, see ordering chart
Current Consumption	8 mA
Min. Load Resistance	5000 ohms
Current Output Units	
Output	4-20 mA (2 wire)
Max. Loop Resistance	(Vs-9) x 50 ohms



1/2" Conduit



Cable



3-Pin Packard Connector



Hirschmann Connector

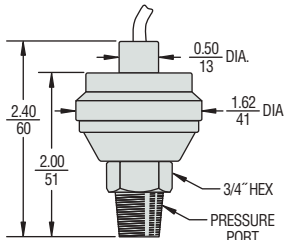
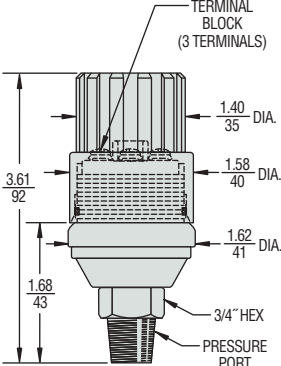
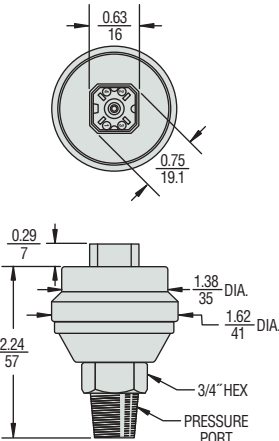
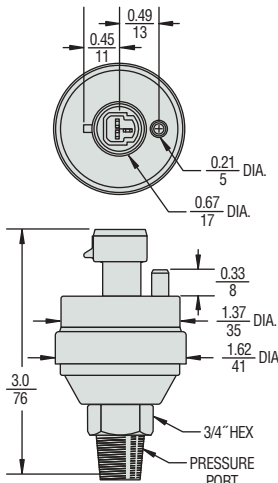
Applications

- Hydraulic Systems
- Compressor Control
- HVAC/R Equipment
- Industrial Engines
- Process and Containerized Refrigeration Systems
- Industrial OEM Equipment

How They Operate

809 Series transducers utilize a proven center mount electrode configuration combined with a durable 17-4 PH stainless steel pressure sensing element to form a variable capacitor. As pressure (or vacuum) increases or decreases, the capacitance changes. Self-contained high-level output IC-circuitry converts the change in capacitance to a fully conditioned linear voltage or current output signal.

Dimensions

Electrical Termination Style	Cable Anchor	1/2" Conduit	Hirschmann Connector	3-Pin Packard Connector
				
Terminal Specifications	Standard: 2 ft. multiconductor cable. Longer lengths options. See ordering chart.	1/2" conduit connection with 3-screw terminal block.	Mating connector is Hirschmann G4WIF. May be ordered separately from Gems—Option 590.	Mating connector is comprised of Packard P/Ns 12065287 & 12103881. May be ordered separately from Gems—Option 581/582.
Ordering Code	XX (cable length in feet)	A1 - Conduit	H2	P1 (3-Pin)

How to Order

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

SELECT

8091 - 001P - G - 2M - 11 - 02 - XXX

Series **8091** - 809 Series

Pressure Range Code

Pressures – psi

Code	Range	Proof	Burst	Code	Range	Proof	Burst
Z01	0 to -14.7	10	15	150P	0 to 150	300	1000
001P	0 to 1	2	250	200P*	0 to 200	400	2000
002P	0 to 2	4	250	250P*	0 to 250	500	2000
005P*	0 to 5	10	250	500P*	0 to 500	1000	3000
010P*	0 to 10	20	500	600P	0 to 600	1200	3000
015P	0 to 15	30	500	10CP*	0 to 1000	2000	5000
025P*	0 to 25	50	500	20CP	0 to 2000	3000	6500
030P	0 to 30	50	500	30CP	0 to 3000	4500	7500
050P*	0 to 50	100	750	50CP	0 to 5000	7500	10000
100P*	0 to 100	200	1000	10KP	0 to 10000	12500	20000

Datum

G - Gauge
C - Compound (030PC = -14.7 to 30 psi)
S - Sealed (available in 200 psi ranges and above)
V - Vacuum (**Z01** range code only)

Options

590 - Hirschmann Mating Connector (for H2 Termination)
581 - Packard Mating Connector, 3 ft. (for P1 Termination)
582 - Packard Mating Connector, 6 ft. (for P1 Termination)

Electrical Termination

XX - Cable length in feet (e.g., 02 = 2 ft.)*
P1 - Packard (3-Pin)
H2 - Hirschmann ("Mini")
A1 - 7/8" Hole for 1/2" Conduit*

Output

11 - 4-20 mA*
24 - 0.5-5.5 Vdc*
28 - 1-6 Vdc
45 - 0.5-4.5 VDC (5 VDC supply voltage)

Pressure Port

2M - 1/4" NPT Male*
J7 - 7/16" SAE Male (J1926-2)
1M - 1/8" NPT Male

* Standard configuration. Minimum 25 pieces apply for all other configurations.

31IS Series and 32IS Heavy Duty Series Intrinsically Safe Industrial Pressure Transmitters

- ▶ Ex II 1G; Ex ia IIB T4 Ga
- ▶ The 3XIS series is certified Intrinsically Safe for use in Group IIB Hazardous Areas, Zones 0, 1 and 2
- ▶ Certification: ATEX Certificate Baseefa10ATEX0196
IECEx Certificate GB/BAS/ExTR10/0230/00

For OEMs that need intrinsically safe pressure sensors with consistent high levels of performance, reliability and stability, the 31/32IS Series sputtered thin film units offer an unbeatable price performance ratio in a small package size. Their size makes them ideal for installation where space is at a premium. They feature all stainless steel wetted parts, a broad selection of electrical and pressure connections and a wide choice of electrical outputs.

32IS Series transmitters feature a thicker diaphragm and a pressure restrictor to withstand the rigors of cavitation or extreme pressure spikes, delivering years of reliable and stable performance in pulsating applications.

Specifications

Performance	
Long Term Drift	0.2% FS/YR (non-cumulative)
Accuracy	0.25% FS
Thermal Error	
31IS	±1.5% max, ±1% typical / 212°F (100°C)
32IS	±2% max
Operating & Compensated Temperatures	-40°F to +176°F (-40°C to +80°C)
Zero Tolerance, Max.	0.5% of span
Span Tolerance, Max.	0.5% of span
Fatigue Life	Designed for more than 100 M cycles
Mechanical Configuration	
Pressure Port	See under "How to Order," last page
Wetted Parts	17-4 PH Stainless Steel
Electrical Connection	See under "How to Order," last page
Enclosure	IP67 (IP65 for electrical code G)
Vibration	BSEN 60068-2-6 (FC) Sine (20G) BSEN 60068-2-64 (FH) Random (14.1 Grms)
Shock	BSEN 60068-2-27 (Ea) (50G, 11ms)
Approvals	
ATEX	Ex II 1G; Ex ia IIB T4 Ga, -40°F ≤ Ta ≤ +176°F (-40°C ≤ Ta ≤ +80°C)
IECEx	Ex ia IIB T4 Ga -40°F ≤ Ta ≤ +176°F (-40°C ≤ Ta ≤ +80°C)
ATEX/IECEx Common	When used in conjunction with a Zener safety barrier or Galvanic Isolation barrier. Fully RoHS Compliant
Weight	1.8 to 5.3 ounces (50-150 grams). Configuration dependant

EMC Specifications

Emissions Tests: EN61326-1:2006 and EN61326-2-3:2006	
EN55011:2007	Radiated Emissions: 30-230MHz 30dB µV/M @10M 230-1000MHz 37dB µV/M @10M
Immunity Tests: EN61326-1:2006 and EN61326-2-3:2006	
EN61000-4-2:2009	Electrostatic Discharge: ±4Kv contact ±8Kv air
EN61000-4-3:2006	Radiated Immunity: 10V/M 80-1000MHz 3V/M 1400-2000MHz 1V/M 2000-2700MHz
EN61000-4-4:2004	Fast Transients: ±0.25, 0.5, 1Kv
EN61000-4-6:2007	Conducted Immunity: 3V 0.15 to 80MHz 80% 1KHz modulation



Individual Specifications

Voltage	
Output (3-wire)	0V min. to 10V max. See under "How to Order," last page
Supply Voltage	1 Volt above full scale to 30V max @ 4.5 mA
Source and Sinks	2 mA
Current	
Output (2-wire)	4-20 mA
Supply Voltage	8-24 Volts measured at the input to the transducer terminals
Maximum Loop Resistance	(Supply Voltage - 8) x 50ohms See Graph
Ratiometric	
Output	0.5 to 4.5V (Source and sink 2mA)
Supply Voltage	5 Vdc ±10% @ 4.5mA

Pressure Capability

Pressure Range PSI (Bar)	Proof Pressure (x Full Scale)		Burst Pressure (x Full Scale)	
	31IS	32IS	31IS	32IS
100-300 (7-20)	3.00 x FS	3.00 x FS	40 x FS	
500-1,500 (40-100)	2.00 x FS		20 x FS	
2,000-6,000 (140-400)			10 x FS	
10,000 (700)			> 60,000 PSI (4,000 bar)	
15,000 (1,000)	2.50 x FS			
25,000 (1,800)	1.70 x FS			
30,000 (2,200)	1.40 x FS	—		

Pressure Ports

NPT and SAE Dimensions in Inches. Metric and BSP Dimensions in MM.


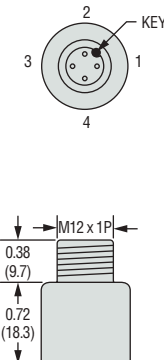
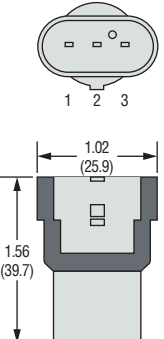
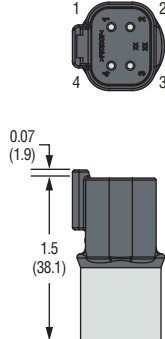
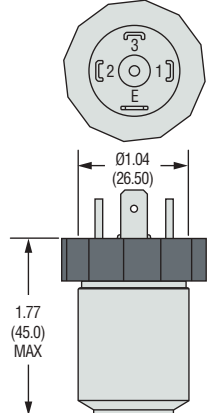
Fitting Code		08 = 1/8~27 NPT		4D = 1/8~27 NPTF Dryseal		02 = 1/4~18 NPT		0E = 1/4~18 NPT Internal	
Torque		2-3 TFFT*		2-3 TFFT*		2-3 TFFT*		2-3 TFFT*	
Fitting Code		4C = 1/4~18 NPTF Dryseal		4N = 3/8~24 UNF		1J = 7/16~20 UNF		04 = 7/16~20 UNF with 37° Flare	
Torque		2-3 TFFT*		18-20 NM		18-20 NM		15-16 NM	
Fitting Code		1G = SAE 4 Female 7/16" Schraeder		1P = 9/16~18 "Heavy Duty"		01 = G1/4~19 A		05 = G1/4~ 19 A Integral Face-Seal	
Torque		18-20 NM		18-20 NM		30-35 NM		30-35 NM	
Fitting Code		0L = M12 x 1.5		2T = M12x1.5 HP Metal Washer Seal		0K = M14 x 1.5			
Torque		28-30 NM		30-35 NM		2-3 TFFT*			

*NPT Threads 2-3 turns from finger tight. Wrench tighten 2-3 turns.

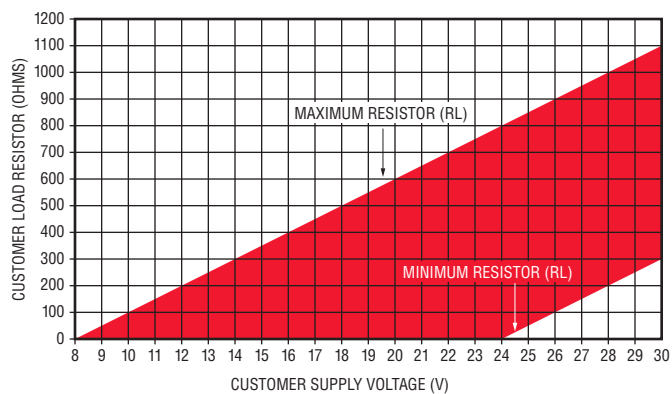
General Notes:

1. The diameter of all cans is 19 mm (0.748")
2. Hex is 22 mm (0.866") Across Flats (A/F) for deep socket mounting
3. O-Ring material, where applicable, is Viton® unless otherwise specified.

Electrical Connector

DIN 9.4 mm			M12 x 1P		Amp Superseal 1.5		Deutsch DT04-4P		DIN 43650A	
 <p>POLARIZING WIDE CONTACT</p>			 <p>M12 x 1P</p>							
Code R			Code E		Code 6		Code 8		Code G	
Pin #	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode	Voltage Mode	Current Mode
1	V_{supply}	Supply	V_{supply}	Supply	V_{out}	No Connect	Ground	Return	V_{supply}	Supply
2	Ground	Return	V_{out}	No Connect	Ground	Return	V_{supply}	Supply	Ground	Return
3	V_{out}	No Connect	Ground	Return	V_{supply}	Supply	No Connect	No Connect	V_{out}	No Connect
4	No Connect	No Connect	No Connect	No Connect	—	—	V_{out}	No Connect	No Connect	No Connect

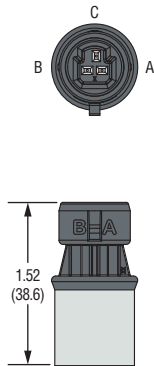
Current Output Mode (Load Resistor Range)



Minimum Resistor Value = $50 \cdot (+V - 24)$ for $+V > 24V$
 Maximum Resistor Value = $50 \cdot (+V - 8)$ for $+V > 8V$

Cable-Out Types

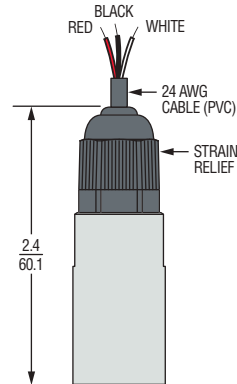
Packard MetriPack



Code 9

Pin ID	Voltage Mode	Current Mode
C	V_{out}	No Connect
A	Ground	Return
B	V_{supply}	Supply
—	—	—

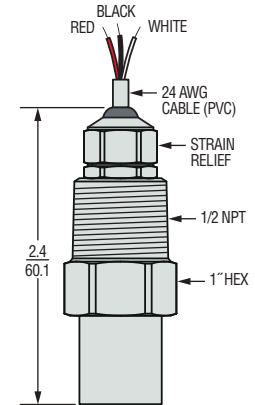
Cable



Code F

Wire Color	Voltage Mode	Current Mode
Red	Supply	Supply
Black	Ground	Return
White	V_{out}	No Connect

1/2" Conduit Connection



Code 3

Voltage Mode	Current Mode	Voltage Mode	Current Mode
Supply	Supply	Supply	Supply
Ground	Return	Ground	Return
V_{out}	No Connect	V_{out}	No Connect

How to Order

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

Series	31IS	B	200PG	02	B	R	01	Cable Length (For electrical connections F & 3 only)
	31IS / 32IS - Pressure Transducer							00 - No Cable 03 - 3 meters 01 - 1 meter 04 - 4 meters 02 - 2 meters 05 - 5 meters
Output	B - 4-20 mA C - 1-6 V H - 1-5 V N - 0.5-4.5 V R - 0-5 V ¹ S - 0-10 V ¹ T - 0.5-4.5 V Ratiometric							Optional Restrictor (32IS only) R - Restrictor 0 - No Restrictor
Pressure Range - psi	100PG - 0-100 psiG 15CPS - 0-1,500 psiS 10KPS = 0-10,000 psiS 150PG - 0-150 psiG 20CPS - 0-2,000 psiS 15KPS - 0-15,000 psiS ² 200PG - 0-200 psiG 25CPS - 0-2,500 psiS 20KPS - 0-20,000 psiS ² 300PG - 0-300 psiG 30CPS - 0-3,000 psiS 25KPS - 0-25,000 psiS ² 500PG - 0-500 psiG 35CPS - 0-3,500 psiS 600PG - 0-600 psiG 40CPS - 0-4,000 psiS 750PG - 0-750 psiG 50CPS - 0-5,000 psiS 10CPG - 0-1,000 psiG 60CPS - 0-6,000 psiS 75CPS - 0-7,500 psiS							Electrical Connection ⁴ B - Industrial DIN 9.4 mm (mating connector not supplied) E - M12 x 1P (4-Pin) F - Cable version G - Large DIN R - Industrial DIN 9.4 mm (alternate pin out) 3 - 1/2" NPT Male Conduit 6 - Amp - Superseal 1.5 Series 8 - Deutsch DT04-4P 9 - Packard MetriPack
Pressure Range - bar	0007G - 0-7 barG 0100S - 0-100 barS 1000S - 1,000 barS ² 0010G - 0-10 barG 0160S - 0-160 barS 1600S - 1,600 barS ² 0016G - 0-16 barG 0250S - 0-250 barS 0025G - 0-25 barG 0400S - 0-400 barS 0040G - 0-40 barG 0600S - 0-600 barS 0060G - 0-60 barG							Pressure Port ³ 08 - 1/8-27 NPT External 02 - 1/4-18 NPT External 04 - 7/16-20 External (SAE #4, J514) 1J - 7/16-20 External (SAE #4, J1926-2) 0E - 1/4-18 NPT Internal 0K - M14 x 1.5 Straight 1G - Schrader SAE #4, 7/16" Internal 1P - SAE 6 (9/16"-18 UNF 2A) 4C - 1/4-18 NPTF External (Dryseal) 4D - 1/8-27 NPTF External (Dryseal) 4N - SAE 3 (3/8-24 UNF External) 01 - G1/4 External 05 - G1/4 External Soft Seal 0L - M12 x 1.5 (<15,000 psi, 1,000 bar) 2T - M12 x 1.5 (6g) (≥15,000 psi, 1,000 bar)

Notes:

- For use with pull-up or pull-down resistors, contact factory.
- Ranges 15,000 psi (1,000 bar) and above available with -2T pressure port only.
- Pressure ports **0E** and **1G** are NOT available with the Restrictor option.
- For electrical codes **F** & **3**, specify cable length in meters.

ELS-1100HT

Handles Temperatures to 212°F

Slightly larger than the ELS-1100, the “HT” or High Temperature version is made from high performance Isoplast® plastic. While maintaining broad chemical compatibility, these units also handle fluid temperatures to 212°F. They feature 3/8-18 NPT mountings and the shortest of any of our plastic electro-optic switch bodies – HTS versions are a mere 1/2” long!

Typical Applications

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

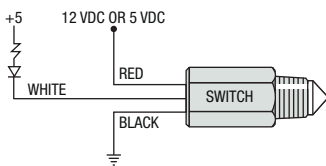
Specifications

Materials	
Housing and Prism	Isoplast®
Max. Operating Pressure	0 to 150 psi (0 to 10.3 bar)
Operating Temperature*	-40°F to +212°F (-40°C +100°C)
Current Consumption	45 mA, Approximately
Output	TTL/CMOS Compatible. Transistor Output with 10K Pull Up Resistor May Sink 18 mA. 12 VDC input power units switch a maximum 5 VDC on output
Repeatability	±1 mm

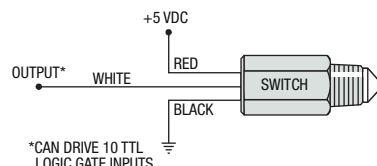
* These switches are not for use in freezing liquids or steam/high condensation environments. Contact Gems for alternative solutions.

Wiring Diagrams

Transistor Output



TTL Compatible Output



How To Order

HT Series

Specify Part Number based on Input and Output Condition required.

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

* 12 VDC input power units switch a maximum 5 VDC on output.

Note: Extend the power and switching capabilities of 10–28 VDC models with Gems Opto-Pak Controllers.

HTS Series - 5 VDC Input Only

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

Mounting Type	Probe Condition at Current Sink	
	Wet	Dry
3/8-18 NPT	181674	181675
M16 × 2	191341	191342



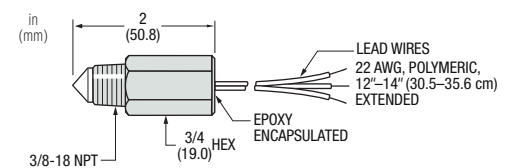
ELS-1100HT



ELS-1100HTS

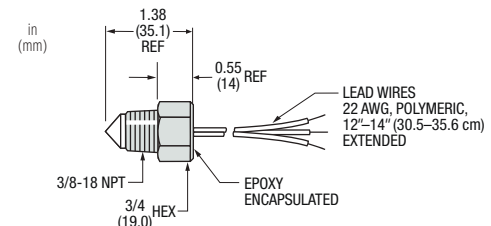
Dimensions

HT Series

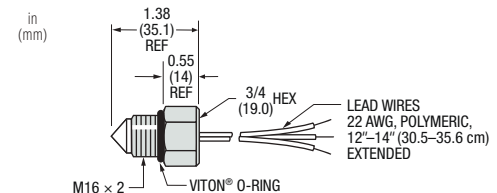


HTS Series

3/8-18 NPT Mounting



M16 × 2 Straight Thread Mounting with O-Ring



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

Converts TTL output signal to 5 Amp relay output. Available as open circuit board or mounted in a NEMA 4X enclosure (pictured). See Page A-28.



Specialty Switches

GEMS Excels in Switches for Special Requirements

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



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



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

LS-270 Series –
Bracket Mounting
Slosh Shield



U.L. Recognized – File No. E45168

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

Dimensions

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

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

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

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

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

Notes:

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

2. Switches are not U.L. Recognized or CSA Listed.

3. See Page B-21 for thermostat ratings and wiring diagram. Other temperature settings are available; consult factory.

Specialty Switches – Continued

Portable Level Switch —
Integral Mounting Magnet

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

LS-750 Series — Weighted
for Suspension Cable

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

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

LS-700F Series



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

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

Dimensions

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

$\dagger L_1$ = Switch actuation level. In liquid with specific gravity of 1.0, switch actuation is approximately half the distance from end of stem to mounting, or at the halfway point of float travel.

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

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

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

⚡ — Stock Items.

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

Series DF Dual Function Controls

- ▶ Solid State Reliability
- ▶ Compact Size
- ▶ Meets CSD1 Requirements
- ▶ U.L. "Motor Control"
- ▶ AC Current Minimizes Electrolysis
- ▶ Optional Test Feature
- ▶ Optional Dirty Electrode Detection
- ▶ Spade Terminals for Easy Wiring
- ▶ Manual Reset (optional)
- ▶ Power Outage Feature (optional)
- ▶ U.L. "Limit Control"
- ▶ U.L. "Limit Control"
- ▶ Time Out Option

Dual function Series DF models are designed to control two independent level functions, one single-level control operation and one differential-level operation.

Optional Power Outage feature resets after nuisance outages. Optional Reset Button is used when device has been deactivated due to low water condition. Reset is activated only after water has returned to normal level. This control is ideal in applications on boilers, food service equipment, and chemical delivery systems.

Specifications

Contact Design	1 N.O. & 1 N.C. (1 form C) extra function
Contact Rating (120, 240 VAC)	10 amp Resistive 1/3 hp
Mode of Operation	H/L Direct/Inverse, LLCO – factory set
Sensitivity	0-26K ohm, factory set
Primary Voltage	120 VAC, 240 VAC ¹ , 24 VAC (+10%/-15%) 208/240: 187 V min. to 255 V max. VAC 50/60 Hz
Secondary Voltage	12 VAC
Temperature	-40°F to +150°F (-40°C to +65°C)
Approvals	U.L. 508 File # E44426, U.L. 353 File # MP1430
Terminal Style	Spade connection
Options	Time Delays, Manual Reset, Power Outage, Retrofit Plate, Test Feature, Dirty Electrode Detection; See page E-11 for descriptions

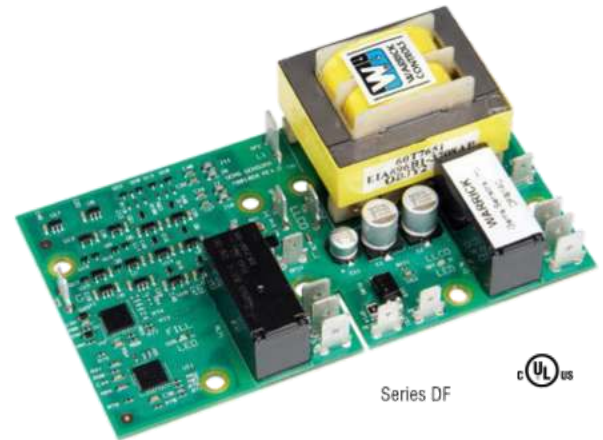
Notes:

- 240 VAC and 208/240 VAC units do not carry U.L. Limit Control recognition.

How to Order

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

	DF	X	X	X	X	X	XX	XX	XX
1. Series	DF								
2. Mode of Operation									
Direct									
Inverse									
A – 4.7K									
K – 4.7K									
B – 10K									
L – 10K									
C – 26K									
M – 26K									
D – 50K									
N – 50K									
E – 100K									
P – 100K									
3. Supply Voltage									
1 – 120 VAC; 2 – 240 VAC;									
3 – 24 VAC; 8 – 208/240 VAC									
4. Standoff Style*									
A – 1/16" Panel									
C – Screw Mount									
B – 1/8" Panel									
D – Retrofit									
5. Enclosure									
0 – None; 1 – NEMA 1; 4 – NEMA 4									
6. Option Package									
See page E-11, Chart B for code letter.									
7. Time Delay (increasing level) H/L function									
00-90 seconds; Blank 0 seconds									
8. Time Delay (decreasing level) H/L function									
00-90 seconds; Blank 0 seconds									
9. Time Delay (decreasing level) LLCO function only									
03-90 seconds; Blank 3 seconds									



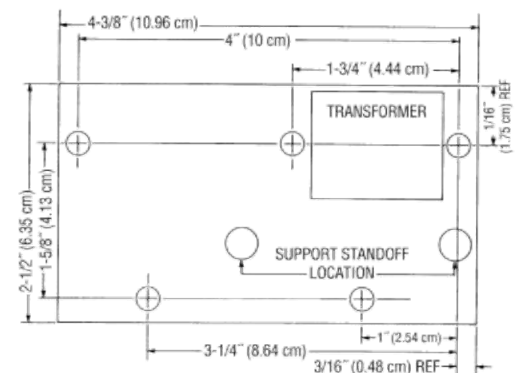
Series DF



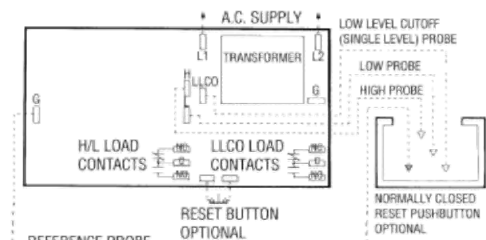
Applications

- Dual Function
- Single-Level Service
- Differential Service
- Feedwater Control / Low-Water Cutoff
- High Level / Low Level
- Pump Down / High Level

Dimensions



Wiring



Note: For single level service, use "H" and "G" connections.

Socket Details and Option Availability
are located on web site.

Series 3W – Wire Suspended Probes

- ▶ Metallic Bars
- ▶ Plastic Shield Protected
- ▶ Adaptable to Many Fittings
- ▶ Field Assembled

Series 3W probes, consisting of metallic bars within a protective plastic shield, are designed to be suspended in liquid with PVC-insulated wires. They are ideal for applications where rigid electrode rods are impractical or cumbersome, such as:

- Deep Wells
- Pump Control
- Waste Water
- Deep Tanks

7/8" (2.22 cm) diameter x 3-3/4" (9.52 cm) length. 3Z1A wire and 3Z1B adaptor kit required for use with 3E, 3F and 3N fittings.

How to Order

Select a 3W electrode, a 3Z1B adaptor and a length of 3Z1A suspension wire to form a complete suspended probe.

1. 3W Electrodes

Probe Material	Part Number
Brass	3W1
316 Stainless Steel	3W2

2. 3Z1B Adaptor Kit

For use with 3E, 3F and 3N fittings.
Part Number: 3Z1B

3. 3Z1A Suspension Wire

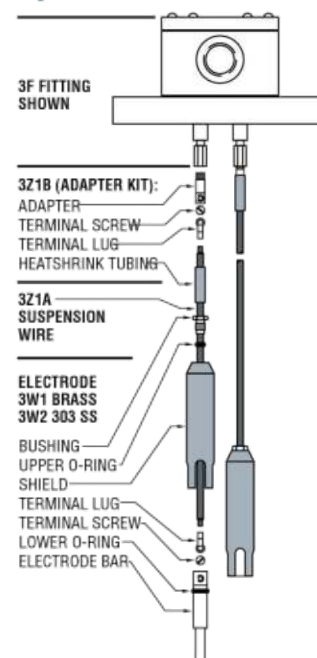
Order in standard or custom length.

Length (Feet)	Part Number
500	3Z1A-500
1000	3Z1A-1000
5000	3Z1A-5000
Custom	3Z1A-XX
Specify in one foot increments up to 5000 ft.	



Series 3W

Components Detail



Series 3Y – Corrosion Resistant Probes

- ▶ Metallic Bars
- ▶ Corrosion Resistant
- ▶ Available in Many Materials for Various Requirements
- ▶ Adaptable for Various Fittings

Series 3Y wire suspended probes consist of metallic bars within a protective plastic shield, designed to be suspended in liquid. Series 3Y suspension wires are PVC or Teflon® insulated for use in corrosive liquid applications. 7/8" (2.22 cm) diameter x 3-1/2" (8.90 cm) length.

Specifications

Style	Wire suspended
Tip Material	Carp. 20, Hastelloy C, 316 stainless steel
Shield Material	PVC 150°F (66°C), Teflon®

How to Order

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

Series	3Y	X	X	X
Shield Material	1 – PVC	3 – Teflon®		
Probe Tip Material	C – 316 Stainless Steel	F – Hastelloy C		
	D – Carp. 20			
Length of Wire	1 – 10 feet	3 – 30 feet		

Note: 3Z1B Connector is used to connect suspension wire with 3B, 3E, 3F, 3G or 3N fitting.



Series 3Y

Applications

- General Purpose
- Wire Suspended Probes
- Corrosive Liquids, Chemicals

Series 3S Multi-Wire Suspended Fittings

- ▶ Probe Isolation
- ▶ Long Length

The 3S series electrode fitting is designed to provide isolation of electrodes from liquids containing solids, grease, soaps, sludge, rags, paper and other debris commonly found in wastewater and sewage pumping applications.

Isolation is accomplished by enclosing wire suspended electrodes within a 1-1/2" galvanized pipe assembly with a neoprene flexible bulb installed on the lower end of the pipe. The bulb and pipe assemblies contain 3-1/2 quarts clean water with one ounce of sodium bicarbonate (baking soda).

When mounted in a sump, the pipe and bulb assembly is acted on by the hydrostatic pressure exerted by the liquid outside the bulb. Assuming the density of the liquid outside is equal to water, the height of the water inside the bulb will equal the height outside.

Specifications

Probes	1 thru 7
Materials of Construction	Cast iron, galvanized pipe, stainless steel, neoprene
Type of Connection	3" flange (7-1/2" O.D.), or bracket
Terminal Housing	Die-cast aluminum, epoxy coated
Pressure	Atmosphere
Temperature	-40°F to +212°F (-40°C to +100°F)

How to Order

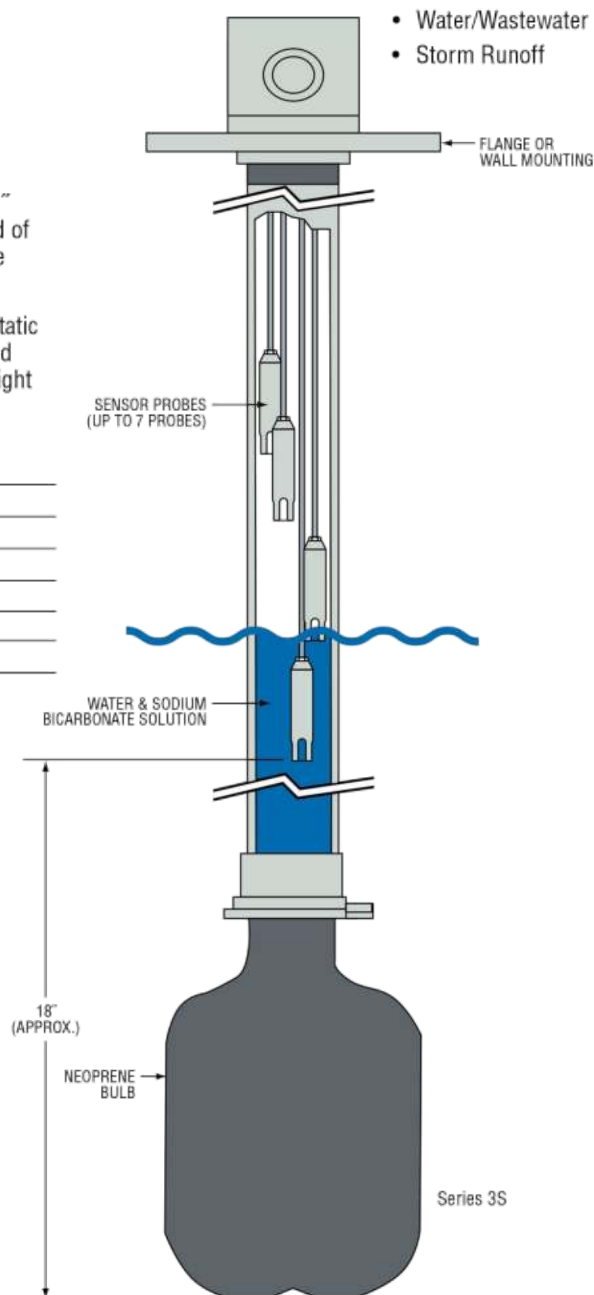
Use the **Bold** characters from the chart below to construct a product code.

Series	3S	X	X	XX	X
Number of Probes	1 – One	4 – Four	7 – Seven		
	2 – Two	5 – Five			
	3 – Three	6 – Six			
Mounting Method	A – Flange	B – Wall mount bracket			
Length of Longest Probe					
(Enter dimension in inches)					
Pipe	blank – Standard 1-1/2" galvanized pipe (included)				
	A – No pipe (customer supplied pipe)				

Note:
Overall length is approximately 18" more than distance to longest electrode.
Probe is adjusted by customer in the field.

Applications

- Sewage
- Water/Wastewater
- Storm Runoff



По вопросам продаж и поддержки обращайтесь:

Алматы (727)345-47-04
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
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Ижевск (3412)26-03-58
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Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81

Магнитогорск (3519)55-03-13
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Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
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Севастополь (8692)22-31-93
Саранск (8342)22-96-24
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35

Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
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Ярославль (4852)69-52-93

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