

Electrical Installation and Operating Instructions - Model 120

1. Safety



Before installing, check the Model Number and verify compatibility to the process media and temperature in contact with the wetted parts. Incompatible media and / or operation at temperature extremes can cause premature degradation of materials which could result in safety risk to personnel.

Verify the selected pressure range (differential pressure and working pressure) and the switch ratings are within specification for your application.

Perform all electrical adjustments with power removed.

The Model 120 product utilizes a piston design which inherently has a small amount of leakage from high process connection to low process (15 SCFH air max at 100 PSID) connection. Do not use this product in an application with the low side process connection left open to atmosphere.

This product utilizes a magnet as part of the sensing element. Magnet particles in the process can cause the piston to stick or become wedged in the bore.



Warning! *If installing product within another enclosure that is pressure tight, please verify all process connection are leak tight. Leakage within a pressure tight (ie NEMA 4X) enclosure could cause a pressure buildup within the enclosure and cause a burst scenario.*



Warning! *Remaining media may result in a risk to personnel, environment etc. Use sufficient precautionary measures when removing and transporting the product.*

1.1 Intended use

The indicating / non-indicating differential pressure switches are used for monitoring differential pressures in industrial applications.

The manufacturer shall not be liable for any claims if the product is used in applications contrary to the intended use.

1.2 Personnel

Personnel installing and putting this instrumentation into service shall be suitably trained and qualified in accordance with local codes, practices and regulations.

1.3 Labeling / Marking



The following Electrical Configurations bear this mark and comply with the relevant European Directives identified on the declaration of conformity: A, B, C, D, E, F, G, H, L, M The following electrical configurations bear 1 or both of these third party listing agency marks for product evaluated to both US and Canadian Standards: E, F, J, K

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2.0 General Specifications

Non-electrical:

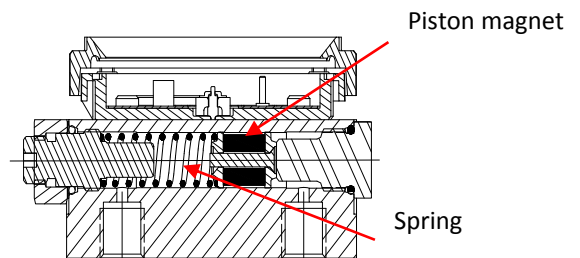
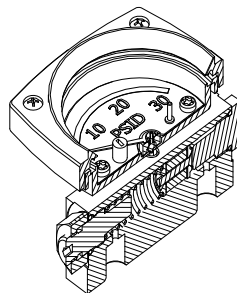
Parameter	Limits(Std)		Limits (Hazardous Locations)	
Working Pressure(PSI)	3000 (AL)	6000 (SS)	3000 (AL)	5000 (SS)
Proof Pressure(PSI)	12,000 (AL) 20,000(SS)			
Temperature	-40° to 200° F			
Differential Pressure Range (PSID)	0-5 to 0 to 110			
Indicator Accuracy ASME B40.100	2%			
DP Over-Range	+/- Proof pressure			

Electrical:

Parameter	Switch Specification		
	SPST	SPDT	SPDT
Option:	E ,F,G	H	A
*Power	60 W	60 W	3W
Max. Current	3.0 Amps	1.0 Amps	0.25 Amps
Max. Voltage VAC/VDC	240	240	125
**Setting (%F.S.)	25 to 95	25 to 100	10 to 90
Hysteresis (Max/Nom)	15% / 8% (F.S.)	20% / 13% (F.S.)	10% / 5% (F.S.)
Repeatability	1% F.S.	1% F.S.	1% F.S.
**Leads 22 Awg.	(2), 24"	(3), 24"	(3), 24"

* Product of the switching voltage and current shall not exceed the power rating of the device

** Except where otherwise noted



3.0 Product Description:

Differential pressure is sensed by the movement of a floating piston magnet against a calibrated spring. The magnetically coupled gauge pointer located outside the pressure housing follows the movement of the piston magnet and indicates differential pressure on the dial. The switches are also magnetically operated and are located outside of the pressure housing. The switches are mechanically adjustable allowing the customer to set the switch within a defined adjustment span of the range of the instrument.

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This instrument is mainly intended for gas / air / oil applications.

4.0 Installation:

Mechanical Connections

¼" FNPT are provided standard, however check your paperwork to confirm the connections ordered. There are 2 connections identified on the gauge body as "Hi" and "Lo" for High pressure and Low pressure respectively. Be sure these are plumbed properly in your system. Improper connection will not damage the instrument, but it will not function properly.



Do not allow gauge fittings to rotate when making process connections. Calibration and / or pressure rating of the product may be compromised.

For end connected or gauges supplied with adapter fittings use two wrenches when making connections. Use one wrench to hold the pressure port fitting on the gauge and the other to tighten the process pipe of tube fitting.

Instrument Location:

On liquid service the instrument should be mounted below the process connections to facilitate self-bleeding. On gas service it should be located above the process connections to promote self-draining. If the process contains particulates, a pigtail loop or drop leg (manometer "U-tube" configuration) in the tubing will minimize the possibility of it migrating into the instrument.

Temperature Limitations:

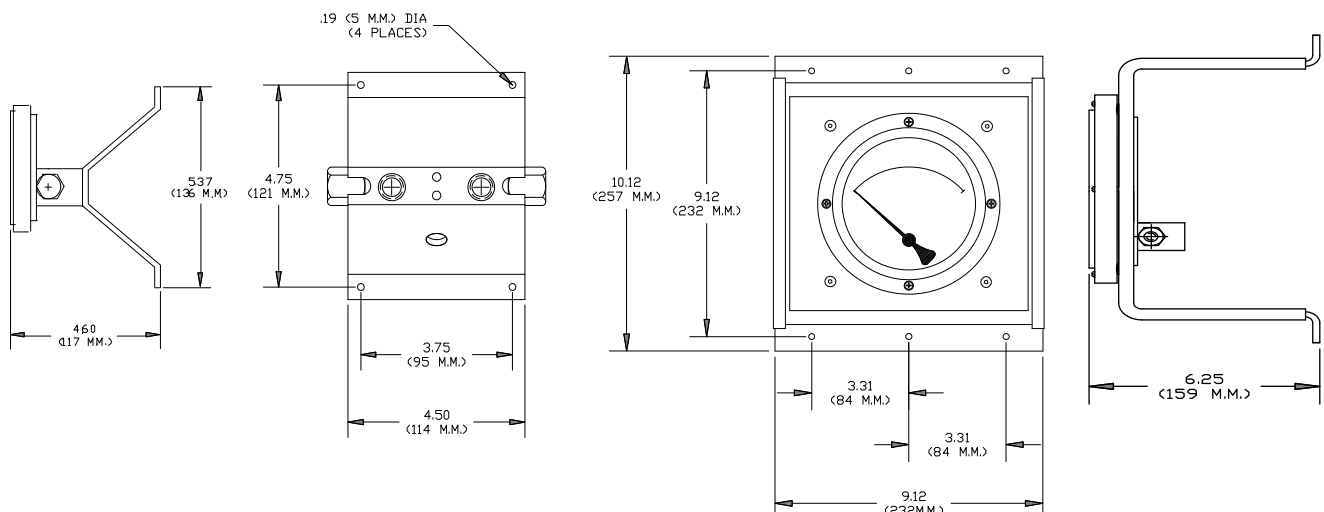
For process temperatures higher than the rated temperature of the dp gauge / switch, use process tubing to reduce the temperature. A general "rule of thumb" is that for horizontal tubing runs the temp drop is 100° F/ ft. Another option is to use "cooling towers" to protect the instrument.

Verify the selected elastomer option is appropriate for your operating temperature.

Wall / Pipe/ Panel Mounting:

Not all combination of options can be wall, pipe, or panel mounted. If your unit is supplied with a wall or panel mount possible configurations are shown below:

Wall Mount Configurations:

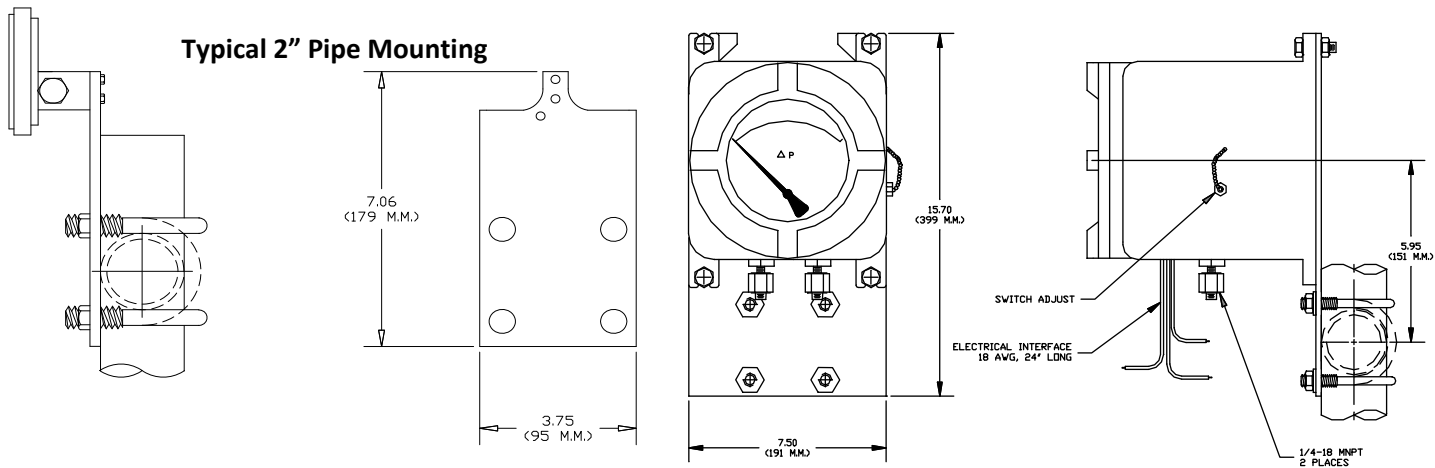


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Wall Mount Configurations (cont)

Wall mounting brackets are not required for the G, H, J & K electrical configurations because they can be mounted via the enclosure mounting ears (J & K) or mounting holes built into the enclosure (G & H). See figures 5 and 6 (Electrical configurations G & H) and Figure 8 for electrical configurations (J & K).

Pipe mounting brackets are not available for Electrical Configurations C, D, E, or F with back port connections.



Panel Mount

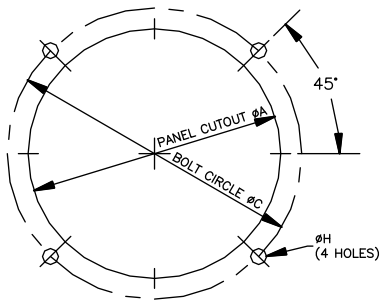
Gauges with 2 1/2" dials can only be mounted through the rear of the panel. Make the proper panel cutout as shown below. Remove the (4) bezel screws and insert the gauge front through the rear of the panel. Reinstall the bezel screws through the front of the panel and into the gauge bezel. Tighten screws securely in an alternating diagonal pattern.

Gauges with 3 1/2" dials should be mounted from the front of the panel. Contact the factory for mounting and dimensional information.

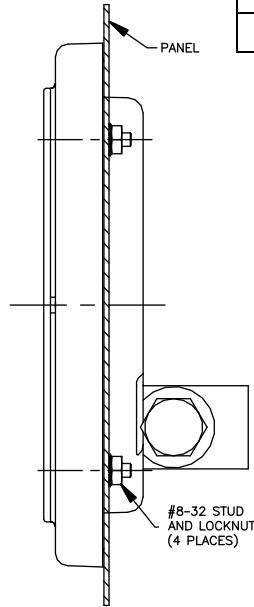
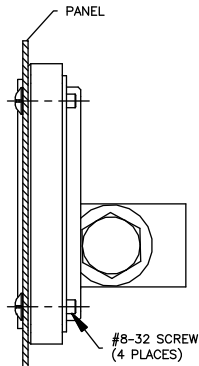
Gauges with 4 1/2" & 6" dials should be mounted from the front of the panel. Make the cutout as indicated below. Insert the (4) panel studs, finger tight, into the metal inserts located in the rear of the bezel. Insert the gauge through the panel, aligning the panel mounting studs with the holes in the panel. Install the (4) 8-32 nuts onto the studs and tighten securely.

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MODEL 120 PANEL CUT-OUT DIMENSIONS



DIAL SIZE	DIAMETER A	DIAMETER C	DIAMETER H
	Inch (mm)	Inch (mm)	Inch (mm)
2-1/2 in.	3.00 (76.2)	3.50 (88.9)	0.19 (4.7)
4-1/2 in.	5.30 (134.6)	5.63 (143.0)	0.19 (4.7)
6 in.	6.50 (165.1)	7.00 (177.8)	0.19 (4.7)



Electrical:



Warning: *Electrical connections should be performed by qualified personnel and meet the representative country's national electrical code.*

Warning: *Failure to connect to the protective conductor terminal may result in a shock hazard.*

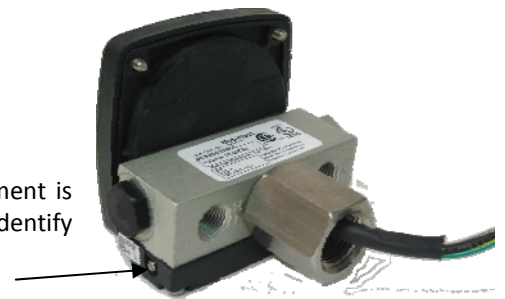
Warning: *Perform all switch adjustments with power removed. Use an ohmmeter or equivalent to monitor contact operation.*

Caution: *Preference should be given to setting the switch prior to installation. It is also recommended to perform adjustments using a non-magnetic screwdriver.*

General

All switch types are field adjustable. The defined range of the adjustment is specified in the table above. All switches come with a decal to identify adjustment direction to increase the set point.

Switch Adjust



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Switch Set Point Adjustment



Do not use excessive force when rotating the adjustment screw as the adjustment mechanism may be damaged. Also note the location of the screw adjust (See Figure 4.) Do not mistake it for the calibration adjust for the gauge.

Note: Switches can be set below the defined minimum set point however, the switch may not remain activated at maximum PSID. If the unit is set below the defined minimum set point, the customer should verify that the switch remains activated from the set point to over range of the gauge.

The switch may be set using the indicating dial as a reference (units with a dial) or by using a reference pressure gauge.

For setting on increasing pressure increase your pressure to the desired set point. Increase the switch set point above the desired switch set (switch deactivated). Slowly decrease the switch set point until the contact activates.

Contact Protection:

Provide standard protection techniques for the switch contacts for capacitive and inductive loads. Use current limiting techniques near the switch to protect the contacts due to high inrush (i.e.; in line resistor or inductor) for long cable interfaces. Provide clamping devices at or near inductive loads (i.e.; relay).



Maximum wire length between the 3W switch and its load should not exceed 70 – 100 Feet for 120 VAC applications. We recommend that you use the 60W rated switches or use a current limiting resistor wired in series and located near the switch. Contact the factory for assistance regarding this condition. (For hazardous Locations the resistor option is not allowed)

Electrical Configurations A, B, C, D, E, F



Electrical configurations A & B, are recommended to be used in Pollution degree 2 type environments or in large enclosures / panels where connections to the “flying lead” wiring can be protected.

Electrical Configurations C, D, E, F can be used in Pollution degree 3 Industrial type areas.

Note: Configurations C, D, E & F have electrical access holes (1/4” NPT and 1/2” NPT). The safety evaluation and the NEMA ratings for these configurations was performed with these accesses sealed (ie; conduit connections)

Connections: (Electrical Configurations A, B, C, D, E, F)

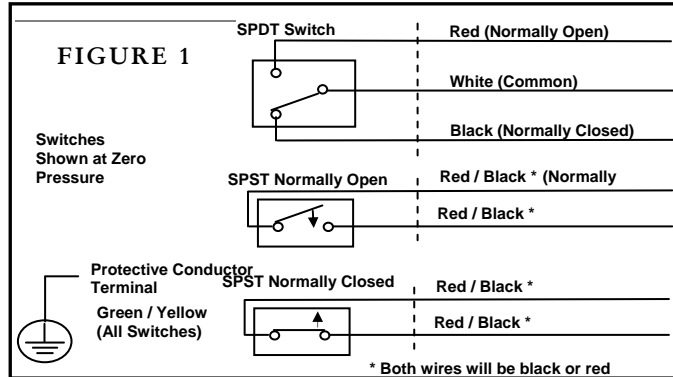
The SPDT switch ('A' or “H” Electrical Option) lead colors and associated functionality at 'O' PSID is shown in Figure 1. SPST switches ('E', 'F', or 'G' Electrical Options) may be normally closed or normally open at 'O' PSID dependent upon the option specified on the purchase order. Wires will be labeled identifying their functionality.

Standard location of the SPDT switch (Electrical Specification A or H) will be on the bottom of the gauge for a standard port (Hi port on the right) and on the top for a reverse port (Hi on the left).

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Location for the SPST switch will vary depending on the switch type required. A standard port gauge has the normally open switch located on the bottom of the gauge body and the normally closed switch located on the top. This applies to both a single switch unit or a double switch unit with one of each type ("G" option Electrical Specifications). Note: Bottom port assemblies will have the switch always on top.

A reverse port gauge has the normally open switch located on the top and the normally closed switch located on the bottom.



Electrical Configurations E & F:



Caution: Please note for Hazardous Locations applications the Working pressure for the SS body material is rated 5000 PSI maximum

The E & F Electrical Configuration are 3RD party certified for Class I, Division II, Groups A, B, C, & D, Class II, Groups F & G hazardous environments. The CSA mark identifies the product has been tested to the applicable US standards and Canadian standards.

Interface is 24", 18 Awg. flying leads with 1/2" FNPT Conduit. (See Figure 7)

Electrical Configurations G and H (NEMA 4X Weatherproof Enclosure):

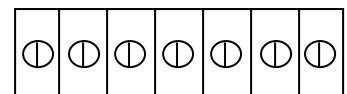


Electrical Configurations G & H can be used in Pollution degree 3 Industrial type areas.

Note: Configurations G & H have an electrical access hole (.875") for addition of a conduit Hub or a cord type connector. The safety evaluation and the NEMA ratings for these configurations was performed with these accesses sealed.

The gauge and switch(es) are mounted inside the enclosure with the switch(es) wired to a seven (7) position terminal strip. The terminal strip connection uses 6-32 screws and is rated for use with wire up to 14 Awg.. An opening is provided on the bottom of the enclosure for a flexible cable or 1/2" conduit connection.

Access the terminal strip by removing the cover from the enclosure and loosening the (4) screws. Insert wires through an appropriate weatherproof connector (not supplied) into the enclosure and connect to the terminal strip. See the terminal strip diagram shown below or on the outside of the switch enclosure. Reinstall the cover and (4) screws (See Figures 5 & 6). For an assembly with 2 switches, the single switch adjust is located on the right side of the enclosure.



NO NC CM CM NC NO
SINGLE DOUBLE

External Switch adjust access holes and plugs are provided for the enclosure for the 2 1/2" dial. (See Figure 5). The cover for the Model 120 with 4 1/2" Dial must be removed to adjust the switch settings. (See Figure 6).

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Electrical Configurations J and K (NEMA 7 Explosion-proof Enclosure):



WARNING: The cover and/or switch adjust access plugs must never be removed when there is power to the unit. Make all adjustments in a nonhazardous area.

CAUTION: Please note for Hazardous Locations applications the Working pressure for the SS body material is rated 5000 PSI maximum.

The gauge and switches are mounted inside the enclosure (See Fig. 8). A 1/2"-14 FNPT conduit connection is provided in the bottom side of the enclosure. A proper explosion-proof, dust tight, sealing fitting with appropriate sealing cement must be used when making connections to the 24", 18 Awg. wire leads. The leads are labeled and/or color coded as described in the grommet / conduit section.

Adjustment of the set point can be accomplished by removing the switch adjustment access plug(s). Insert the screw driver through the hole into the switch adjustment slot and rotate until the desired set point is reached. For a double switch assembly the leads identified with "1" correspond with the adjust access on the right side of the enclosure (facing the front)



WARNING: Reinstall the access plugs with at least 5 threads of engagement after completion.

WARNING: Assembly is equipped with Flame arrestors embedded in the process port connection. Never remove the flame arrestors. The Flame Arrestors are critical to the Integrity of the Explosion-Proof design

Enclosures with SPDT or SPST switches are third party certified for use in Class I, Groups C & D, Class II, Groups E, F, & G Hazardous Locations.

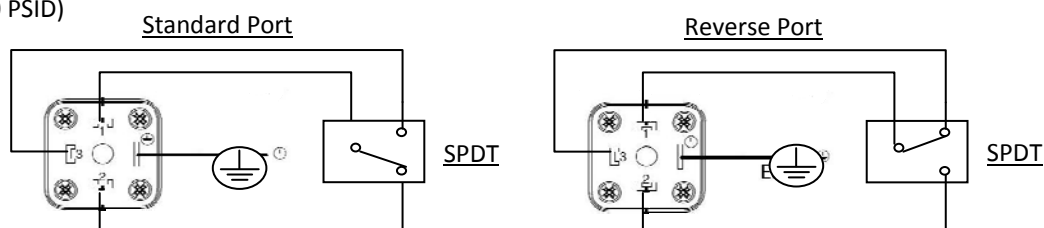
Electrical Configurations L and M (DIN Plug-in Connector):



Electrical Configurations L & M can be used in Pollution degree 3 Industrial type areas.

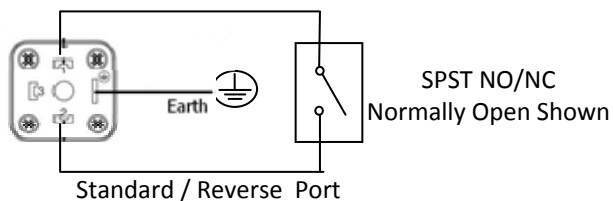
The DIN interface conforms to DIN 43650A / ISO 4400 and **when mated** provides an IP65 rated protection class. The cable gland seal will accommodate an outer diameter of 6mm (.24") to 11.5mm (.45"). The right angle mating connector is supplied with the gauge upon order. Clocking (orientation) can be changed by prying out the insert and rotating the insert to the desired clocking (90° increments). (See Figure 4). Single switch assemblies will have the switch located on the bottom of the gauge except for bottom ports.

Wiring for the SPDT bottom and top switch for the defined port configuration is as follows: (switches shown at 0 PSID)



Standard Port - 1.- Common, 2. - N.C., 3. - N.O.

Reverse Port - 1. - Common, 2. - N.O., 3. - N.C.



Standard / Reverse Port

SPST NO/NC
Normally Open Shown

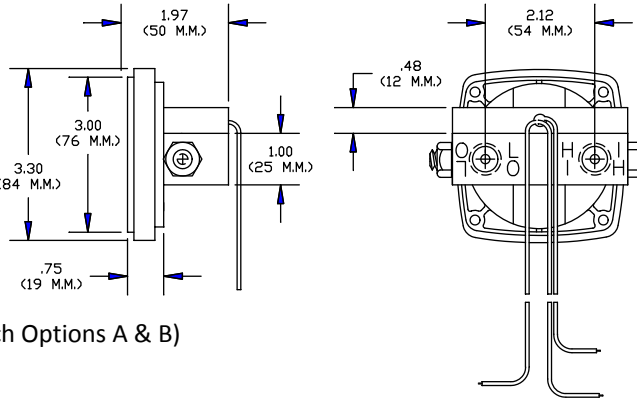
Wiring for the SPST switch is between terminals 1 & 2 (Normally Open or Normally Closed). A protective conductor terminal is provided on the DIN connector.

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5.0 Dimensions:

FIGURE 2

Model 120 Reverse Port
Grommet Interface Switch Options A & B



NOT SHOWN: (Fig 2 & 3)

The Protective Conductor Terminal with a Green / Yellow Wire located on the High Port end of the gauge body.

FIGURE 3

Model 120 Standard Port
1/4" FNPT Interface Switch
(Options C & D)

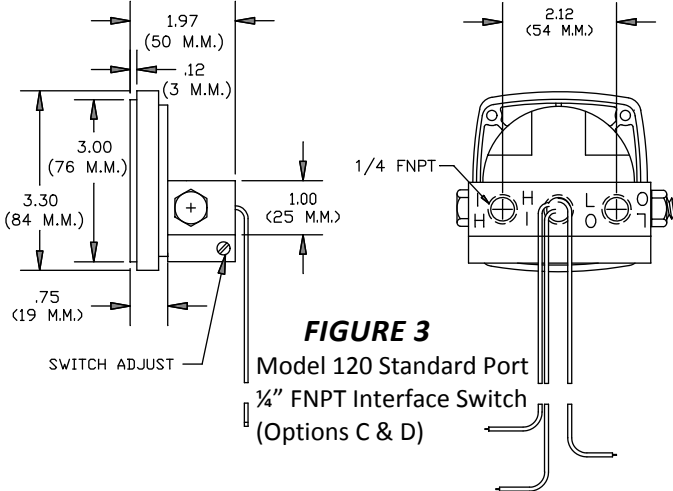


FIGURE 4

Model 120 Reverse Port
Din Connector Interface
Switch (Options L & M)

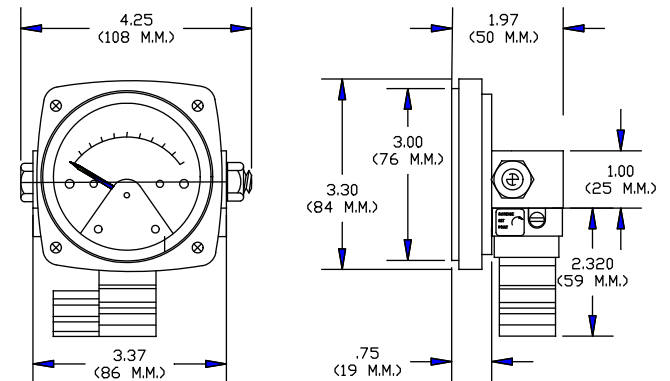


FIGURE 5

Model 120 2 1/2 Dial
NEMA 4 X (Options G & H)

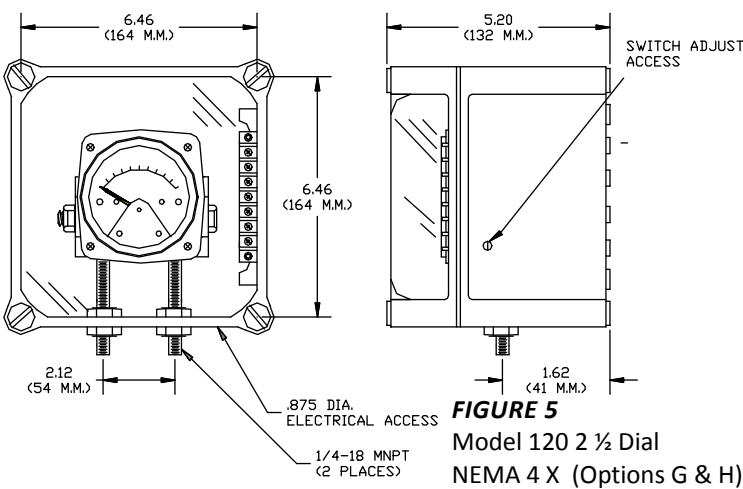


FIGURE 6

Model 120 4 1/2 Dial
NEMA 4 X (Options G & H)

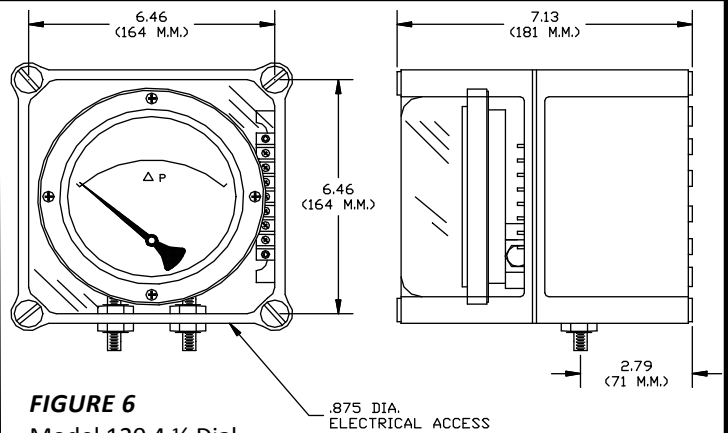
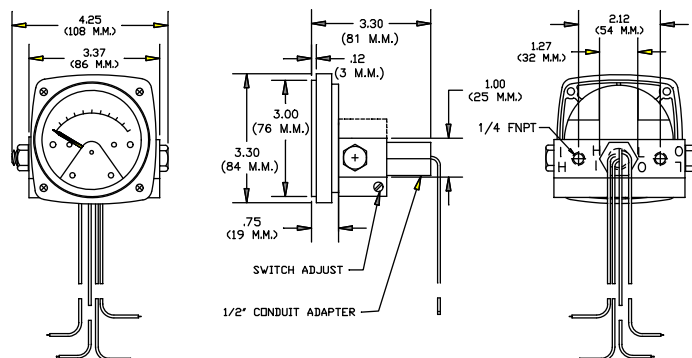


FIGURE 7

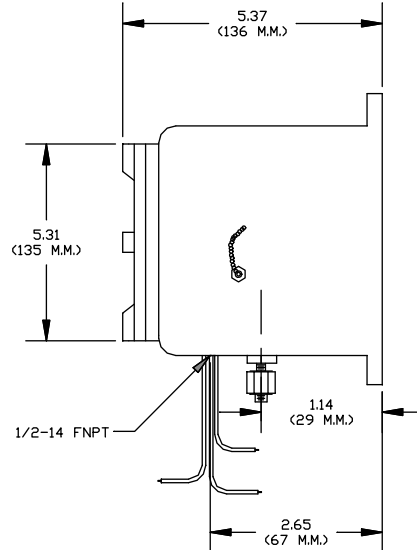
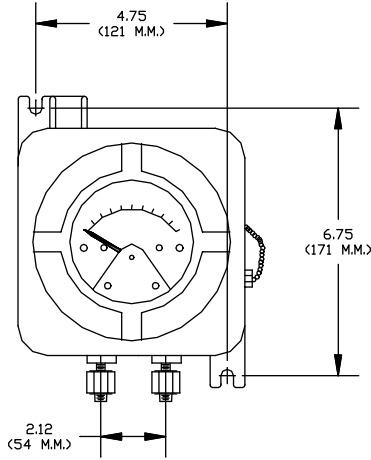
Model 120 2 1/2 Dial Options (E & F)
Hazardous Locations,
Division II, Class I,
Groups A, B, C, D
Class II Groups F & G
(CSA Listed for all switch
specifications)



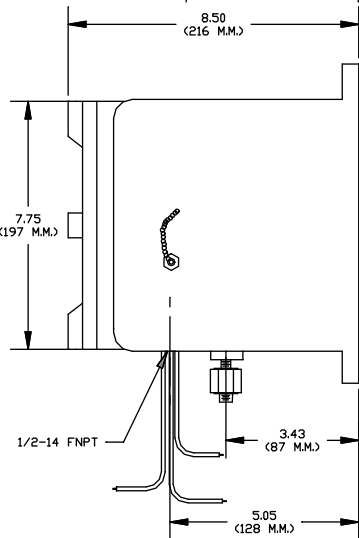
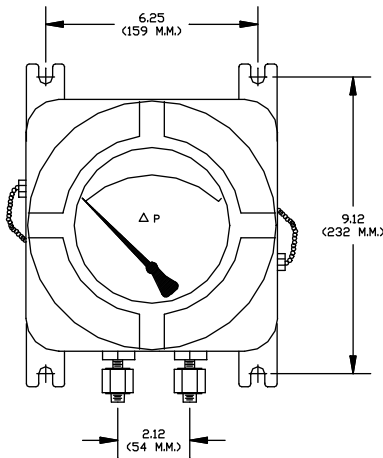
Explosion-Proof Enclosures Class I, Groups C & D,
Class II, Groups E, F, & G
(Options J & K)

FIGURE 8

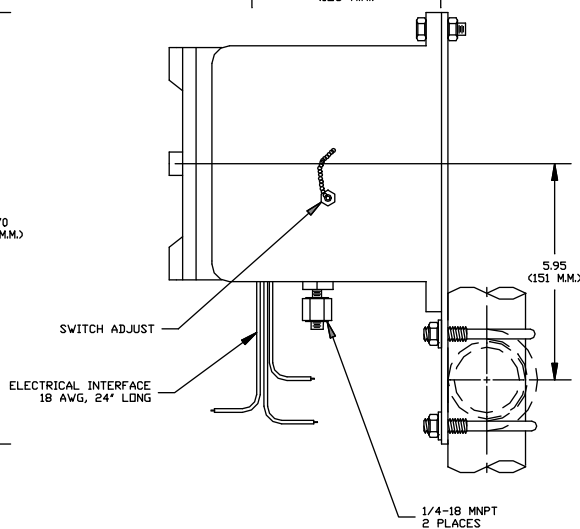
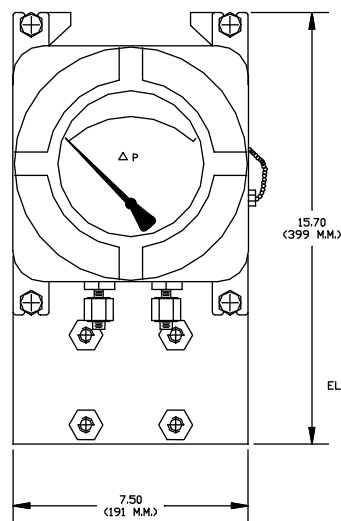
2 1/2 Inch
Dial



4 1/2 Inch
Dial



Typical 2" Pipe
Mounting



6.0 Troubleshooting

- A. Gauge accuracy and set point problems:
 - i. Verify your process connections are plumbed properly
 - ii. Verify gauge is not in an electromagnetic / magnetic environment. i.e.; close proximity to high current power lines.
 - iii. Verify the pointer has fluid movement as pressure increases. Jumpy movement or no movement may indicate a stuck piston
 - iv. All others contact the factory for assistance.

- B Switch doesn't function
 - i. Make sure that the switch load does not exceed the specified wattage rating of the switch. (steady-state and transient). Contact factory for assistance for excessive loads, otherwise proceed to the next step.
 - ii. Perform a continuity check of the switch contacts by trying to actuate the switch using an external magnet. An operational switch usually indicates a problem with the gauge. If not operational proceed to the next step.
 - iii. Verify the reed switch wires are connected to the terminal strip (NEMA 4X enclosure only). Contact the factory for assistance if the switch is connected and/or request an "RGA" number.

7.0 Misc:

CE Marking Statements:

Low Voltage Directive

The Electrical Configurations A, B, C, D, E, F, G, H, L, & M of this product are CE marked in compliance with the Low Voltage Directive to EN-61010-1

ATEX Directive 94/9/EC

Model 120 product has not been evaluated to the ATEX directive.

Pressure Equipment Directive :

The Pressure Equipment Directive has been determined to be **non-applicable for CE marking for Group 1 applications below 200 bar or Group 2 applications below 1000 bar..** These products are manufactured in accordance with article 3, paragraph 3 of the directive, "sound engineering practice". They fall below category I for non-hazardous gases, hazardous liquids, & non-hazardous liquids. This product also falls below category I for hazardous gases at or below 200 bar.

For Group 1 applications above 200bar, this product has not been evaluated to meet the essential safety requirements of Annex I of the Pressure Equipment Directive. Use of this product in an EU member state shall be limited to less than 200 bar for Group 1 applications.

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ROHS Directive:

The electrical Configurations A, B, C, D, E, F, G, H, L, & M of this product are CE marked in compliance with the RoHS directive 2011/65/EU (RoHS2).

Warning: *The suitability of the application and installation of this differential pressure switch / transmitter is the responsibility of the end user. The applicable certifications, listings apply to the differential pressure switch / transmitter only.*

STANDARDS: All Model 120 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1	NACE MR0175
ASME B40.1	NEMA Std. 250
EN-61010-1	UL Std. No. 50, 508, 1203 & 1604
EN 50581	CSA-C22.2 No. 14, 25, 30, & 213



Engineering &
Industrial
Instrumentation

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