Differential Pressure Switch

Installation and Operation

#18872 – 1/10/19

Overview

The Differential Pressure Switch is ideal for air filter monitoring, static pressure proving, airflow proving, or auxiliary fan actuation. Because of its UL 353 Limit Control Listing, the Pressure Switch can be used in safety circuits to protect heating appliances, heating systems, processing systems and HVAC/R systems.

The setpoint is field adjustable from 0.1” to 35” WC, and the unit can measure positive pressure, vacuum, or true differential pressure. The seven pressure ranges are field-selectable by changing a color-coded spring. The spring for the range that you order is preinstalled, and the other six springs are shipped with the unit so that you can change ranges in the field if you choose.

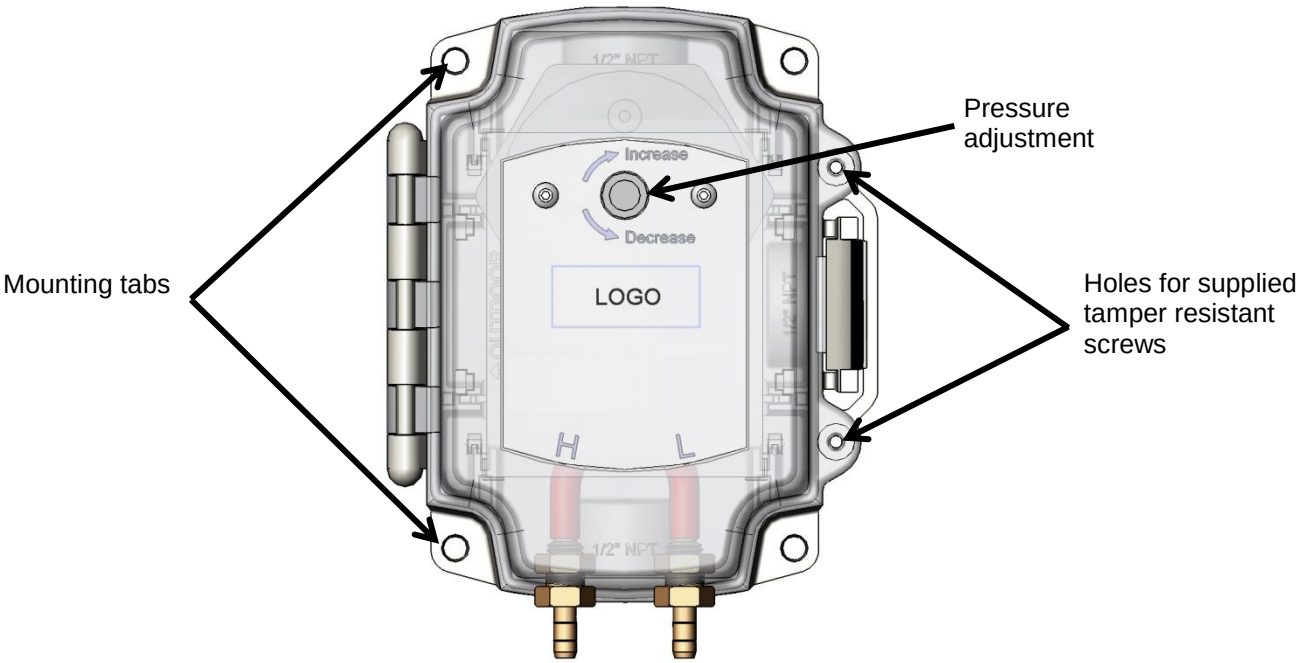

Figure 1: Differential Pressure Switch

Part #s:
NSB-ZPS-SW2
NSB-ZPS-SW3
NSB-ZPS-SW4

Specifications

Pressure Range	
NSB-ZPS-SW2	0.40" to 1.40" W.C. (100 Pa to 350 Pa)
NSB-ZPS-SW3	1.20" to 2.40" W.C. (300 Pa to 600 Pa)
NSB-ZPS-SW4	2.40" to 6.42" W.C. (600 Pa to 1600 Pa)
Pressure Ports	¼ brass
Proof Pressure	100” W.C. (3.6 PSI, 24,900 Pa)
Switch Type	SPDT (Silver Contacts)

Contact Rating	(UL 353) 28 VA pilot duty, 24 VAC 1/10 hp, 120-277 VAC 125 VA pilot duty, 125 VAC 2.5 A inductive, 125 VAC 5 A resistive, 125 VAC
Contact material	Silver
Operating Temperature	-40°F to 185°F (-40°C to 85°C)
Operating Humidity	5 to 95% RH non-condensing
Measurement Media	Air or Combustion Gases

Specifications subject to change without notice.

Mounting

1. Hold the unit vertical in its mounting location and mark the holes in the mounting tabs or use the actual size template shown in Figure 3 below. **NOTE** If unit is mounted outside, it must be oriented horizontal with the latch down and the ports to the left.
2. Using #10 screws attach the box to the mounting surface.

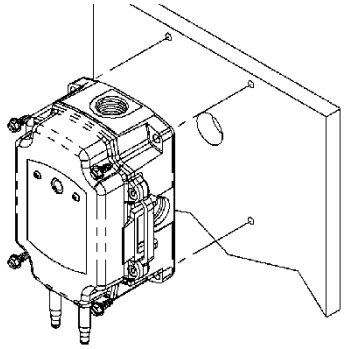

Figure 2: Differential Pressure Switch Mounting

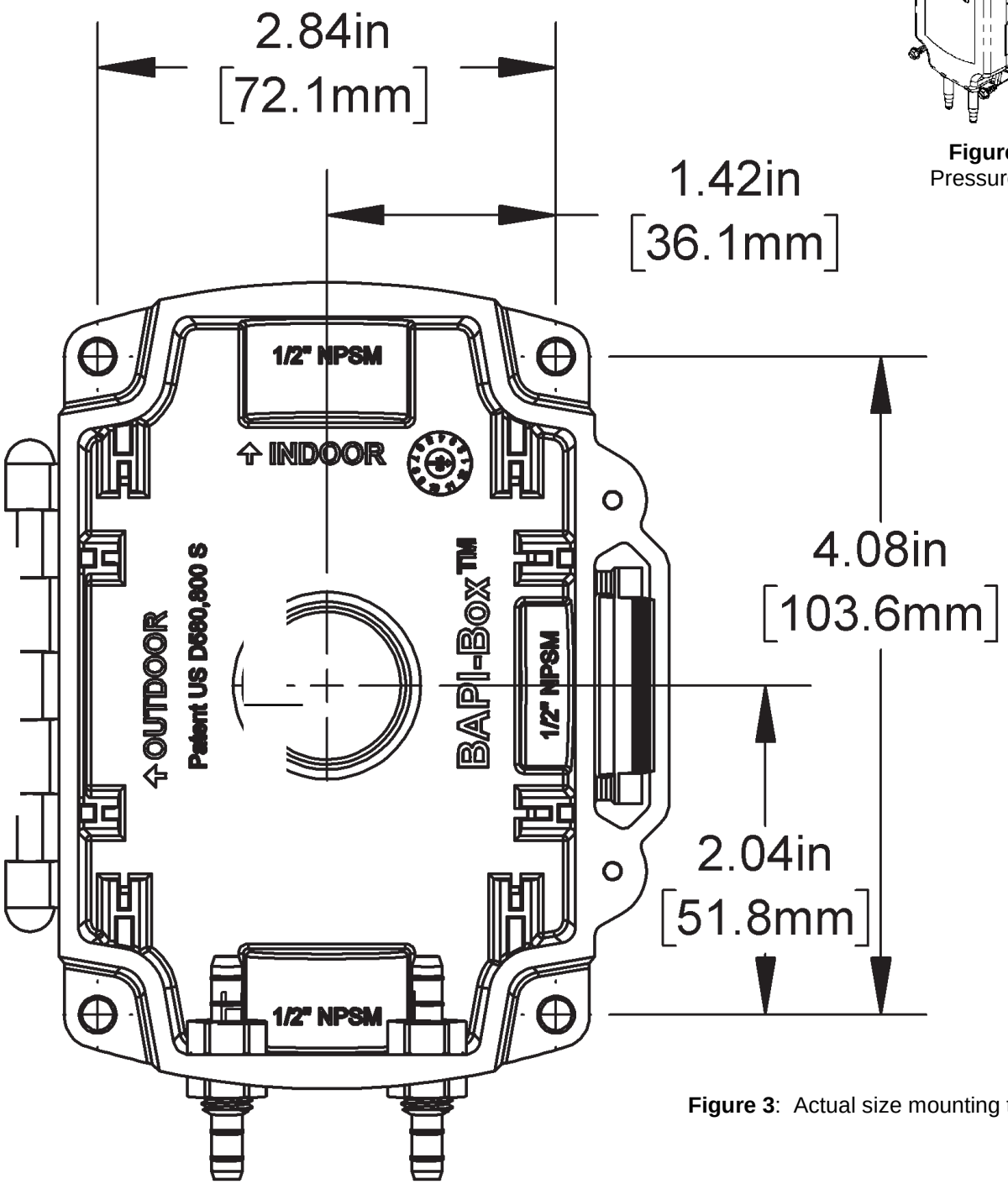

Figure 3: Actual size mounting template

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Termination

1. Attach wire to the wiring terminals using supplied crimp terminals, close the cover and push on it until it latches.
2. Secure cover with tamper-resistant screws if desired.

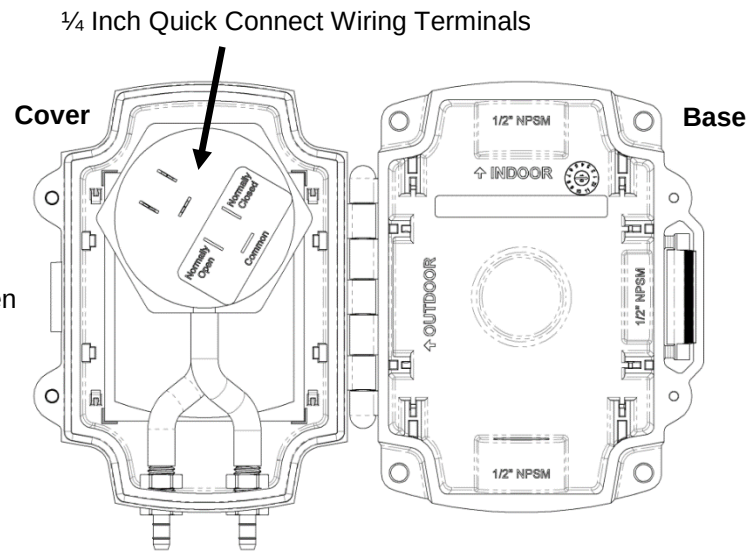


Figure 4: Pressure Switch Open Showing Switch Connections

Pressure Adjustment

The seven pressure ranges are field-selectable by changing a color-coded spring. The spring for the range that you order is preinstalled, and the other six springs are shipped with the unit so that you can change ranges in the field if you choose. Use the table below to adjust the pressure switch.

Table 1: Pressure Setpoint Ranges

Model	Spring Color	Setpoint range	Setpoint change per turn	Initial factory setpoint ±10%
	Brown	0.12 to 0.52 W.C. (30 Pa to 130 Pa)	0.05 W.C. (12 Pa)	0.31 W.C. (77 Pa)
ZPS-SW2	None	0.40 to 1.40 W.C. (100 Pa to 350 Pa)	0.11 W.C. (28 Pa)	0.90 W.C. (225 Pa)
ZPS-SW3	Orange	1.20 to 2.40 W.C. (300 Pa to 600 Pa)	0.15 W.C. (37 Pa)	1.88 W.C. (470 Pa)
ZPS-SW4	Blue	2.40 to 6.42 W.C. (600 Pa to 1,600 Pa)	0.45 W.C. (112 Pa)	4.38 W.C. (1,090 Pa)
	Red	5.22 to 12.84 W.C. (1,300 Pa to 3,200 Pa)	0.85 W.C. (211 Pa)	9.03 W.C. (2,250 Pa)
	Purple	11.64 to 23.68 W.C. (2,900 Pa to 5,900 Pa)	1.34 W.C. (333 Pa)	17.66 W.C. (4,400 Pa)
	Green	21.68 to 35.32 W.C. (5,400 Pa to 8,800 Pa)	1.52 W.C. (378 Pa)	28.50 W.C. (7,100 Pa)

To change the pressure at which the switch closes, insert an SQ1 square bit (0.110 inches, 2.8mm) into the pressure adjustment screw and turn clockwise to increase the pressure, or counterclockwise to decrease it.

Changing Pressure Ranges

Change pressure ranges by replacing the spring behind the pressure adjustment screw. Turn the pressure adjustment counterclockwise until it is loose from the switch body; be careful not to drop the screw. Using needle nose pliers, remove the pressure regulation spring. Place the spring into the empty plastic bag inside the switch case.

Find the bag with the spring for the pressure range you need. Remove the spring from the bag, place the spring into the hole behind the pressure adjustment screw and put all the plastic bags with springs and the empty bag into the switch case.

Place an ohmmeter or indicating lamp across the common and normally closed switch contacts. The switch should indicate open (high resistance or no light). Place the pressure adjusting screw into its hole and slowly turn the screw clockwise. Somewhere between three and seven turns the switch will close (low resistance or light turns on), this is the low end of the switches working pressure. From this point, nine more turns will be the highest working pressure for that spring. If you turn the pressure adjusting screw more than nine turns it will be locked into position and no amount of pressure will cause it to switch.

Proper adjustment procedures

Make all adjustments slowly. There is a restriction orifice built into the switch that acts as a pressure snubber. The snubber filters out transient pressure spikes that would ordinarily cause nuisance pressure switch actuations. The snubber slows down the air entering the switch's pressure chamber. At low differential pressures, it can take a couple of seconds for the pressure switch chambers to fill with air.

First set the spring to the bottom of its range as described in *Changing Pressure Ranges* above. Turn the adjustment screw in two turns and apply the pressure that you wish the pressure switch to switch at. Follow either A or B below.

A. If the pressure switch does not switch, release the pressure and turn the adjustment counterclockwise about ¼ turn. Repeat as necessary until the pressure switch switches at the pressure you desire.

B. If the pressure switch switches, release the pressure and turn the adjustment clockwise about ¼ turn. Repeat as necessary until the pressure switch switches at the pressure you desire.

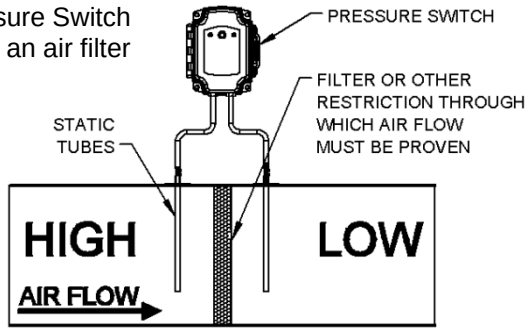
Always release the pressure between trials. If you do not release the pressure while you are adjusting the screw, the switch contacts stick, making adjustment impossible.

Applications

Air Filter Monitoring

The static pressure on each side of a filter is compared and the output contacts close when the pressure across the filter exceeds a predetermined value. Ideally, a Static Pressure Probe (Part #NSB-ZPS-ACC07) is placed one duct diameter upstream of the filter and another probe one duct diameter downstream of the filter. Connect the upstream static pressure probe to the high port on the Pressure Switch and the down stream probe to the low port on the Pressure Switch.

Figure 4: Pressure Switch monitoring an air filter



To set the pressure trip point, remove the tubing from the Pressure Switch. Connect a manometer and a pressure source to the high pressure port on the Pressure Switch. Use the manometer to measure the pressure. Set the pressure as described in the *Proper Adjustment Procedures* section above. Reconnect tubing when finished.

An alternative way to adjust the pressure setpoint is:

1. Place a new, clean filter into the duct.
2. Turn on the fan.
3. Cut a piece of cardboard approximately 1/2 the face area of the filter.
4. Place the cardboard against the filter on the upstream side.
5. Set the pressure as described in the Proper Adjustment Procedures section above.
6. Remove the cardboard.

Static Pressure Proving

Static pressure proving compares the static pressure in a monitored space to the static pressure in a reference space. The Pressure Switch contacts close when the pressure exceeds the setpoint. The Pressure Switch is independent of any static pressure control; it is an independent monitor and alarm if the control condition is not met.

For example, you do not want the odors in a school chemistry laboratory to get out into the hallway. The lab is the monitored space and the hallway is the reference space. Place a Static Pressure Pickup Port (Part #NSB-ZPS-ACC01) into the space you wish to monitor and place another Static Pressure Pickup Port into the reference space.

If you want the reference space to be higher pressure, connect the reference space to the Pressure Switch high port and the monitored space to the low port.

If you want the monitored space to be higher pressure, connect the monitored space to the Pressure Switch high port and the reference space to the low port.

To set the pressure trip point, remove the tubing from the Pressure Switch. Connect a manometer and a pressure source to the high pressure port on the Pressure Switch. Use the manometer to measure the pressure. Set the pressure as described in the *Proper Adjustment Procedures* section above. Don t forget to reconnect the tubing.

Another example is making sure that the static pressure in a duct is different from the static pressure in your plenum. The duct is the monitored space and the plenum is the reference space. Place a Static Pressure Probe (Part #NSB-ZPS-ACC07) into the duct you wish to monitor and a Static Pressure Pickup Port (Part #NSB-ZPS-ACC01) in the plenum. Connect the sensor tubes as explained above.

Air Flow Proving

Place a Pitot Assembly (Part #NSB-ZPS-ACC11) into the duct you wish to monitor. Connect the Pressure Switch's high port to the total pressure probe and the low port to the static probe. Set the pressure adjustment screw for the airflow desired.

Flow, Feet per Minute	Pressure, Inches of Water
1000	0.062
2000	0.250
3000	0.560
4000	1.000

To set the pressure trip point, remove the tubing from the Pressure Switch. Connect a manometer and a pressure source to the high pressure port on the Pressure Switch. Use the manometer to measure the pressure. Set the pressure as described in the *Proper Adjustment Procedures* section above. Don t forget to reconnect the tubing.

Auxiliary Fan Actuation

Many appliances, clothes driers, range hoods or bathroom exhaust fans, do not have enough fan power to force sufficient air through long duct lengths. Auxiliary exhaust fans are often placed at the end of the duct to draw the exhaust air through the duct. Turning on these auxiliary fans can be difficult if the appliance does not have auxiliary fan output contacts.

You can use the Pressure Switch to easily turn on the auxiliary fan. Place a Static Pressure Probe (Part #NSB-ZPS-ACC07) in the exhaust duct and a Static Pressure Pickup Port (Part #NSB-ZPS-ACC01) in the space with the appliance. Connect the exhaust duct to the high port on the Pressure Switch. Connect the appliance space to the low port on the Pressure Switch. Set the setpoint screw so that the switch contacts close whenever the appliance is turned on. Use the switch contacts to control the power to the auxiliary fan.

Diagnostics

Possible Problems:	**Possible Solutions:**
Cannot calibrate switch pressure	Make sure that the correct spring is selected
	Make sure that the high and low pressure tubes are not swapped
	Make sure that the high and low pressure tubes are connected to the proper locations and are not kinked