

# ASHCROFT®

YOUR PRESSURE AND  
TEMPERATURE SWITCH SOURCE

**P-SERIES SWITCHES**  
PRESSURE, DIFFERENTIAL  
PRESSURE AND TEMPERATURE



ISO 9001  
REGISTERED FIRM



Measurement  
& Control

BULLETIN SW-11

## P-SERIES SWITCH PRODUCT INFORMATION

Dresser Measurement supplies highly reliable Ashcroft® switches and controls for industrial and process applications. We begin with rock-solid designs, matching the most appropriate technology with the safety and reliability requirements of the applications. The materials of construction are specified to Dresser's exacting standards, and product is built to last in the toughest applications. Our modern, responsive manufacturing facility is supported by an extensive network of stocking distributors and factory sales offices located in virtually every part of the world. Special application assistance is always just a telephone call away. The Ashcroft P-Series switch line is designed for uncompromising end user reliability and safety.

Die cast aluminum enclosure is available in NEMA 4X (weatherproof, corrosion resistant) or NEMA 7 (explosion-proof enclosure Class I, Div. 1 & 2, Groups B, C, & D and Class II, Div. 1 & 2, Groups E, F and G). Dual chamber design allows setpoint changes to be made safely even with power connected.

Materials of construction have been selected for long life. A wide variety of precision switch elements are available to meet every application requirement, including hermetically sealed contacts for added reliability and safety. The actuators we use have been proven in more than twenty years of service in plants and mills throughout the world. Multiple features such as dual setpoints and adjustable deadbands are offered. Special designs are available for fire safety, limit control and other more stringent requirements. Ease of use is stressed to improve the reliability of the installation.

### Watertight Enclosure – N4 Models

UL and CSA listed instrument quality snap-action switch for reliable operation in any position.

Two standard 3/4 NPT electrical conduit connections.

Epoxy-coated aluminum enclosure and cover for corrosion resistance. NEMA 4X, IP66 watertight construction.

Stainless steel internal parts.

Easy-to-read scale for approximate setpoint indication (±5% accuracy).

Easy setpoint adjustment(s) capability.

Diaphragm-sealed piston actuator for long life is standard for most ranges.

Buna N O-ring for sealing switch chamber.

Standard pressure connection materials:  
Stainless Steel – Pressure psi ranges  
Nickel-Plated Brass – Differential psid ranges  
Carbon Steel – Pressure and Differential I.W. ranges  
1/4 NPTF connection standard  
Optional 1/2 NPTM shown

Cover and Neoprene gasket for adjustment chamber protection.

CE



P-Series switches are currently being successfully used in refineries, chemical and petrochemical plants, water and sewage treatment plants, steel mills and other tough applications. Typical applications are on blowers, compressors, boilers, burners, turbines and reverse osmosis systems.

*Hermetically Sealed Switch*

We recommend hermetically sealed switch elements for improved reliability. The hermetically sealed switch provides uncompromising contact protection in harsh or corrosive environments. The NEMA 4 configuration is also approved for installation in Division II hazardous areas when supplied with hermetically sealed contacts.



*Features:*

- UL-recognized component, guide WSQ2, File E85076
- All-stainless steel welded construction

**RECOMMENDED PRACTICE:**

All controls should be selected considering the media and ambient operating conditions. Improper application can be detrimental to the switch, cause failure and possibly personal injury or property damage. The information in this catalog is offered as a guide to assist in making the proper selection of Ashcroft controls. Additional information is available from Dresser Control Instrument Operations Sales. Offices are listed on the back cover.

**Explosion Proof and Watertight Enclosure – N7 Models**

UL and CSA listed instrument quality snap-action switch for reliable operation in any position.

Ready access to switch elements for easy wiring. Terminal blocks optional.

Epoxy-coated aluminum enclosure and cover for corrosion resistance. NEMA 7/9, IP66 explosion-proof construction. Dual chamber design allows setpoint change while power is on.

Buna N O-ring for sealing switch chamber.

Easy-to-read scale for approximate setpoint indication ( $\pm 5\%$  accuracy).

Stainless steel internal parts.

Easy setpoint adjustment(s) capability.

Diaphragm-sealed piston actuator for long life is standard for most ranges.



Cover and Neoprene gasket for adjustment chamber protection.

Standard pressure connection materials:  
 Stainless Steel – Pressure psi ranges  
 Nickel-Plated Brass – Differential psid ranges  
 Carbon Steel – Pressure and Differential I.W. ranges  
 ¼ NPTF connection standard  
 Optional ½ NPTM shown

# PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

P-Series pressure, differential pressure and vacuum switches utilize two different actuators, depending on setpoint requirements. For setpoints between 2 and 3000 psi, the simple, rugged diaphragm-sealed piston actuator is used. This design features high reliability and choice of actuator seal materials for virtually every application. An optional welded design is also available for setpoints up to 1000 psi for maximum reliability. This design is available

in 316 SS or Monel. Differential pressure models utilize a unique dual diaphragm-sealed piston design that features very high static operating pressures and small size.

For setpoints between 4.5 and 150 inches of H<sub>2</sub>O, a large diaphragm is used for increased sensitivity in both pressure and differential pressure designs with good choice of materials of construction.

All standard models feature ±1 percent of range setpoint repeatability and a minimum of 400 percent of range proof pressures.

These standard designs perform well in applications where shock and vibration could be a problem and may be used in conjunction with Ashcroft diaphragm seals in extreme services such as slurries or abrasive process fluids.

## PRESSURE/VACUUM SWITCHES

APPROXIMATE DEADBAND<sup>(2)</sup> (BUNA-N DIAPHRAGM)

NOMINAL RANGE			Overpressure Ratings		PPA <sup>(3)</sup>		PPS <sup>(4)</sup>				PPD <sup>(4)</sup>			
			Proof psi	Burst psi	SWITCH ELEMENT									
					J,H	G	J,H	K,F	P	GG	JJ,HH	KK,FF	PP	
VACUUM	-30" Hg	-760mm Hg	-100 Kpa	500	1000	7-26	3-5	3-6.5	1-2	1-2.5	3-5	3-6.5	1-2	1-2.5
COMPOUND	30" Hg/ 15 psi	760mm Hg/ 1.0 Kg/cm <sup>2</sup>	-100 Kpa 100 Kpa	500	1000	10-25 4-13	3-5 1-2	2.5-3.5 1-3	1-2 0.5-1	1-2.5 0.5-1.2	3-5 2-4	2.5-4.5 1-3	1-2 0.5-1	1-2.5 0.5-1.2
PRESSURE	30" H <sub>2</sub> O	750mm H <sub>2</sub> O	7.5 Kpa	20	35	4-27	1.5-3.5	2-5	0.5-1	0.5-2	1.5-3.5	2-5	0.5-1	0.5-2
	60" H <sub>2</sub> O	1500mm H <sub>2</sub> O	15 Kpa	20	35	5-54	1.5-3.5	2.5-5	0.5-1.3	1-2	1.5-3.5	2.5-5	0.5-1.3	1-2
	100" H <sub>2</sub> O	2500mm H <sub>2</sub> O	25 Kpa	20	35	8.5-90	4-6	4-8.5	1-2	1-3	4-7	4-8.5	1-2	1-3
	150" H <sub>2</sub> O	3750mm H <sub>2</sub> O	37 Kpa	20	35	18-135	5-11	10-18	1.5-3	2-6	8-14	10-18	1.5-3	2-6
	15 psi	1.0 kg/cm <sup>2</sup>	100 Kpa	500	1000	2.5-13	1-2	1-3	0.5-1	0.5-1.2	1-2	1-3	0.5-1	0.5-1.2
	30 psi	2.0 kg/cm <sup>2</sup>	200 Kpa	500	1500	3-26	1-2.5	2-4.5	0.5-1.5	0.5-1.5	1-2.5	2-4.5	0.5-1.5	0.5-1.5
	60 psi	4.0 kg/cm <sup>2</sup>	400 Kpa	500	1500	5-54	2-4	4-7	1-2	1-2.5	2-4	4-7	1-2	1-2.5
	100 psi	7.0 kg/cm <sup>2</sup>	700 Kpa	1000	3000	10-90	5-7	5-10	1-2.5	2-4	5-7	5-10	1-2.5	2-4
	200 psi	14 kg/cm <sup>2</sup>	1400 Kpa	1000	3000	20-180	10-15	10-18	1-4	5-8	10-20	15-35	3-6	5-8
	400 psi	28 kg/cm <sup>2</sup>	2800 Kpa	2400	3000	45-360	16-30	16-45	4-8	5-15	16-30	16-45	4-8	5-15
	600 psi	42 kg/cm <sup>2</sup>	4200 Kpa	2400	3000	75-540	16-50	20-75	5-15	6-25	16-50	20-75	5-15	6-25
	1000 psi	70 kg/cm <sup>2</sup>	7000 Kpa	12000	18000	160-900	75-130	50-160	7-30	10-85	75-130	50-160	7-30	10-85
	2000 psi	140 kg/cm <sup>2</sup>	14000 Kpa	12000	18000	350-1800	150-200	150-350	20-50	25-110	150-200	150-350	20-50	25-110
	3000 psi	210 kg/cm <sup>2</sup>	21000 Kpa	12000	18000	400-2600	180-250	180-400	30-70	50-250	180-250	180-400	30-70	50-250

## DIFFERENTIAL PRESSURE SWITCHES

APPROXIMATE DEADBAND<sup>(2)</sup> (BUNA-N DIAPHRAGM)

NOMINAL RANGE		Overpressure Ratings		PDA <sup>(3)</sup>		PDS <sup>(4)</sup>				PPD <sup>(4)</sup>			
		Static Working Pressure	Proof psi	SWITCH ELEMENT									
				J,H	G	J,H	K,F	P	GG	JJ,HH	KK,FF	PP	
30" H <sub>2</sub> O Diff.	750mm H <sub>2</sub> O	5.4	21.6	5.5-27	3-5	4-6.5	0.5-1	0.5-2	3-5	4-6.5	0.5-1	0.5-2	
60" H <sub>2</sub> O Diff.	1500mm H <sub>2</sub> O	5.4	21.6	5.5-54	3-5	4.5-6.5	0.5-1.3	1-2	3-5	4-6.5	0.5-1.3	1-2	
100" H <sub>2</sub> O Diff.	2500mm H <sub>2</sub> O	5.4	21.6	8.5-90	4-6	4.5-8.5	1-2	1-3	4-7	4-8.5	1-2	1-3	
150" H <sub>2</sub> O Diff.	3750mm H <sub>2</sub> O	5.4	21.6	18-135	5-11	10-18	1.5-3	2-6	8-12	10-18	1.5-3	2-6	
15 psid	1.0 kg/cm <sup>2</sup>	500	2000	2.5-13	1-2	1-3	0.5-1	0.5-1.2	1-2	1-3	0.5-1	0.5-1.2	
30 psid	2.0 kg/cm <sup>2</sup>	500	2000	3.5-27	1-2.5	2-4.5	1-1.5	1-1.5	1-2.5	2-4.5	0.5-1.5	0.5-1.5	
60 psid	4.0 kg/cm <sup>2</sup>	500	2000	6.5-54	2-4	4-7	1-2	1-2.5	2-4	4-7	1-2	1-2.5	
100 psid	7.0 kg/cm <sup>2</sup>	1000	4000	10-90	5-7	5-10	1-2.5	2-4	5-7	5-10	1-2.5	2-4	
200 psid	14 kg/cm <sup>2</sup>	1000	4000	20-180	10-15	10-18	1-4	5-8	10-20	10-18	3-6	5-8	
400 psid	28 kg/cm <sup>2</sup>	1000	8000	45-360	16-30	16-45	4-8	5-15	16-30	16-45	4-8	5-15	

Values shown are for 0 static working pressure

### NOTES:

- Switches may generally be set between 15% and 100% of nominal range on increasing pressure. Consult factory for applications where set points must be lower.
- All deadbands are given in English units as shown in the nominal range column.

Deadbands shown are for switches with Buna N diaphragm. Approximate deadbands for optional diaphragms:  
 Viton: Multiply Buna N value by 1.4  
 Teflon: Multiply Buna N value by 1.2  
 Stainless Steel: Multiply Buna N value by 1.7  
 Monel: Multiply Buna N value by 1.7

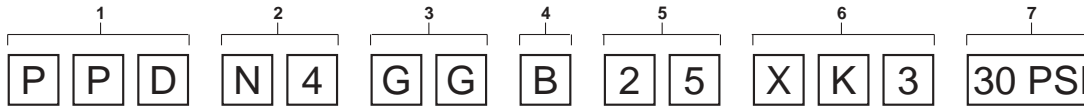
- Deadbands for PPA and PDA models are adjustable between the values shown.
- Deadbands for PPS, PPD, PDS and PDD models are fixed within the range of values shown. Manufacturing and parts variances result in variation from one unit to another as shown.

# ORDER INFORMATION



## P-SERIES PRESSURE AND DIFFERENTIAL PRESSURE SWITCH MODEL NUMBER:

To specify the exact switch desired select entries from appropriate tables as shown in example below.



1 – FUNCTION
PPA – Pressure control, single setpoint, adjustable deadband
PPD – Pressure control, two independently adjustable setpoints, fixed deadband
PPS – Pressure control, single setpoint, fixed deadband
PDA – Differential pressure control, single setpoint, adjustable deadband
PDD – Differential pressure control, two independently adjustable setpoints, fixed deadband
PDS – Differential Pressure control, single setpoint, fixed deadband

4 – ACTUATOR SEAL™					
Code and Material	Process Temp. Limits °F <sup>(2)</sup>	Range			
		VAC ° H <sub>2</sub> O	0-600 psi	1000 psi	2000-3000 psi
B – Buna-N	0 to 150	•	•	•	•
V – Viton	20 to 300	•	•	•	•
T – Teflon	0 to 150	•	•	•	•
S – St. St. <sup>(9)</sup>	0 to 300		•	•	
P – Monel <sup>(9)</sup>	0 to 300		•	•	

5 – PRESSURE PORT	
Code	
25	¼" NPT Female (Std. up to 1000#)
06	¼" NPT Female and ½" NPT Male Combination
07	½" NPT Female

7 – RANGE
Select from Table on Page 4

2 – ENCLOSURE
N4-NEMA 4, 4X, IP66 (watertight and corrosion resistant)
N7-NEMA 7&9, IP66 (explosion proof Div. 1 & 2)

3 – SWITCH ELEMENTS FOR PPA & PDA CONTROLS			
CODE		S.P.D.T. Switch Elements UL/CSA Listed	
H	General Purpose	10A, 125/250 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc	
J	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc	
SWITCH ELEMENTS FOR PPD, PPS, PDD AND PDS CONTROLS			
CODE		Switch Elements UL/CSA Listed	
Single (PS)	Dual (PD)		
K <sup>(4)</sup>	KK	Narrow Deadband	15A, 125/250 Vac
F <sup>(4)</sup>	FF	Sealed Environment Proof	125/250 Vac
G <sup>(5)</sup>	GG	General Purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
P <sup>(3)</sup>	PP	Hermetically Sealed Switch, Narrow Deadband	5A, 125/250 Vac
J	JJ	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc

6 – P-SERIES OPTIONS					
CODE	DESCRIPTION	Pressure		Differential Pressure	
		psi	" H <sub>2</sub> O	psi	" H <sub>2</sub> O
XCH	Chained Cover	•	•	•	•
XC8 <sup>(10)</sup>	CSA Approval, N7	•	•	•	•
XFP	Fungus Proofing	•	•	•	•
XFS <sup>(6)</sup>	Factory Adjusted Setpoints	•	•	•	•
XG9 <sup>(7)</sup>	Fire Safe Actuator	•	N/A	N/A	N/A
XHX	40 psi Static Press. (D/P Only)	N/A	•	N/A	•
	160 psi Proof Press. (D/P Only)				
	100 psi Proof Press. (Press. Only)				
XJL	¾" to ½" Reducing Bushing	•	•	•	•
XK3	Terminal Blocks	•	•	•	•
XL9 <sup>(12)</sup>	Low Hardness St. St. Pressure Conn.	•	N/A	N/A	N/A
XNH	Tagging Stainless Steel	•	•	•	•
XPK <sup>(11)</sup>	Pilot Light(s)	•	•	•	•
XPM	¾" Sealed Conduit Conn. with 16" Lead Wires	•	•	•	•
XTA	316 St. St. Press. Conn. for "H <sub>2</sub> O Ranges	N/A	•	N/A	•
XUD	316 St. St. Press. Conn. for psid Ranges	N/A	N/A	•	N/A
X2B	Breather Drain	•	•	•	•
X6B <sup>(8)</sup>	Cleaned for Oxygen Service	•	N/A	•	N/A

### NOTES:

- 1 These items are wetted by process fluid.
- 2 Ambient operating temperature limits –20 to 150°F, all styles. Set point shift of range per 50°F temperature change is normal.
- 3 Estimated dc rating, 2.5A, 28 Vdc (not UL listed).

- 4 Estimated dc rating, .4A, 120 Vdc (not UL listed).
- 5 Not UL listed at 480 Vac.
- 6 Supply static pressure for D/P switches.
- 7 St. St. diaphragm only.
- 8 Not available with Buna-N diaphragm.

- 9 Available on psi only.
- 10 Standard on N4 enclosure.
- 11 Not available on NEMA 7.
- 12 Available with Teflon diaphragm only, to 600 psi only.

# TEMPERATURE SWITCHES

P-Series temperature switches feature a SAMA Class II vapor pressure thermal system. This system provides quick, accurate response to process temperature changes with negligible ambient temperature effects. This is inherent in the design due to the precise relationship that exists between temperature and pressure according to

the vapor pressure laws. A wide selection of sensing bulb and armored capillary lengths are available. The vapor pressure system design features small bulb sizes, making installation easy and cost-effective.

All models feature  $\pm 1\%$  percent of span set point repeatability with very high overtemperature ratings.

These standard designs perform well in applications where shock and vibration could be a problem and should be used with Ashcroft thermowells for bulb protection and ease of installation and maintenance.

## STANDARD TEMPERATURE RANGE SELECTION

NOMINAL RANGE		MAX. TEMP. °F	APPROXIMATE DEADBAND									
			PTA <sup>(1)</sup>		PTS <sup>(4)</sup>					PTD <sup>(5)</sup>		
°F	°C		SWITCH ELEMENT									
			J,H	G	J,H	K,F	P	GG	JJ,HH	KK,FF	PP	
-40 to 60	-40 to 16	400	18-90	2-10	9-18	1-2	1-5	2-10	9-18	1-2	1-5	
0 to 100	-20 to 40	400	30-90	2-15	10-30	1-3	1.5-7	2-15	10-30	1.5-3	1.5-7	
75 to 205	20 to 95	400	34-120	2-17	10-34	1.5-3.5	1.5-8	2-17	10-34	1.5-3.5	1.5-8	
150 to 260	65 to 125	400	25-100	2.5-12	9-25	1-2.5	1-7	2.5-12	9-25	1-2.5	1-7	
235 to 375	110 to 190	500	35-130	2-18	10-35	1-3.5	1.5-8	2-18	10-35	1-3.5	1.5-8	
350 to 525 <sup>(6)</sup>	175 to 275	700	40-165	3-25	15-40	2-4.5	2.5-11	3-25	15-40	2-4.5	2.5-11	
500 to 750 <sup>(6)</sup>	260 to 400	900	50-200	20-36	36-60	5-10	6-21	20-36	36-60	5-10	6-21	

### NOTES:

- All deadbands are in °F.
- Switches can be set at increase or decrease throughout the nominal range.
- Deadbands for PTA models are adjustable between the values shown.
- Deadbands for PTS and PTD models are fixed within the range of values shown. Manufacturing and parts variances result in variation from one unit to another as shown.
- Available with remote mount thermal systems only.
- Not available with 2 $\frac{3}{4}$ " stem.

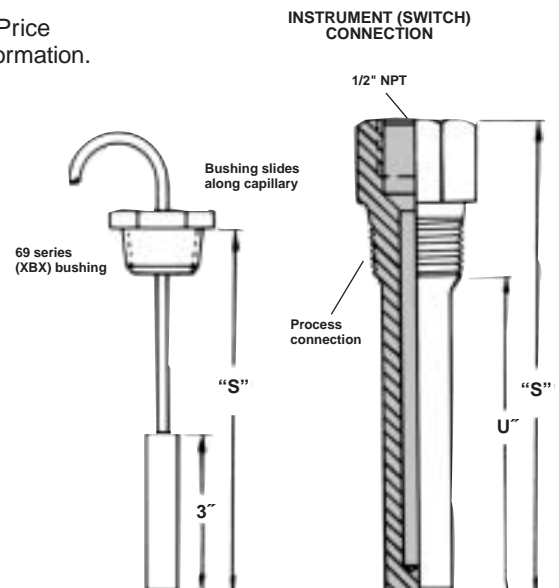
## THERMOWELLS

Thermowells must be used on any application where the bulb of the temperature switch may be exposed to pressure, corrosive fluids or high velocity. Additionally, the use of a thermowell permits instrument interchange or calibration check without disturbing or closing down the process.

Ashcroft temperature switches have bulb diameters to match  $\frac{3}{8}$ " nominal bore thermowells. The bulbs have a sensitive portion length of 2" which can be used with 2 $\frac{1}{2}$ " "U" dimensioned thermowells or longer. For maximum accuracy a thermowell's "U" dimension should be selected to permit complete immersion of the sensitive portion plus 1" when measuring the temperature of liquids; an extra 3" should be allowed when measuring the temperature of gases.

Thermowell bushings should be used with remote mount temperature switches. We recommend the standard 3" bulb and code 69 Series bushings for use with any thermowell "U" dimension. A split rubber grommet allows easy installation and "S" dimension adjustment.

To order a thermowell, refer to Price Sheet TH/PS-1 for complete information.



# ORDER INFORMATION



## P-SERIES TEMPERATURE SWITCH MODEL NUMBER:

To specify the exact switch desired select entries from appropriate tables as shown in example below.



1 – FUNCTION
PTA – Temperature control, single setpoint, adjustable deadband
PTD – Temperature control, two independently adjustable setpoints, fixed deadband
PTS – Temperature control, single setpoint, fixed deadband

2 – ENCLOSURE
N4-NEMA 4, 4X, IP66 (watertight and corrosion resistant)
N7-NEMA 7, 9, IP66 (explosion proof Div.1 & 2)

3 – SWITCH ELEMENTS FOR PTA CONTROLS			
CODE		S.P.D.T. Switch Elements UL/CSA Listed	
H	General Purpose	10A, 125/250 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc	
J	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc	
SWITCH ELEMENTS FOR PTD AND PTS CONTROLS			
CODE		Switch Elements UL/CSA Listed	
Single (PS)	Dual (PD)		
K <sup>(6)</sup>	KK	Narrow Deadband	15A, 125/250 Vac
F <sup>(6)</sup>	FF	Sealed Environment Proof	125/250 Vac
G <sup>(7)</sup>	GG	General Purpose	15A, 125/250/480 Vac 1/2A, 125 Vdc 1/4A, 250 Vdc
P <sup>(6)</sup>	PP	Hermetically Sealed Switch, Narrow Deadband	5A, 125/250 Vac
J	JJ	Hermetically Sealed Switch, General Purpose	11A, 125/250 Vac 5A, 30 Vdc

### NOTES:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1 All thermal systems are 316 St. St.</li> <li>2 Additional line lengths available, consult factory.</li> <li>3 Additional bulb lengths available, consult factory.</li> <li>4 Additional ranges available, consult factory.</li> <li>5 Estimated dc rating, 2.5A, 28Vdc (not UL listed).</li> </ul> | <ul style="list-style-type: none"> <li>6 Estimated dc rating, .4A, 120 Vdc (not UL listed).</li> <li>7 Not UL listed at 480 Vac.</li> <li>8 See page 5 for thermowell application information.</li> <li>9 Standard on N4 enclosure.</li> <li>10 Not available in 350/5250F range.</li> </ul> |
|---|--|

4 – LINE LENGTH <sup>(2)</sup>		
Direct Mount		
ORDER CODE	Line Length	Style
00	Not Applicable	Rigid
Remote Mount		
05	5'	Capillary with Armor (Std.)
10	10'	
15	15'	
20	20'	
25	25'	

5 – THERMAL SYSTEM SELECTION <sup>(1)</sup>	
LINE MATERIAL	
Direct Mount	
ORDER CODE	DESCRIPTION
	No Entry Required for Direct Mount
Remote Mount	
A7	SS Armor (Std.)

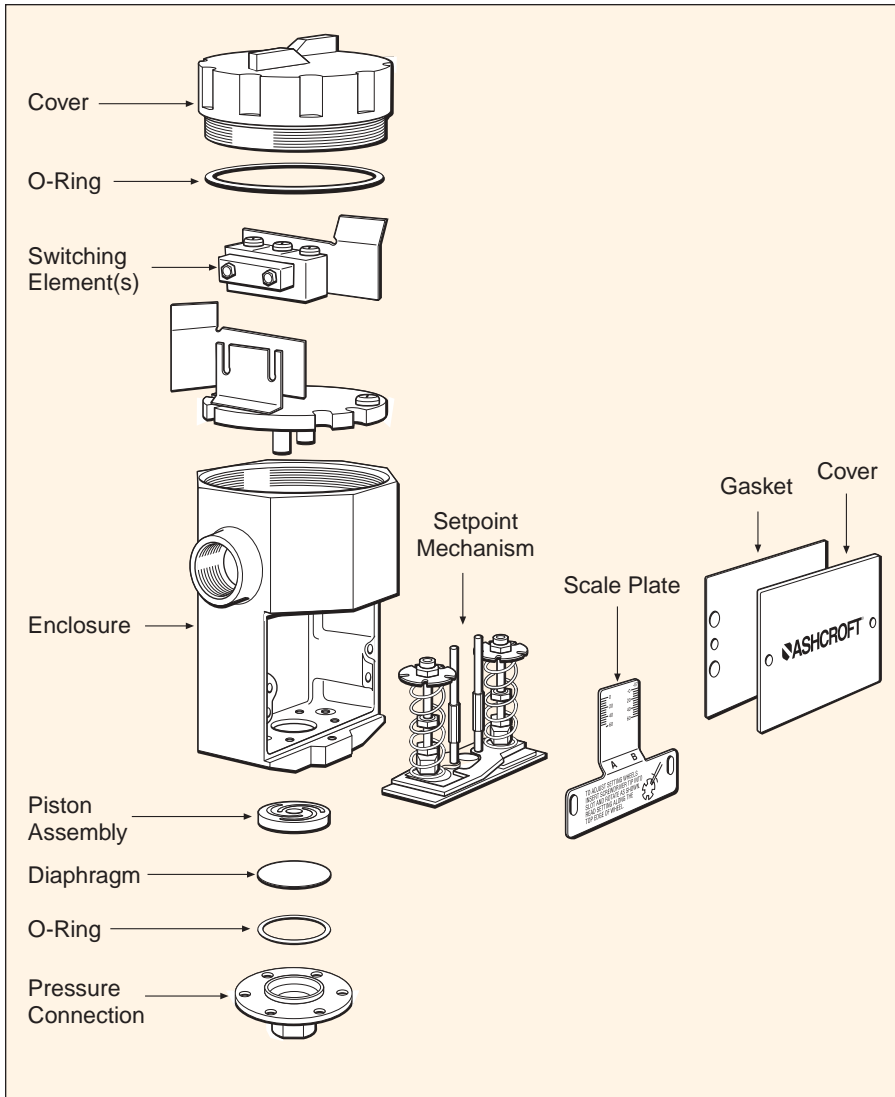
6 – BULB LENGTH SELECTION <sup>(3)</sup>		
Direct Mount		
ORDER CODE	"S" DIM.	MIN. <sup>(8)</sup> THERMOWELL "U" DIM.
027 <sup>(10)</sup>	2 <sup>3</sup> / <sub>4</sub> "	–
040	4"	2 <sup>1</sup> / <sub>2</sub> "
060	6"	4 <sup>1</sup> / <sub>2</sub> "
090	9"	7 <sup>1</sup> / <sub>2</sub> "
120	12"	10 <sup>1</sup> / <sub>2</sub> "
Remote Mount		
030	3"	2 <sup>1</sup> / <sub>2</sub> "

7 – P-SERIES OPTIONS	
CODE	DESCRIPTION
XCH	Chained Cover
XC8 <sup>(9)</sup>	CSA Approval, N7
XFP	Fungus Proof
XFS	Factory Adjusted Setpoints
XJL	<sup>3</sup> / <sub>4</sub> " to <sup>1</sup> / <sub>2</sub> " Reducing Bushing
XK3	Terminal Blocks
XNH	Tagging Stainless Steel
XPK	Pilot Light(s)
X2B	Breather Drain
XPM	<sup>3</sup> / <sub>4</sub> " Sealed Conduit Connection with 16" Lead Wires
XBX	69 Series Bushing for Thermowell System

8 – STANDARD TEMPERATURE RANGE SELECTION <sup>(4)</sup>
Select from Table on Page 6



# PRODUCT SELECTION INFORMATION



## SELECTION

Before making your selection, consider the following:

### 1. Actuator

The actuator responds to changes in pressure, temperature or differential pressure and operates the switch element in response to these changes.

The actuator is normally exposed to process fluid and must therefore be chemically compatible with it. The following may be used to help select actuator type:

For nominal pressure ranges 0-15 psi through 0-3000 psi, Dresser's standard actuator is a diaphragm-sealed piston. In this actuator, process pressure acting on the piston area causes it to overcome the adjustment spring force and actuate a snap-action switch. A diaphragm and O-ring seal the process media from this mechanism. These are available in various materials, i.e.: Buna

N, Teflon and Viton. The standard process connection is stainless steel. Optional Monel pressure connection is available.

For H<sub>2</sub>O pressure and differential pressure ranges, a diaphragm actuator is used. In this design, the standard pressure connections are carbon steel. Diaphragms are available in Viton, Buna N and Teflon. Always review process temperature limits before making seal selections. Optional stainless steel pressure connections are available (option XTA).

For high differential pressure actuator ranges, 3-15 to 60-600 psid, a dual diaphragm-sealed piston actuator is used. This actuator is designed to for high static-pressure applications. The standard pressure connections are nickel-plated brass. Diaphragms are available in Viton, Buna N and Teflon. Always review process temperature limits before making seal selections. Optional stainless steel pressure connections are available (option XUD).

For all temperature ranges the standard Ashcroft® temperature actuator operates on the vapor pressure principle: the vapor pressure in a sealed thermal system is applied to a sensing element, which in turn actuates a switch. This is known as a SAMA Class II system. Various filling materials are used, including Propane, Butane, Methyl Alcohol, N Propyl Alcohol and Xylene. High overtemperature capability is possible with this type of system. The interface between liquid and vapor is the point at which sensing occurs. This is the "sensitive" portion of the bulb. Bulb extensions and capillary are normally filled with vapor, and have little effect on the setpoint, regardless of ambient temperature variations; therefore, no ambient compensation is required. For best results, the bulb should be mounted within 60 degrees of vertical to assure the liquid remains in the bulb.

### 2. Enclosure

The enclosure protects the switch element and mechanism from the environment and has provisions for mounting and wiring. All Ashcroft switch enclosures are epoxy-coated aluminum or stainless steel for maximum corrosion resistance. Choose between watertight NEMA 4, 4X for most industrial applications and explosion-proof NEMA 7/9 for most process applications.

Ashcroft enclosures include watertight cover gaskets, external mounting holes and one or two 3/4 NPT electrical conduit holes for ease of installation. Pressure switches may also be mounted directly to the process by means of the standard 1/4 NPTF or optional 1/2 NPT pressure connection.

**Note:** When installing Ashcroft switches, refer to instruction sheets included with each switch, the National Electrical Code, and any other local codes or requirements to assure safety.

### 3. The Switching Function

Next, consider the switching function. Most applications for alarm and shutdown are satisfied by single setpoint, fixed deadband models. For high/low or alarm and shutdown, the dual setpoint models may be selected. For pump, compressor, level and other control applications, an adjustable deadband model is often the best choice. Consult your Ashcroft representative for dual setpoint or adjustable-deadband pressure and temperature switches.

### 4. The Switch Element

Finally, the electrical switching element must be compatible with the electrical load being switched. For ease of selection, all electrical switching elements are snap acting, SPDT (single pole-double throw), or 2 (SPDT). Refer to catalog pages for switch element



# PRODUCT SELECTION INFORMATION

choices. Select a switch element with electrical rating that exceeds the electrical rating of the device being controlled by the switch. For better reliability and safety, optional hermetically sealed switching elements may be specified.

## ADDITIONAL SWITCH TERMINOLOGY

**Accuracy** – (see repeatability) Accuracy normally refers to conformity of an indicated value to an accepted standard value. There is no indication in switch products; thus, instead, the term repeatability is used as the key performance measure.

**Automatic Reset Switch** – Switch which returns to normal state when actuating variable (pressure or temperature) is reduced.

**Adjustable or Operating Range** – That part of the nominal range over which the switch setpoint may be adjusted. Normally about 15% to 100% of the nominal range for pressure and differential pressure switches and the full span for temperature switches.

**Burst Pressure** – The maximum pressure that may be applied to a pressure switch without causing leakage or rupture. This is normally at least 400% of nominal range for Ashcroft switches. Switches subjected to pressures above the nominal range can be permanently damaged.

**Deadband** – The difference between the setpoint and the reset point, normally expressed in units of the actuating variable. Sometimes referred to as differential.

**Division 1** – A national electrical code classification of hazardous locations. In Division 1 locations, hazardous concentrations of flammable gases or vapors exist continuously, intermittently or periodically under normal conditions; frequently because of repair or maintenance operation/leakage or due to breakdown or faulty operation of equipment or processes which might also cause simultaneous failure of electrical equipment. Explosion-proof NEMA 7/9 enclosures are required in Division 1 locations.

**Division 2** – A national electrical code classification of Hazardous locations. In Division 2 hazardous locations, flammable or volatile liquid or flammable gases are handled, processed or used, but will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown or in case of abnormal operation of equipment. Either Nema 7/9 explosion-proof enclosures or any enclosure with hermetically sealed switch contacts may be used in Division 2 locations.

**Explosion Proof** – A term commonly used in industry referring to enclosures capable of

withstanding an internal explosion of a specified gas without igniting surrounding gases. Strict installation practices in accordance with the national electrical code are also required for safety.

**Fixed Deadband** – The difference between the setpoint and the reset point of a pressure or temperature switch. It further signifies that this deadband is a fixed function of the pressure switch and not adjustable.

**Hermetically Sealed Switch** – A switch element whose contacts are completely sealed from the environment to provide additional safety and reliability. Contact arc cannot cause an explosion, and atmospheric corrosive elements cannot affect the contacts.

**Manual Reset Switch** – Pressure or temperature switch in which contacts remain actuated even after the actuating variable returns to normal. On Ashcroft manual reset switches, a button must be pushed to reset the contacts.

**National Electrical Manufacturers Association (NEMA)** – This group has defined several categories of enclosures, usually referred to as “types”. Further, they designate certain features and capabilities each type must include. For example, among other features, a NEMA 4 enclosure must include a threaded conduit connector, external mounting provision and cover gaskets. When selecting a NEMA 4 enclosure from any manufacturer, a buyer is assured of receiving these features.

**NEMA 4** – Watertight and dusttight enclosures intended for use indoors or outdoors to protect the equipment against splashing, falling or hose-directed water, external condensation and water seepage. They are also sleet-resistant.

**NEMA 4X** – Watertight, dusttight and corrosion-resistant enclosures with same qualifications as NEMA 4, but with added corrosion resistance.

**NEMA 7** – Enclosures for indoor Class I, Division 1 hazardous locations with gas or vapor atmospheres.

**NEMA 9** – Enclosures for indoor Class II, Division 1 hazardous locations with combustible dust atmospheres.

**Normal Switch Position** – Contact position before actuating pressure (or variable) is applied. Normally closed contacts open when the switch is actuated. Normally open contacts close when the switch is actuated.

**Normally Closed** – Refers to switch contacts that are closed in the normal switch state or position (unactuated). A pressure change opens the contacts.

**Normally Open Switch** – Refers to the contacts that are open in the normal switch state or position (unactuated). A pressure change closes the contacts.

**Overpressure Rating(s)** – A nonspecific term that could refer to either burst or proof pressure, or both.

**Proof Pressure** – The maximum pressure which may be applied without causing damage. This is determined under strict laboratory conditions including controlled rate of change and temperature: This value is for reference only. Consult factory for applications where switch must operate at pressures above nominal range.

**Repeatability (Accuracy)** – The closeness of agreement among a number of consecutive measurements of the output setpoint for the same value of the input under the same operating conditions, approaching from the same direction, for full-range traverses.

**Note:** It is usually measured as nonrepeatability and expressed as repeatability in percent of span or nominal range. It does not include hysteresis or deadband.

**Reset Point** – The reset point is the pressure, temperature or differential pressure value where the electrical switch contacts will return to their original or normal position after the switch has activated.

**Setpoint** – The setpoint is the pressure, temperature or differential pressure value at which the electrical circuit of a switch will change state or actuate. It should be specified either on increase or decrease of that variable. (See also reset point.)

## Single-Pole Double Throw (SPDT)

**Switching Element** – A SPDT switching element has one normally open, one normally closed, and one common terminal. The switch can be wired with the circuit either normally open (N/O) or normally closed (N/C). SPDT is standard with most Ashcroft pressure and temperature switches.

**Snap Action** – In switch terminology, snap action generally refers to the action of contacts in the switch element. These contacts open and close quickly and snap closed with sufficient pressure to firmly establish an electrical circuit. The term distinguishes products from mercury bottle types that were subject to vibration problems.

**Static Pressure** – For differential pressure switches, static pressure refers to the lower of the two pressures applied to the actuator.

# ADDITIONAL PRESSURE AND TEMPERATURE SWITCH APPLICATION INFORMATION

## DIFFICULT PROCESS MEDIA

When specifying pressure or temperature switches, the material in contact with media must be compatible with it. Otherwise, failure could occur, resulting in leakage, injury, and loss of life, property or production. The user should review prior experience with materials of construction in the process for guidance in material selection. If this is not appropriate, contact Dresser Control Instrument Operation for assistance. Relevant information such as process media, concentration of each constituent, temperature, pressure, the presence of contaminants, particulate, vibration or pulsation is necessary to make the best recommendation. Refer also to Product Information Page ASH-PI-14B "Corrosion Data Guide."

Some applications are best handled by adding an Ashcroft diaphragm seal to isolate the fluid media from the pressure or differential pressure switch.

Diaphragm seals are recommended where:

- The process media being sensed could clog the pressure element.
- The process media temperature is above or below the ratings of the actuator seal materials.
- The application calls for a sanitary process connection.

**Note:** The addition of a diaphragm seal may increase the deadband and response time of the pressure switch to process pressure changes. Please consult the Control Instrument Operation for details.

Refer also to Ashcroft Product Bulletin DS-1 and Product Information Page SW/PI-30B, "Switch, Diaphragm Seal Combination."

## OXIDIZING MEDIA

When specifying a pressure switch for use in oxidizing media, such as chlorine, oxygen and several other chemical compounds, the wetted materials must be compatible with the media, and the switch should be cleaned for oxygen service. This is necessary to remove any residue that might react violently with the oxidizing media. Specify option X6B (clean for oxygen service). Refer also to Product Information Page SW/PI-6B, "Oxygen Cleaning for Ashcroft Switches."

## STEAM SERVICE

In order to prevent live steam from coming into contact with the switch actuator, a siphon filled with water should be installed between the switch and the process line. We recommend the optional stainless steel welded process connection and diaphragm even though viton is rated for use with steam. Experience has shown that in many steam applications, the 300°F high temperature limit of Viton is exceeded by steam under pressure.

In some boiler applications, a special U.L. listing, "MBPR," which requires unique features, is needed. These are available with Ashcroft B and L series switches only by specifying option XG8. Refer also to Product

Information Page SW/PI-27A, "Steam Limit Control Switch."

## NACE

The National Associations of Corrosion Engineers (NACE) publishes a standard covering the requirements of metallic materials in contact with process media containing Hydrogen Sulfide. We recommend the use of Monel (code P) wetted materials for most applications. Other alternatives include adding applicable diaphragm seals or low hardness stainless steel pressure connection (XL9) and teflon diaphragm. Refer also to Product Information Page SW-22A, "Pressure Switches Meeting NACE Standard MR-01-75."

## HIGH TEMPERATURE PROCESS

Refer to the actuator seal table for process temperature limits for pressure switch actuators. Pressure switches mounted directly to the process can withstand up to 300°F when equipped with optional Viton, stainless steel or Monel wetted parts. If process temperature exceeds 300°F, four feet of 1/2" tubing between the process and the switch will generally protect the switch from damage.

Alternatively, an Ashcroft diaphragm seal selected from bulletin DS-1 can be used to isolate the switch from the hot process.

## VIBRATION

Generally, vibration will not harm Ashcroft pressure switches. However, premature tripping may occur under severe conditions. This tends to be annoying, but repeatable for a given situation and might be in the order of 5% to 10% of switch range from the setpoint, i.e. a 100 psi switch set at 50 psi on increasing pressure might trip somewhere between 40 and 45 psi on increasing pressure. This would not reduce the life of the pressure switch.

The best approach in this type of application is to mount the switch remotely, connecting the switch to the process or equipment with flexible tubing.

## PULSATION

Pressure pulsation below the range of the pressure switch will not harm it. However, because the switch can react to pressure pulses less than one-second duration, it might be desirable to include a dampening device. Several Ashcroft accessories such as snubbers address this situation. Refer to the accessory section of Ashcroft Ordering Handbook (OH-1), or consult your Ashcroft representative for more information.

## MOUNTING

All Ashcroft pressure, temperature and differential pressure switches with snap acting contacts may be mounted in any position. This includes the sensing bulbs of temperature switches. This is an important advantage of snap acting switch designs.

## SWITCH ELEMENT SELECTION

P-Series switches are available with a wide variety of snap acting switch elements to meet most electrical requirements. The standard contact arrangement is single pole, double throw (S.P.D.T.). This includes both normally open and normally closed contacts. Standard contact material is fine silver which generally is suitable for switching 8 volts or more, up to the rating in the Switch Element Selection Table. When switching less than 8 volts, optional gold alloy contacts are recommended.

## HAZARDOUS LOCATIONS

### a. Division I.

Ashcroft explosion proof enclosures are required to meet the requirements of Division I Hazardous Locations as defined by the National Electrical Code.

### b. Division II.

These enclosures also meet the less stringent requirements for Division II Hazardous Locations. Alternatively, Ashcroft watertight enclosures with hermetically sealed switch elements are approved for use in Division II hazardous locations.

### c. Intrinsic Safety.

Ashcroft P-series pressure and temperature switches may be used with approved barriers in most intrinsically safe systems. These switches do not create or store energy and are therefore designated "simple devices" in these systems.

## INFORMATION & GUIDELINES FOR SETTING ASHCROFT PRESSURE, TEMPERATURE AND DIFFERENTIAL PRESSURE SWITCHES

All Ashcroft pressure, temperature and differential pressure switches can be set at any point between about 15% and 100% of the range as designated on the label or the nominal range table.

Ashcroft pressure and temperature switches can be either set in the field or ordered from the factory preset to your requirements. When set at the factory, the specification is  $\pm 1\%$  of the nominal range.

Factory setting, or XFS, is a very popular option, and as a result, we often receive orders that do not have enough information or have incorrect information.

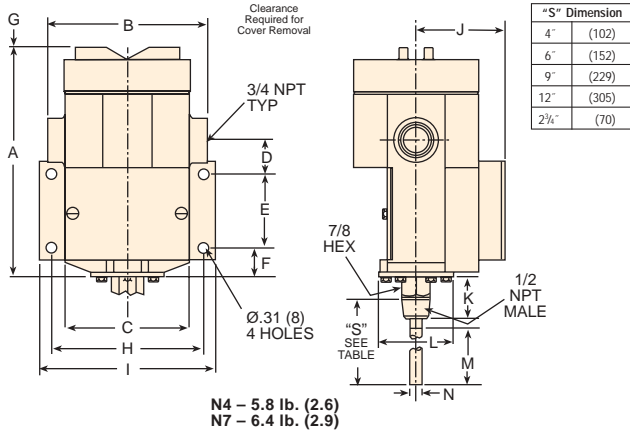
## HOW TO ORDER

When "XFS" is desired:

1. Setpoint must be indicated.
2. Increasing or decreasing pressure must be indicated.  
Ex: PPSN7JB25XFS100  
Set: 60# decreasing
3. For differential pressure switches, static operating pressure must also be specified.

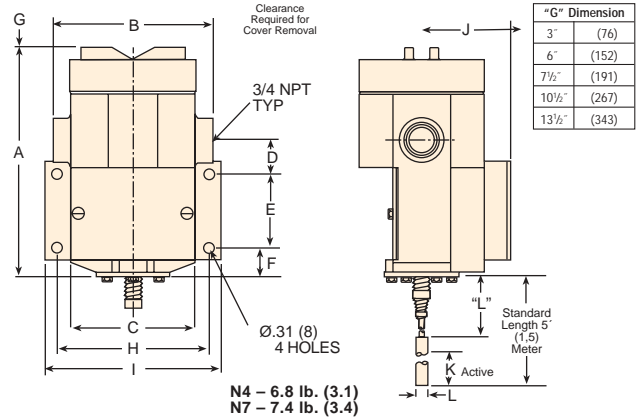
# P-SERIES DIMENSIONS

## Temperature Switch – Direct Mount



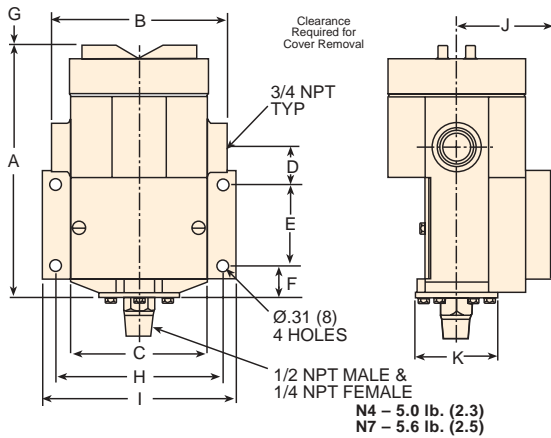
A	B	C	D	E	F	G	H	I	J	K	L	M	N
7 1/16	5	3 7/8	1 1/16	2 5/16	1 5/16	1 1/16	4 3/4	5 1/2	2 3/4	1 13/16	2 5/16	2 5/16	3/8
(179)	(127)	(98)	(27)	(59)	(24)	(17)	(121)	(140)	(70)	(46)	(59)	(59)	9.5

## Temperature Switch – Remote Mount



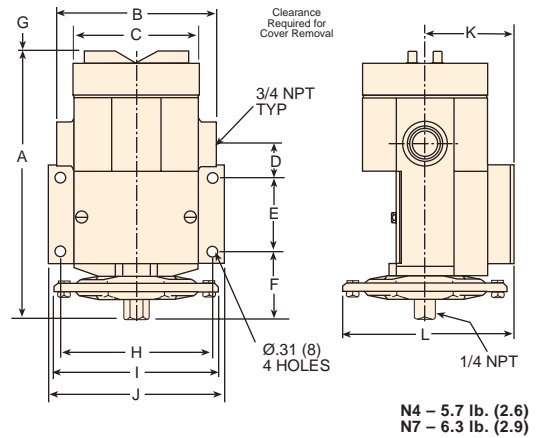
A	B	C	D	E	F	G	H	I	J	K	L
7 1/16	5	3 7/8	1 1/16	2 5/16	1 5/16	1 1/16	4 3/4	5 1/2	2 3/4	2 5/16	3/8
(179)	(127)	(98)	(27)	(59)	(24)	(17)	(121)	(140)	(70)	(59)	9.5

## Pressure Switch – psi Ranges



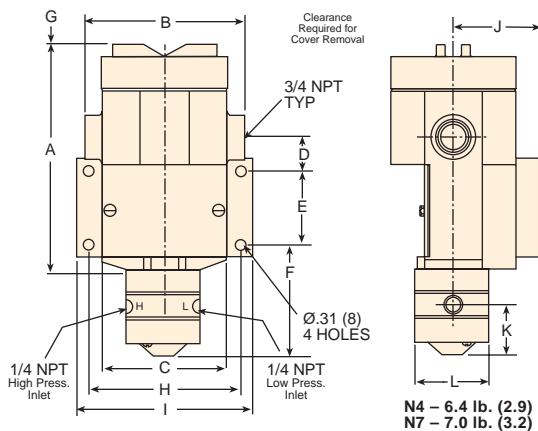
A	B	C	D	E	F	G	H	I	J	K
7 1/16	5	3 7/8	1 1/16	2 5/16	1 5/16	1 1/16	4 3/4	5 1/2	2 3/4	2 5/16
(189)	(127)	(98)	(27)	(59)	(33)	(17)	(121)	(140)	(70)	(59)

## Pressure Switch – in. H<sub>2</sub>O Ranges



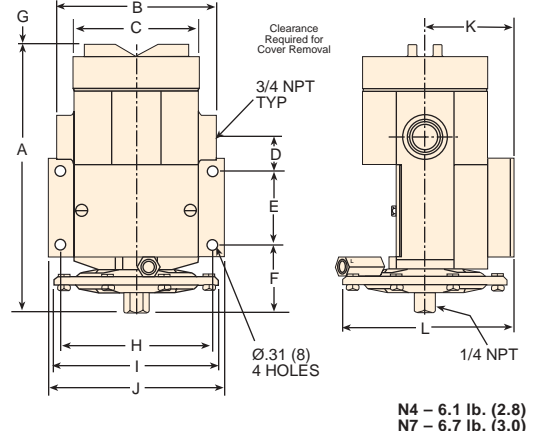
A	B	C	D	E	F	G	H	I	J	K	L
8 3/8	5	3 7/8	1 1/16	2 5/16	2	1 1/16	4 3/4	5 1/8	5 1/2	2 3/4	5 5/16
(206)	(127)	(98)	(27)	(59)	(51)	(17)	(121)	(130)	(140)	(70)	(135)

## Differential Pressure Switch – psid Ranges



A	B	C	D	E	F	G	H	I	J	K	L
9 1/16	5	3 7/8	1 1/16	2 5/16	3 5/16	1 1/16	4 3/4	5 1/2	2 3/4	1 17/16	2 5/16
(240)	(127)	(98)	(27)	(59)	(84)	(17)	(121)	(140)	(70)	(39)	(59)

## Differential Pressure Switch – Diff. in. H<sub>2</sub>O Ranges



A	B	C	D	E	F	G	H	I	J	K	L
8 3/8	5	3 7/8	1 1/16	2 5/16	2	1 1/16	4 3/4	5 1/8	5 1/2	2 3/4	5 5/16
(206)	(127)	(98)	(27)	(59)	(51)	(17)	(121)	(130)	(140)	(70)	(135)

## Instrument Division Sales and Customer Service Locations

For additional product information contact:

**Dresser Instrument, Dresser Inc.**  
**Control Instrument Operations**  
Two Research Drive  
Shelton, CT 06484  
Tel: (203) 925-4000  
Fax: (203) 925-4010

### U.S. Operations

**Industrial Instrument Operations**  
**Stratford, Connecticut**  
250 E. Main Street  
Stratford, CT 06614-5145  
Tel: (203) 378-8281  
Fax: (203) 381-9042

**Shelton Operations**  
**Shelton, Connecticut**  
Two Research Drive  
Shelton, CT 06484  
Tel: (203) 925-4000  
Fax: (203) 925-4010

**Commercial Instrument Operations**  
**Berea, Kentucky**  
200 Harrison Road  
Berea, KY 40403  
Tel: (859) 986-9333  
Fax: (859) 986-7676

### U.S. Sales Offices

**Midwest Region**  
400 W. Lake Street  
Suite 318  
Roselle, IL 60172-3573  
Tel: (630) 980-9030  
Fax: (630) 980-9440

**Southwest Region**  
605 Bel Air Blvd.  
Suite 10  
Mobile, AL 36606  
Tel: (251) 473-1692  
Fax: (251) 473-1782

**Southeast Region**  
605 Bel Air Blvd.  
Suite 10  
Mobile, AL 36606  
Tel: (251) 473-1692  
Fax: (251) 473-1782

**Northeast Region**  
250 E. Main Street  
Stratford, CT 06614-5145  
Tel: (203) 385-0670  
Fax: (203) 385-0756

**Pacific Region**  
250 E. Main Street  
Stratford, CT 06614-5145  
Tel: (203) 385-0399  
Fax: (203) 385-0402

### International Operations

**Brazil**  
Dresser Industria e Comercio Ltda.  
Rua Senador Vergueiro #433  
09521-320 Sao Caetano do Sul  
Sao Paulo, Brazil  
Tel: 55-11-4224-7400  
Fax: 55-11-4224-7477  
E-Mail: vendas.instrumentos@dresser.com

**Brazil (Jacarei)**  
Dresser Industria e Comercio Ltda.  
Divisao Masonellan  
Rua Particular- Estrada  
Velha Rio De Janeiro -  
Sao Paulo, KM 101 Jacarei,  
Sao Paulo Caixa  
Postal 167, CEP 12305-330  
Tel: 55-11-3958-2011  
Fax: 55-11-3958-2670  
E-Mail: dresserjac@uol.com.br

**Canada**  
Dresser Canada, Inc.  
2135 Meadowpine Blvd.  
Mississauga,  
Ontario L5N 6L5 Canada  
Tel: 905-826-8411  
Fax: 905-826-9106  
E-Mail: Lance\_Barette@dresser.com

**China**  
Dresser Industries, Inc.  
Room #2404, Capital Mansion  
No. 6 Xin Yuan Nan Road Beijing,  
People's Republic of China 100004  
Tel: 86-10-84862440/1/2/3/4  
Fax: 86-10-84862445  
E-Mail: dresser@public3.bta.net.cn

**France**  
Dresser Europe GmbH  
206, Rue des Campanules Le Mandinet  
F 77185 Lognes, France  
Tel: 33-1-60372530  
Fax: 33-1-60372539  
E-Mail: europe@wanadoo.fr

**Germany**  
Dresser Europe GmbH  
Postfach 11 20 Max-Planck-Str. 1  
D-52499 Baesweiler, Germany  
Tel: 49-24-01-8080  
Fax: 49-24-01-7027  
E-Mail: jbiermans@dresserbae.de

**Germany**  
Ebro Electronic GmbH  
Peringerstr 10D-85055  
Ingolstadt, Germany  
Tel: 49-84-1-95478-0  
Fax: 49-84-1-95478-80  
E-Mail: info@ebro.de

**Japan**  
Dresser Japan Ltd.  
Room 818, Shin Tokyo Building  
3-1 Marunouchi 3-Chome,  
Chiyoda-ku, Tokyo, Japan  
Tel: 813-3201-1501  
Fax: 813-3213-6567  
E-Mail: yuichi.yamamoto@dresserjapan.co.jp

**Korea**  
Dresser International, S.A  
#2015 Kuk Dong Bldg.  
60-1, 3-KA, Choongmu-Ro,  
Chung-ku, Seoul, Korea 100-705  
Tel: 82-2-2274-0792  
Fax: 82-2-2274-0794  
E-Mail: dkisjlee@chollian.net

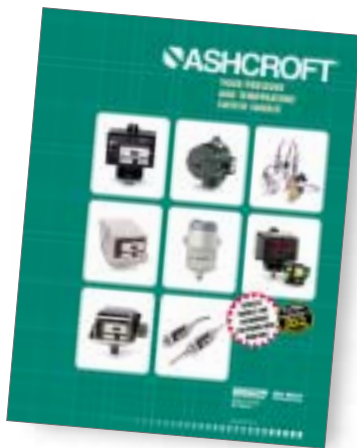
**Mexico**  
Dresser Instruments S.A. De C.V.  
Mexico Operations  
Henry Ford No. 114  
Esq. Foulton Fracc.  
Industrial San Nicolas  
54030 Tlalnepantla,  
Edo De Mexico  
Tel: (52)55-53-10-72-17  
(52)55-53-10-89-83  
(52)55-53-10-28-29  
(52)55-53-10-28-75  
Fax: (52)55-53-10-26-08  
E-Mail: mendiet@avantel.net

**Saudi Arabia**  
Dresser Al Rushaid Valve &  
Instrument Co. (DARVICO)  
P.O. Box 10145  
Jubail Industrial City  
Saudi Arabia 31961  
Tel: 966-3-341-0278  
Fax: 966-3-341-7624  
E-Mail: bill\_dumasia@darvico.com  
E-Mail: sam\_dastur@darvico.com

**Singapore**  
Dresser Singapore  
Instrument Operations  
Block 1004 Toa Payoh North  
#07-15/17 Singapore 318995  
Tel: 65-6252-6602  
Fax: 65-6252-6603  
E-Mail: john.wong@dresser.com.sg

**United Kingdom**  
Dresser Europe GmbH  
East Gillibrands, Skelmersdale  
Lancashire, WN8 9TU  
United Kingdom  
Tel: 14-16-95-52600  
Fax: 14-16-95-52693  
E-Mail: Johanna.Gribben@  
dresser-instrument.co.uk  
E-Mail: sales@dresser-instrument.co.uk

**Venezuela**  
Manufactures Petroleras  
Venezolanas (M.P.V.)  
KM 7 Carretera A El Mojan Calle 18,  
#15B355 ZONA Ind. Norte Sector  
Canchancha Maracaibo Edo  
Zulia Venezuela  
Tel: 58-61-579-762/070  
Fax: 58-61-579-461  
E-Mail: contactenos@mapvensa.com  
E-Mail: ventasmpv@telcel.net.ve



For other Ashcroft switch models request Ashcroft Bulletin, Switch Quick Guide QG-3.  
All product information pages mentioned in this bulletin can be downloaded from our web site.



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1P6/94 10MCP R12/02