Data Sheet

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A-Series Miniature Watertight Pressure Switches

FEATURES

- Compact size
- 316 stainless steel construction
- Pressure ranges from vacuum to 15,000 psi
- Factory set or field adjustable setpoints
- Wide operating temperature range (–40°C to 100°C)
- Precision snap-acting micro switch
- SPDT or DPDT switching
- UL, CSA listed models
- CE and ROHS compliant
- CRN models available (up to 10,000 psi)
- SIL 3 capable

TYPICAL USES

- Offshore oil rigs
- Chemical and petrochemical plants
- Pulp and papermills
- Autoclaves and sterilizers
- Rail and heavy vehicles
- Specialty machinery and equipment

SIL 3 CAPABLE

LOOK FOR THESE MARKS ON OUR PRODUCTS

- **High performance**
- **Small size**
- **Special connections**
- **Easily configurable to meet your application requirements**
- **SIL 3 capable**

SPECIFICATIONS

Setpoint:	Factory set or field adjustable
Setpoint repeatability:	±2% of range (Additional setpoint shift of ±2% of range per 40°F from initial setpoint set at 70°F typical)
Vibration:	Passed MIL-STD-202G
Shock:	75G's 10 milliseconds 3 axist
Piston:	Stainless steel w/Viton or Buna-N o-ring
Mechanical life piston design:	>1,000,000 operations typical
Diaphragm:	316L Stainless steel
Mechanical life diaphragm design:	>400,000 operations typical
Enclosure material:	316L Stainless steel
Enclosure rating:	NEMA 6, IP 67
Pressure Connection:	⅛ NPTF, ¼ NPTF, ¼ NPTM, ⅛ NPTM, ½ MNPT, ½ FNPT, (7/16-20 SAE M), VCR, VCO, ¾″ Tri-Clamp®, 1.5″ Tri-Clover®, 2.0″ Tri-Clover G¼ B, G¼ A, Type E Stub end
Electrical output:	SPDT, or DPDT 5A or 3A 120VAC, 2A @ 30 VDC, gold contacts available
Electrical termination:	Wire leads, spade terminals or custom cables, ½ NPT conduit connection with wire leads, Micro DIN with and without mating connector M20 x 1.5 conduit connection with wire leads
Approvals:	CRN: OF 14836.5C, CSA: 2454057 (LR55528), UL: E34743, CE, ROHS

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CHARACTERISTICS AND RATINGS

A SERIES SWITCH PERFORMANCE CHARACTERISTICS													
	RANGE			SETPOINT REPEATABILITY			SETPOINT ADJUSTABILITY			DEADBAND (DB)		
	psi	bar kg/cm²	kPa	psi	bar, kg/cm²	kPa	psi	bar, kg/cm²	kpa	psi	bar, kg/cm²	kPa
DIAPHRAGM	–15/15	–1/1	–100/100	±0.6	±.04	±4	–15/15	–1/1	–100/100	1-5	.07-.35	7-35
	30	2	200	±0.6	±.04	±4	6-30	.4-2	6-200	1-5	.07-.35	7-35
	60	4	400	±1.2	±.08	±8	8-60	.6-4	60-400	2-10	.14-.70	14-70
	100	7	700	±2	±.14	±14	10-100	.7-7	70-700	3-15	.2-1.0	20-100
	200	14	1400	±4	±.28	±28	20-200	1.4-1.4	140-1400	3-30	.2-2.0	20-200
PISTON	100	7	700	±2	±.14	±14	20-100	1.4-7	140-700	3-15	.2-1.0	20-100
	200	14	1400	±4	±.28	±28	40-200	2.8-1.4	280-1400	3-30	.2-2.0	20-200
	500	35	3500	±10	±.70	±70	50-500	3.5-35	350-3500	20-100	1.4-7.0	140-700
	1000	70	7000	±20	±1.40	±140	100-1000	7-70	700-7000	25-150	1.7-10	170-1000
	2000	140	14000	±40	±2.8	±280	200-2000	14-140	1400-1400	30-300	2-20	200-2000
	5000	350	35000	±100	±7.0	±700	500-5000	35-350	3500-35000	75-750	5-50	500-5000
	7500	500	50000	±150	±10	±1000	750-7500	50-500	5000-50000	110-1100	7.5-75	750-7500
	10000	700	70000	±200	±14.0	±1400	1000-10000	70-700	7000-70000	250-2500	17-170	1700-17000
	15000	1000	100000	±300	±20	±2000	1500-15000	100-1000	10000-100000	300-3000	20-200	2000-20000

CONFIGURATION		MAX. WORKING PRESSURE "MWP"			PROOF PRESSURE "PROOF"			BURST PRESSURE		
RANGES (psi)	w/SEAL	psi	bar, kg/cm²	kPa	psi	bar kg/cm²	kPa	psi	bar, kg/cm2	kPa
up to 200	S	800	55	5500	1000	70	7000	>9500	>655	>65500
100-200	B, V or N	2000	140	1400	2000	140	14000	>10000	>700	>70000
500-2000	B, V or N	5000	350	35000	8000	550	55000	>30000	>2100	>210000
5000-7500	B, V or N	10000	700	70000	15000	1000	100000	>50000	>3500	>350000
10000-15000	B, V or N	15000	1000	100000	20000	1400	140000	>45000	>31000	>310000

"MWP" and "PROOF" PRESSURES

MATERIAL AND TEMPERATURE RATINGS (based on mat'l and switch code)

ELECTRIC	
Switch Code	Electric) on Label
1P, 2P	3A 125Vac; 2A, 30Vdc
1H, 2H	5A 125/250Vac; 5A, 28Vdc
1G, 2G	0.1A 125Vac; 0.1A 30Vdc
1L, 2L	1A 125Vac; 1A 28Vdc

MATERIAL & TEMPERATURE		
Actuator Seal	Material	Temperature Range
S	SS	–40-100°C
B (Ranges 100#, 200#)	SS, BUNA	–28-100°C
B (Ranges 500# to 15,000#)	SS, BUNA	–40-100°C
V	SS, Viton	–20-100°C
N	SS, HNBR	–20-100°C

Tri-Clover is a registered trademark of Alfa Laval

Tri-Clamp is a registered trademark of Ladish Co.

OPTIONS	
Code	Description
XC4	Individual certified calibration chart
XFP	Fungus proofing
XMQ	Positive Material Identification (75, 15 & 20 process conn. only)
XNC	2 wire leads w/ground wire – wired for normally closed operation
XNO	2 wire leads w/ground wire – wired for normally open operation
XNH	Stainless Steel tag
XNN	Paper tag
X6B	Cleaned for oxygen service

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ORDERING CODE

Example:	APS	N4	1H	012C	S	02	30# -	15 R -	X6B

Function

APS	Pressure switch, single setpoint, fixed deadband, factory set, not field adjustable
APA	Pressure switch, single setpoint, fixed deadband, field adjustable

Enclosure

N4	Watertight 316 SS body

Micro Switch, First Character

1	Single Switch – SPDT
2	Dual Switch – DPDT (not available with "S" actuator with <100 psi range)

Micro Switch, Second Character

G	Gold Contact – 0.1 A @ 125 Vac, 0.1 A @ 30 Vdc
H	Higher Current – 5A @ 125/250 Vac, 5A @ 28 Vdc resistive, 3A @ 28 Vdc inductive.
L	Higher Current Gold Contacts – 1A @125 Vac, 1A @ 28 Vdc resistive, 0.5A @ 28 Vdc Inductive
P	General Purpose – 3A @ 125 Vac, 2A @30 Vdc

Electrical Connection

000H**	Micro DIN Connector – Watertight DIN 43650 FORM C cable socket without mating connector. Not available with DPDT switching
00MH**	Micro DIN Connector – Watertight DIN 43650 FORM C cable socket with mating connector. Not available with DPDT switching
000N	Nonstandard, customer specified see # variation
000T	Spade terminals, 4 - 0.187″ male spade – Not available with DPDT switching
___C	½ NPT male conduit connection with 18 AWG wires
___L	Wire leads, 3-18 AWG PVC insulated wires
___G	M20 x 1.5 male conduit connection with 18 AWG wire
___K	M20 x 1.5 male conduit connection with 4 conductor jacketed cable with 18 AWG wires
___J	½ NPT male conduit connection with 4 conductor jacketed cable with 18 AWG wires

NOTE: ___ (e.g. 012C = 12″ lead wires. Specify wire length in inches.

Actuator Seal (see page six for more information)

B	316 SS piston & Buna O-ring, ranges ≥100 psi
V	316 SS piston & Viton O-ring, ranges ≥100 psi
S	316 SS welded Diaphragm, ranges ≤200 psi
N	316 SS piston & HNBR O-ring, ranges ≥100 psi

Pressure Connection

01	⅛ NPT Male
02	¼ NPT Male
03	⅛ NPT Female*
04	½ NPT Male
50	½ NPT Female*
12	G ¼A (Type E Stud End)
13	G ¼B
25	¼ NPT Female*
05	7/16-20 SAE Male
06	VCR Fixed*
07	VCO Fixed*
08	7/16-20 SAE Female
46	9/16-18 SAE Female
76	7/16-20 SAE w/37° Flare End
75	0.75″ Tri-Clamp® connection (includes 3A Approval)†
15	1.5″ Tri-Clover® connection (includes 3A Approval)†
20	2.0″ Tri-Clover® connection (includes 3A Approval)†

Ranges

Select from table page 2

Setpoint

5 characters maximum representing setpoint of the switch in the same units as the range of the switch. For setpoints in Vacuum specify as "– "pressure. If no setpoint is required on an APA switch use either "NSR" or "NSD." If direction is not known use "NSR" as the default.

Setpoint Direction

R	Rising Pressure (Increasing Pressure, Decreasing Vacuum)
D	Decreasing Pressure, (Increasing Vacuum)

Options

Select from table page 2

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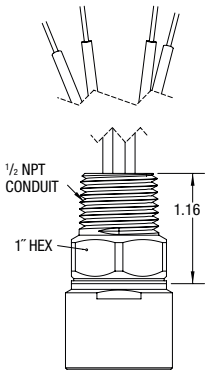
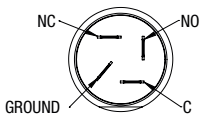
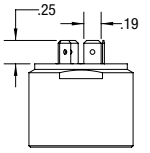
DIMENSIONS

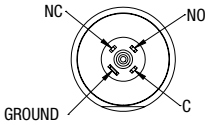


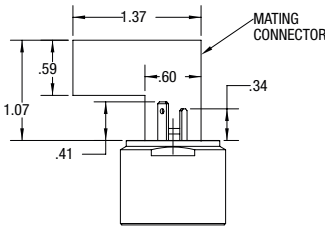
CONDUIT (XXXC)
XXX = WIRE LENGTH (in.)





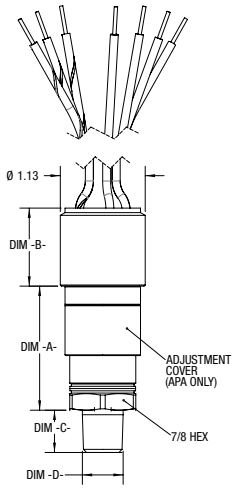
SPADE TERMINALS
(000T)



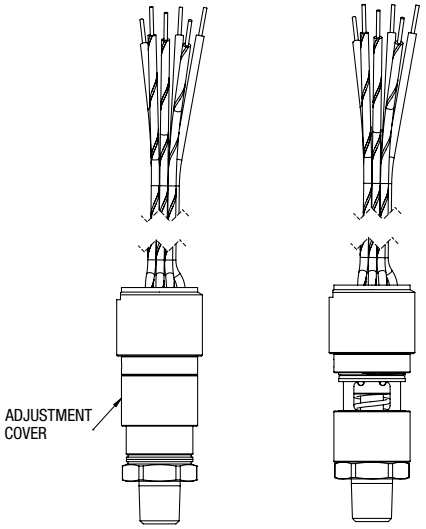


MICRO DIN
(000H) NO CONN.
(001H) WITH CONN.

WIRE LEAD (XXXL) CONNECTION WITH DUAL SWITCH SHOWN XXX = WIRE LENTH (in.)



FIELD ADJUSTABLE



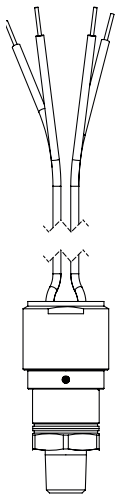
SLIDE COVER DOWN TO ACCESS SETPOINT ADJUSTMENT. SLIDE COVER UP TO CLOSE AND SEAL ADJUSTMENT

ROTATE LEFT <—— TO INCREASE SET POINT

ROTATE RIGHT ——> TO DECREASE SET POINT

∅.095 OR SMALLER TOOL REQUIRED TO ROTATE NUT

FACTORY SET



FUNCTION CODE	
Description	**Dim. A**
APS (Factory Set)	1.06
APA (Field Adjustable)	1.64

MICRO SWITCH	
Description	**Dim. B**
1H, 2H, 1L, 2L	1.03
1P, 2P, 1G, 2G	0.90

PRESSURE CONNECTION GENERAL DIMENSION			
Code	**Description**	**Dim. C**	**Dim. D**
01	1/8 NPT Male	0.45	0.441
02	1/4 NPT Female	0.56	0.54
03	1/8 NPT Female	0.75	0.65
04	1/2 NPT Male	0.92	0.75
25	1/4 NPT Female	1.10	0.75
50	1/2 NPT Female	1.25	1.04
05	7/16-20 SAE Male	0.56	0.44
08	7/16-20 SAE Female	1.10	0.84
06	VCR Fixed	0.58	0.56
07	VCO Fixed	0.47	0.56
12	G 1/4A	0.47	0.44
13	G 1/4B	0.59	0.37
46	9/16-18 SAE Female	0.39	0.47
76	7/16-20 SAE w/37_ Flare End	0.55	0.36
75	0.75″ Tri-Clamp Seal	1.10	0.96
15	1.5″ Tri-Clover Seal	1.23	1.99
20	2.0″ Tri-Clover Seal	1.23	2.49

CRN: OF 14836.5C,

CSA: 2454057 (LR55528)

UL: E34743

CE

ROHS

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AVAILABLE CONNECTIONS

PRESSURE CONNECTIONS

1/8, 1/4 or 1/2 MALE NPT

1/8 or 1/4 FEMALE NPT, 7/16-20 SAE FEMALE

VCR or VCO

7/16-20 SAE MALE (OPTIONAL 37° FLARE END)

3/4″, 1.5″ or 2.0″ SANITARY

G 1/4 A TYPE-E STUD END

1/2 FEMALE NPT

G 1/4 B

ELECTRICAL CONNECTIONS

18 AWG WIRE LEADS

1/2 NPT CONDUIT CONNECTOR WITH 18 AWG WIRE LEADS

SPADE TERMINAL 4-0.187 MALE TERMINALS

HIRSCHMANN MICRO-DIN CONNECTOR 43650 FORM C

DPDT 18 AWG LEADS

M20 X 1.5 MALE CONDUIT WITH 18 AWG WIRES

1/2 NPT MALE CONDUIT AND JACKETED CABLE WITH 18 AWG WIRES

M20 X 1.5 MALE CONDUIT AND JACKETED CABLE WITH 18 AWG WIRES

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SELECTION GUIDE

Before selecting a switch the following should be considered:

Actuator:

The actuator responds to changes in pressure and operates the micro switch element in response to these changes. The actuator is normally exposed to the process media and must be chemically compatible with it. There are three types of actuators available for the A-Series switches – all welded 316 SS diaphragm sealed piston; 316 SS piston with Viton O-ring seal; and 316 SS piston with Buna-N O-ring seal. The 316 SS diaphragm is available in ranges from –15/15 psi to 200 psi. The 316 SS piston is available in ranges from 100 psi to 15,000 psi. Switches offered in 100 psi and 200 psi can be ordered with either the piston or diaphragm design. The piston design will have a longer mechanical life, while the diaphragm design has a better operating temperature.

The piston design is more reliable than a diaphragm design when subjected to frequent large pressure excursions, pressure surges and spikes associated with typical hydraulic applications. Piston designs are typically used when the switch is used as low pressure alarm or cutoff where the normal working pressure is above the nominal range of the switch.

The Switching Function:

Most applications for alarm, shutdown and interlock are satisfied by the standard
A-Series switches which feature single setpoint fixed deadband. For pump, compressor and other control applications, the deadband becomes a very important consideration and may require increasing the range of the switch to increase the deadband. Please consult your Ashcroft representative for assistance with special applications.

The Micro Switch Element:

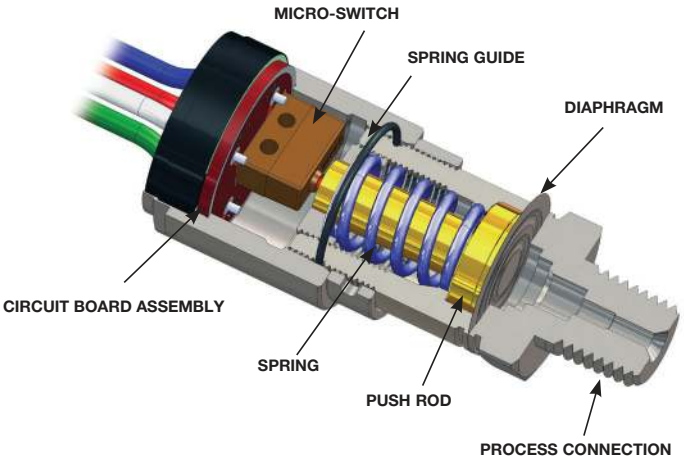
The micro switch element must be chosen to meet the electrical load requirement to be switched. The switches are offered as either SPDT (single pole double throw) or DPDT (double pole double throw). The DPDT switch is made up of two SPDT switches which are adjusted to work together by Ashcroft's patent pending Circuit Board Rotation Design. DPDT switching is not available on diaphragm designs below 100 psi, with Spade terminals or the Micro DIN connector.

Understanding Setpoints and Reset Points:

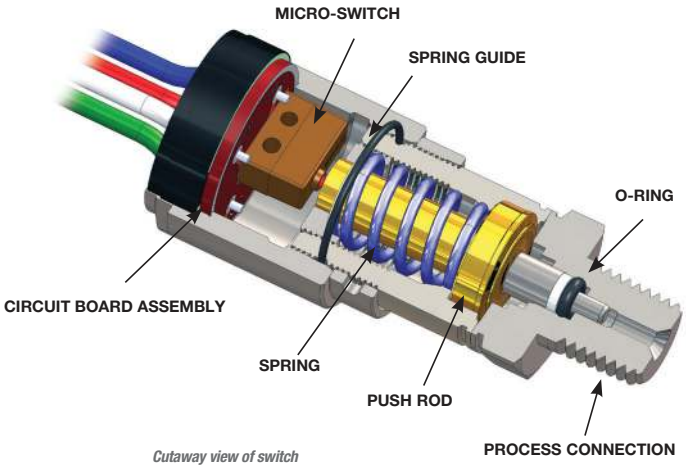
Pressure switches can be set to switch on either increasing (rising) or decreasing pressures. Since the switches have both Normally Open (NO) contacts and Normally Closed (NC) contacts you can wire the switch to open or close for either an increasing or decreasing pressure. To be consistent in setting the switches Ashcroft defines the setpoints as follows. For an increasing setpoint, the pressure is increased from 0 psi to the set point and then decreased to the reset point. For a decreasing setpoint, the pressure is increased to full range and then decreased to the setpoint and then increased to the resetpoint.

Custom Applications:

The A-series switch is designed to allow custom process connections and electrical terminations. Please consult your Ashcroft representative for assistance with custom applications.



Cutaway view of switch assembly with welded SS diaphragm



Cutaway view of switch assembly with SS piston

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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. Ashcroft A-Series switch accuracy is 2% of nominal range.

Automatic Reset Switch – Switch which returns to normal state when actuating variable Pressure is reduced.

Adjustable or Operating Range – That part of the nominal range over which the switch setpoint may be adjusted. Normally about 10% to 100% of the nominal range for A-Series pressure switches.

Burst Pressure – The maximum pressure that may be applied to a pressure switch without causing leakage or rupture. This is approximately 16X of nominal range for A-Series switches. Diaphragm switches subjected to pressures above the nominal range can be permanently damaged.

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

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

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.

NEMA 6 – Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (hose directed water and the entry of water during occasional temporary submersion at a limited depth); and that will be undamaged by the external formation of ice on the enclosure.

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 or reference temperature (70°F).

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. Ashcroft A-series switch repeatability is 2% of nominal range.

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

Resetpoint – The resetpoint is the 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 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.

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 A-series switches.

Double Pole Double Throw (DPDT) Switching Element – Two SPDT switching elements both set to actuate or de-actuate at the same set or resetpoint. Each switch one has one normally open, one normally closed, and one common terminal. The switches are independent of each other and can be wired to two independent circuits. The two circuits can either normally open (N/O) or normally closed (N/C).

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.

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