

## CLARK SOLUTIONS

### 12 Series: Pressure, Diff. Pressure & Temp. Switches

Explosion Proof, Adjustable Ranges 30" Vac to 6000 PSI, -130 to 650°F

#### V DESCRIPTION

12 Series switches are ideal for operation in harsh explosive environments where space is at a premium. A snap-action Belleville spring assembly is used to provide vibration resistance and prolonged switch life. A hermetically sealed switch and stainless steel enclosure provide ruggedness and protection from the environment. The 12 Series is approved for use in hazardous locations worldwide, from offshore oil rigs to process and energy applications, to protection of capital equipment.

Triple approval (UL, cUL and ATEX) means the 12 Series meets the demanding requirements of hazardous locations. It can be used in a wide variety of applications where space is at a premium. Ambient temperatures can be as low as -58°F (-50°C) or as high as 203°F (95°C). All metal wetted parts comply with NACE MR-0175. The stainless steel design and enclosure type 4X rating assure long-term performance in the toughest applications.

#### SPECIFICATIONS

##### GENERAL

**STORAGE TEMPERATURE:** -58° to 203°F (-50 to 95°C)

**OPERATING AMBIENT TEMPERATURE:** -58 to 203°F (-50 to 95°C). Set point shifts less than 1% of range for a 50°F (28°C) ambient temperature change. Slight ambient effects for 25-50' extra capillary length on temperature switch models, consult factory.

**MEDIA TEMPERATURE:** Pressure models: Sensor types 2, 7, 9: -50 to 400°F (-45 to 204°C), Sensor types 3, 4, 8: -20 to 200°F (-28 to 93°C), Sensor types 5, 6: 0 to 320°F (-18 to 160°C), Sensor type P: 0 to 200°F (-18 to 93°C), 20 to 250°F (-7 to 121°C) for optional Viton sensor. Differential pressure models: Sensor type K: 0 to 180°F (-18 to 82°C), 20 to 250°F (-7 to 121°C) for optional Viton sensor, Temperature models: See model chart.

**SET POINT REPEATABILITY:** Temperature models: ±1% of adjustable range  
Pressure models: Sensor types 2, P: ±1.5% of adjustable range, Sensor types 3-9: ±1% of adjustable range, Differential pressure models: K1 to K3: ±1%, K4 to K6: ±1.5% of adjustable range

**SHOCK:** Differential pressure and temperature models: set point repeats after 15 G's, 10 millisecond duration, Pressure models: Set point repeats after 75 G's, 10 milliseconds

**VIBRATION:** Differential pressure and temperature models: Set point repeats after 2.5 G's, 10-2000 Hz. Pressure models: Set point repeats after 15 G's, 10-2000 Hz

**ENCLOSURE:** 300 series stainless steel

**ENCLOSURE CLASSIFICATION:** Certified to Enclosure Type 4X, Class I, Division 1 product meets enclosure Type 7; Class II, Division I product meets enclosure type 9. Certified to IP66 requirements

**SWITCH OUTPUT:** Code S: One SPDT, hermetically sealed, Code D: Two SPDT for DPDT action, hermetically sealed

**ELECTRICAL RATINGS:** Code H: 5 A at 250 VAC, 5 A resistive and 3 A inductive at 28 VDC. Silver contacts, Code L: 1 A at 125 VAC, 1 A resistive and 0.5 A inductive at 28 VDC, Bifurcated gold contacts

**ELECTRICAL CONNECTION:** Code N: 1/2" NPT (male) with 72" leadwires, Code M: M20 metric threads, 72" leads, Option M515, 4 terminal DIN connector (DIN 43650 Form A) available SPDT only

**WEIGHT:** Temperature models: approximately 1 lb 14 oz. (0,85 kg)

Pressure models: approximately 12 ounces (0,34 kg)

Differential models: approximately 3 lb (1,4 kg)

**TEMPERATURE ASSEMBLY:** Non-toxic oil fill; 6 feet 304 stainless steel. Optional lengths available

**TEMPERATURE DEADBAND:** Typically 2% of range under laboratory conditions (70°F ambient circulating bath at a rate of 1/2°F per minute change)

**PRESSURE CONNECTION:** 1/2" NPT (female) or 1/4" NPT (female). Option M511: 1/4" NPT (male), Differential pressure: 1/8" NPT (female), Piston models: 1/4" NPT (female)

**MOUNTING:** Pressure: May be pipe mounted or bracket mounted using kit 62169-13  
Differential Pressure: Should be mounted using 2 mounting holes on sensor bracket



#### FEATURES

- Compact stainless steel construction
- Convenient field setting and adjustment
- UL, cUL and ATEX approved for Div. 1 or Zone 1 hazardous locations
- SPDT or DPDT hermetically sealed switches
- Snap-acting Belleville spring for long life, vibration resistance and stability
- Mounting bracket available for retrofit applications
- 3 year warranty
- 72" leadwires with strain relief

#### Approvals:

Class I, Division 1 and 2, Groups A, B, C & D

Class II, Division 1 and 2, Groups E, F & G

Class III

Class I, Zone 1, Group IIC

Enclosure Type 4X

UL Listed, cUL Certified

Pressure: UL 508 & 698; CSA C22.2 No. 14, 25 & 30

File # E40857

Temperature: UL 873, 1203;

CSA C22.2 No. 24, 25 & 30 - File # E43374

ATEX Directive (94/9/EC)

II 2 G EEx d IIC T6

II 2 D T+85°C

Tamb = -50°C to +80°C

IP 66

UL International DEMKO A/S (N.B.# 0539)

Certificate # DEMKO 03 ATEX 0252466X

EN 50014, 50018, 50281-1-1 & 60529

## TECHNOLOGY

At the heart of the 12 Series is a Belleville spring assembly. The spring is a small conical washer that transfers motion to a hermetically sealed 1 or 5 amp microswitch. Its "snap-action" provides fast, positive contact transfer. The Belleville spring snaps over when pressure is applied and snaps back upon pressure release.

### ADVANTAGES:

- Set point stability: The switch performs under challenging environmental conditions such as vibration and temperature changes. In addition, minimal movement of components reduces sensor fatigue thereby increasing life and accuracy.
- High over-pressures: The Belleville spring mechanism limits over-travel, thus extending pressure limits.
- Resistance to vibration: Preloading of the electrical switch helps reduce contact chatter.
- Maximum life: The Belleville spring enhances cycle life with a short stroke movement to minimize fatigue.
- Small size: Belleville springs are simple in appearance, but can deliver a heavy load with a relatively small deflection, contributing to an overall compact product envelope.
- Deadbands: The Belleville is a negative-rate snap acting device, so on-off deadband values are wider at the low end of the range. To minimize deadbands, select a model with a set point at the higher end of the range whenever possible.

## 12 SERIES MODEL CHART

Sensor Type/Range Code	Adjustable Range Lower end of range on fall; Higher end on rise		Deadband		Over Range Pressure		Proof Pressure	
<b>Sensor Type 2, 316 stainless steel 1/2" NPT (female) pressure connection and welded diaphragm, 23/32" orifice for clean out purposes.</b>								
Range Code	psi	bar	psi	bar	psi	bar	psi	bar
A	10 to 25	0.7 to 1.7	2 to 7	0.1 to 0.5	1000	68.9	2500	172.4
B	15 to 45	1.0 to 3.1	3 to 10	0.2 to 0.7	1000	68.9	2500	172.4
C	25 to 85	1.7 to 5.9	5 to 20	0.3 to 1.4	1000	68.9	2500	172.4
D	50 to 130	3.4 to 9.0	7 to 25	0.5 to 1.7	1500	103.4	2500	172.4
E	100 to 210	6.9 to 14.5	8 to 30	0.6 to 2.1	1500	103.4	2500	172.4
F	160 to 400	11.0 to 27.6	10 to 50	0.7 to 3.4	1500	103.4	2500	172.4
G	275 to 850	19.0 to 58.6	40 to 125	2.8 to 8.6	1500	103.4	2500	172.4
<b>Sensor Type 4, 316L stainless steel 1/4" NPT (female) pressure connection, Teflon® coated Polyimide (Kapton®) diaphragm, Buna N O-ring, 1/8" orifice.</b>								
<b>Sensor Type 3, 316L stainless steel 1/2" NPT (female) pressure connection, Teflon® coated Polyimide(Kapton®) diaphragm, Buna N O-ring, 1/2" orifice for clean out purposes.</b>								
Range Code	psi	bar	psi	bar	psi	bar	psi	bar
A	8 to 30	0.6 to 2.1	2 to 6	0.1 to 0.4	600	41.4	1000	68.9
B	15 to 55	1.0 to 3.8	3 to 8	0.2 to 0.6	600	41.4	1000	68.9
C	30 to 170	2.1 to 11.7	5 to 15	0.3 to 1.0	600	41.4	1000	68.9
D	100 to 370	6.9 to 25.5	15 to 50	1.0 to 3.4	600	41.4	1000	68.9
E	200 to 700	13.8 to 48.3	40 to 90	2.8 to 6.2	1500	103.4	3000	206.8
F	400 to 1500	27.6 to 103.4	100 to 250	6.9 to 17.2	3000	206.8	4500	310.3
G	1000 to 3200	68.9 to 220.6	100 to 500	6.9 to 34.5	6000	413.7	10000	689.5
H	2000 to 6000	137.9 to 413.7	400 to 800	27.6 to 55.2	8000	551.6	10000	689.5
<b>Sensor Type 5, 316L stainless steel 1/2" NPT (female) 1/2" pressure connection and diaphragm, Viton® O-ring, 1/2" orifice for clean out purposes.</b>								
<b>Sensor Type 6, 316L stainless steel 1/4" NPT (female) pressure connection and diaphragm, Viton® O-ring, 1/8" orifice.</b>								
Range Code	psi	bar	psi	bar	psi	bar	psi	bar
A	9 to 35	0.6 to 2.4	2 to 7	0.1 to 0.5	600	41.4	1000	68.9
B	25 to 65	1.7 to 4.5	3 to 10	0.2 to 0.7	600	41.4	1000	68.9
C	50 to 150	3.4 to 10.3	5 to 15	0.3 to 1.0	600	41.4	1000	68.9
D	100 to 350	6.9 to 24.1	15 to 50	1.0 to 3.4	600	41.4	1000	68.9
E	250 to 700	17.2 to 48.3	40 to 95	2.8 to 6.6	1500	103.4	3000	206.8
F	400 to 1500	27.6 to 103.4	100 to 300	6.9 to 20.7	3000	206.8	4500	310.3
G	1000 to 3200	68.9 to 220.6	100 to 500	6.9 to 34.5	6000	413.7	10000	689.5
H	2000 to 6000	137.9 to 413.7	400 to 1000	27.6 to 68.9	8000	551.6	10000	689.5
<b>Sensor Type 7, 316L stainless steel 1/2" NPT (female) pressure connection and welded diaphragm. Large 23/32" orifice for clean out purposes.</b>								
Range Code	psi	bar	psi	bar	psi	bar	psi	bar
A	3 to 15	0.2 to 1.0	1 to 4	0.1 to 0.3	300	20.7	500	34.5
B	10 to 35	0.7 to 2.4	1 to 6	0.1 to 0.4	300	20.7	500	34.5
C	25 to 85	1.7 to 5.9	3 to 11	0.2 to 0.8	300	20.7	500	34.5
D	65 to 125	4.5 to 8.6	6 to 18	0.4 to 1.2	300	20.7	500	34.5

Sensor Type/Range Code	Adjustable Range Lower end of range on fall; Higher end of rise		Deadband		Over Range Pressure		Proof Pressure	
<b>Sensor Type 8, 316L stainless steel 1/4" NPT (female) pressure connection, Teflon® coated Polyimide (Kapton®) diaphragm, Buna N O-ring, 1/8" orifice. Non-Belleville actuation.</b>								
Range Code	psi	bar	psi	bar (unless noted)	psi	bar	psi	bar
A	2 to 25	0.14 to 1.7	0.5 to 4	34.5 mbar to 0.3 bar	600	41.4	1000	68.9
B	15 to 75	1.0 to 5.2	1 to 7	0.1 to 0.5	600	41.4	1000	68.9
C	25 to 150	1.7 to 10.3	1 to 12	0.1 to 0.8	600	41.4	1000	68.9
D	50 to 450	3.4 to 31.0	3 to 28	0.2 to 1.9	2000	137.9	3000	206.8
E	100 to 900	6.9 to 62.1	10 to 60	0.7 to 4.1	2000	137.9	3000	206.8
F	500 to 2500	34.5 to 172.4	20 to 140	1.4 to 9.7	6000	413.7	7500	517.1
G	700 to 4000	48.3 to 275.8	40 to 250	2.8 to 17.2	6000	413.7	7500	517.1
<b>Sensor Type 9, 316L stainless steel 1/2" NPT (female) pressure connection and welded diaphragm. Large 23/32" orifice for clean-out purposes. Non-Belleville actuation.</b>								
Range Code	psi	bar	psi	mbar	psi	bar	psi	bar
A	1 to 15	0.1 to 1.0	0.5 to 2	34.5 to 137.9	300	20.7	500	34.5
B	3 to 50	0.2 to 3.4	0.5 to 4	34.5 to 275.8	300	20.7	500	34.5
C	5 to 100	0.3 to 6.9	1.0 to 8	0.1 to 0.6 bar	300	20.7	500	34.5
<b>Sensor Type P, 303 stainless steel piston and 1/4" NPT (female) pressure connection, Buna N O-Ring. Non-Belleville actuation.</b>								
Range Code	psi	bar	psi	bar	psi	bar	psi	bar
A	300 to 1200	20.7 to 82.7	30 to 200	2.1 to 13.8	6000	413.7	10000	689.5
B	600 to 2600	41.4 to 179.3	50 to 350	3.4 to 24.1	6000	413.7	10000	689.5
C	1200 to 5500	82.7 to 379.2	100 to 800	6.9 to 55.2	6000	413.7	10000	689.5

### DIFFERENTIAL PRESSURE MODEL CHART

Sensor Type/Range Code	Adjustable Range Lower end of range on fall; Higher end on rise		Deadband		Over Range Pressure		Proof Pressure	
<b>Sensor Type K, epoxy coated aluminum pressure housing with Kapton® diaphragm, Buna N sealing diaphragms and 1/8" NPT (female) pressure connections. Non-Belleville actuation. 303/304 stainless steel mounting bracket attached.</b>								
Range Code	wcd	mbar	wcd	mbar	psi	bar	psi	bar
1	0.7 to 10	1.7 to 24.9	0.2 to 1	0.5 to 2.5	30 Hg Vac to 200	-1.0 to 13.8	400	27.6
2	3 to 20	7.5 to 49.8	0.3 to 1.5	0.7 to 3.7	30 Hg Vac to 200	-1.0 to 13.8	400	27.6
3	10 to 150	24.9 to 373.4	0.3 to 5	0.7 to 12.4	30 Hg Vac to 200	-1.0 to 13.8	400	27.6
Range Code	psid	bar	psi	bar	psi	bar	psi	bar
4	2 to 20	0.1 to 1.4	0.3 to 1.5	20.7 to 103.4 mbar	30 Hg Vac to 1200	-1.0 to 82.7	2500	172.4
5	5 to 80	0.3 to 5.5	1 to 8	0.1 to 0.6	30 Hg Vac to 1200	-1.0 to 82.7	2500	172.4
6	10 to 150	0.7 to 10.3	1 to 10	0.1 to 0.7	30 Hg Vac to 1200	-1.0 to 82.7	2500	172.4
<b>Sensor Type K, epoxy coated aluminum pressure housing with Kapton® diaphragm, Buna N sealing diaphragms and 1/8" NPT (female) pressure connections. Non-Belleville actuation. 303/304 stainless steel mounting bracket attached. DPDT Switch (double pole double throw)</b>								
Range Code	wcd	mbar	wc	mbar	psi	bar	psi	bar
1	0.7 to 10	1.7 to 24.9	0.2 to 1.5	0.5 to 3.7	30 Hg Vac to 200	-1.0 to 13.8	400	27.6
2	3 to 20	7.5 to 49.8	0.3 to 2	0.7 to 5.0	30 Hg Vac to 200	-1.0 to 13.8	400	27.6
3	10 to 150	24.9 to 373.4	0.3 to 8	0.7 to 19.9	30 Hg Vac to 200	-1.0 to 13.8	400	27.6
Range Code	psid	bar	psi	bar	psi	bar	psi	bar
4	2 to 20	0.1 to 1.4	0.3 to 3	20.7 to 206.8 mbar	30 Hg Vac to 1200	-1.0 to 82.7	2500	172.4
5	5 to 80	0.3 to 5.5	1 to 10	0.1 to 0.7	30 Hg Vac to 1200	-1.0 to 82.7	2500	172.4
6	10 to 150	0.7 to 10.3	1 to 15	0.1 to 1.0	30 Hg Vac to 1200	-1.0 to 82.7	2500	172.4

### TEMPERATURE MODEL CHART

Sensor Type R, Standard Capillary: 6ft, 304 SS

Range Code	Adjustable Range		Max Temperature		Bulb Size
	°F	°C	°F	°C	
R1	-130 to 120	-90 to 48.9	170	76.7	3/8 O.D. x 4-7 / 8"
R2	0 to 150	-17.8 to 65.6	200	93.3	3/8 O.D. x 7-1 / 4"
R3	50 to 300	10 to 148.9	350	176.7	3/8 O.D. x 4-7/8"
R4	150 to 650	65.6 to 343.3	700	371.1	3/8 O.D. x 4"

## ORDERING INFORMATION

### BUILD PART NUMBER PER BELOW TABLE

Model Number Reference

12	S	L	S	N	2	A	M201
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12	<b>12</b> Designates the 12 Series
S	<b>S</b> Stainless Steel <b>HOUSING MATERIAL</b>
L	<b>L</b> 1 amp <b>H</b> 5 amp All switches have limited DC capabilities. Consult factory for details. <b>ELECTRICAL RATING</b>
S	<b>S</b> SPDT <b>D</b> DPDT <b>TYPE OF SWITCHES</b>
N	<b>N</b> 1/2" NPT male <b>M</b> M20 metric thread <b>ELECTRICAL CONDUIT</b>
2	<b>2</b> Welded 316 stainless steel diaphragm, 1/2" NPT (female) pressure connection <b>3</b> Teflon® coated Polyimide (Kapton®) diaphragm, Buna N O-ring, 1/2" NPT (female) pressure connection <b>4</b> Teflon® coated Polyimide (Kapton®) diaphragm, Buna N O-ring, 1/4" NPT (female) pressure connection <b>5</b> 316L stainless steel diaphragm, Viton® O-ring, 1/2" NPT (female) pressure connection <b>6</b> 316L stainless steel diaphragm, Viton® O-ring, 1/4" NPT (female) pressure connection <b>7</b> Welded 316L stainless steel diaphragm, 1/2" NPT (female) pressure connection <b>8</b> Kapton® diaphragm, Buna N O-ring, 1/4" NPT (female) pressure connection* <b>9</b> 316L stainless steel welded diaphragm, 1/2" NPT (female) pressure connection* <b>P</b> 303 stainless steel piston, Buna N O-ring, 1/4" NPT (female) pressure connections* <b>K</b> Kapton® diaphragm, Buna N sealing diaphragm, 1/8" NPT (female) pressure connections* <b>R</b> Remote bulb & capillary, temperature * (non-Belleville actuation) <b>SENSOR TYPE (See Tables)</b>
A	<b>A, B, C, D, E, F, G, H, 1, 2, 3, 4, 5, 6</b> <b>RANGE (See tables)</b>
M201	<b>OPTIONS</b> <b>M201</b> Factory set switch, specify increasing or decreasing pressure <b>M277</b> Range in kPa or mPa on nameplate, factory selected. NOT AVAILABLE ON TEMPERATURE VERSIONS <b>M278</b> Range in kg/cm2 on nameplate. NOT AVAILABLE ON TEMPERATURE VERSIONS <b>M404</b> Flameproof compliance for Ukraine per Gosnadzorohrantruda standards <b>M405</b> European ATEX intrinsic safety compliance <b>M406</b> Flameproof and intrinsic safety compliance per Russian Gosgortekhnadzor standards <b>M407</b> CE compliance to Pressure Equipment Directive (category IV). NOT AVAILABLE ON TEMPERATURE VERSIONS <b>M421</b> Gosgortekhnadzor flameproof junction box, pre-wired (not UL approved or ATEX certified) <b>M423</b> ATEX flameproof compliant junction box, pre-wire (not UL approved) <b>M430</b> Cover lock <b>M444</b> Paper ID tag <b>M446</b> Stainless steel ID tag and wire attachment <b>M460</b> External ground screw; required for non-metallic conduit systems (ATEX installations only) <b>M480</b> 316 Stainless steel construction, enclosure and pressure connection(s) only, sensor material cannot be changed. Must order with option code M516 for sensor type P <b>M511</b> 1/4" NPT (male) pressure connection for sensor types 3, 4, 5, 6 and 8 only <b>M513</b> UL/CSA approved, explosion proof junction box, pre-wired (not approved for ATEX or as enclosure type 4X). NOT AVAILABLE ON METRIC THREAD ELECTRICAL CONDUIT VERSION <b>M515</b> DIN Connector-4 terminal; conforms to DIN 43650 Form A, (not approved for Class I Div. 1 & 2 or ATEX flame proof requirements). NOT AVAILABLE ON DPDT OR METRIC THREAD ELECTRICAL CONDUIT VERSIONS <b>M516</b> 316 Stainless steel 1/4" NPT (female) pressure connection and piston. AVAILABLE SENSOR TYPE P ONLY <b>M540</b> Viton® construction (deadband and low end of range will increase slightly); wetted parts include Kapton diaphragm, Viton® O-ring and sealing diaphragm. AVAILABLE SENSOR TYPES K AND P ONLY <b>M550</b> Oxygen service cleaning; internal construction and materials may change (includes Viton® diaphragm and/or O-ring when applicable). NOT AVAILABLE ON SENSOR TYPES 3, 4, AND 8 NC1 NACE certificate

**OPTIONS FOR TEMPERATURE MODELS**

**UNION CONNECTORS:**

Option Replacement Number Description  
 304 Stainless Steel  
 W028 SD6213-28 1/2" NPT w/ 3/4" bushing  
 W046 SD6213-46 3/4" NPT  
 W050 SD6213-50 1/2" NPT

**THERMOWELLS**

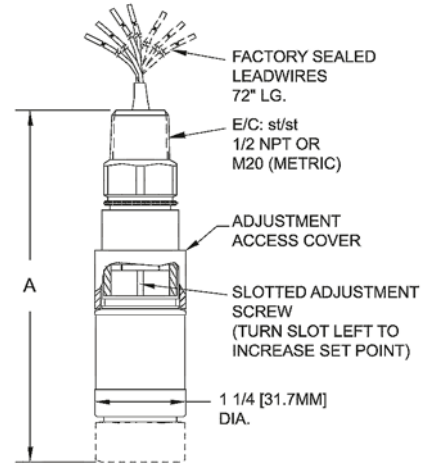
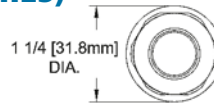
For all bulb & capillary switches  
 316 Stainless Steel  
 W076 SD6225-76 3/4" NPT, 4.5" BT  
 W193 SD6225-193 1/2" NPT, 4.5" BT  
 W119 SD6225-119 3/4" NPT, 7.5" BT  
 W177 SD6225-177 1/2" NPT, 7.5" BT

**OPTIONAL LENGTHS**

Optional capillary length to 50' available in copper or 304 SS. Armor or Teflon® capillary protection available to lengths less than or equal to capillary length.

**DIMENSIONS (INCHES)**

Dimension A			
Types	Inches	mm	NPT
Pressure			
2	4.88	123.9	1/2"
3	4.88	123.9	1/2"
4	4.88	123.9	1/4"
5	4.88	123.9	1/2"
6	4.88	123.9	1/4"
7	5.41	137.5	1/2"
8	4.88	123.9	1/4"
9	5.41	137.5	1/2"
P1-P3	5.38	136.5	1/4"
K1-K3	6.69	169.9	1/8"
K4-K6	6.94	176.2	1/8"
R1-R4	5.00	126.9	N/A

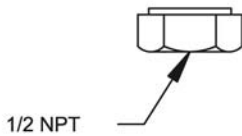


**12 Series, Explosion Proof STANDARD CONFIGURATION**

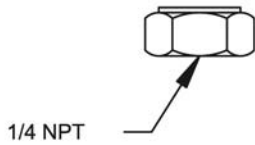
**Pressure, Differential, and Temperature Sensors**

**Pressure**

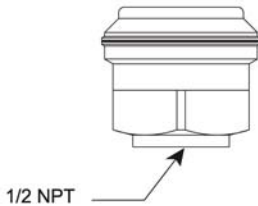
**TYPES 2, 3, 5 SENSOR**



**TYPES 4, 6, 8 P1-P3**

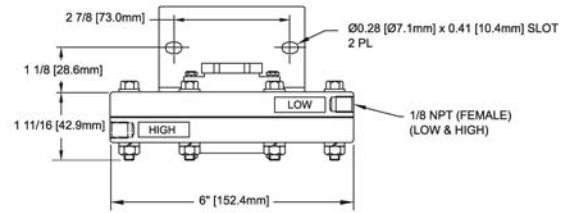


**TYPES 7, 9 SENSOR**

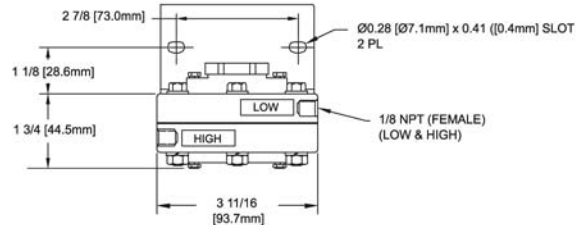


**Differential Pressure**

**TYPE K1-K3\***



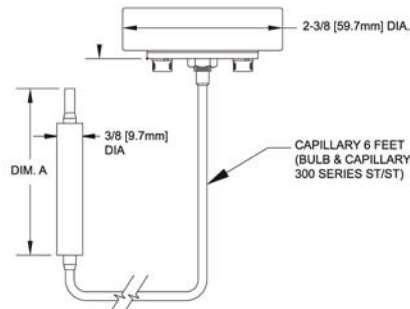
**TYPES K4-K6\***



\*Shown with mounting bracket attached

**Temperature**

**TYPES R1-R4**



BULB DIMENSIONS		
Dimension A		
Types	Inches	mm
R1	4-7/8 "	123.8
R2	7-1/4 "	184.2
R3	4-7/8 "	123.8
R4	4 "	101.6