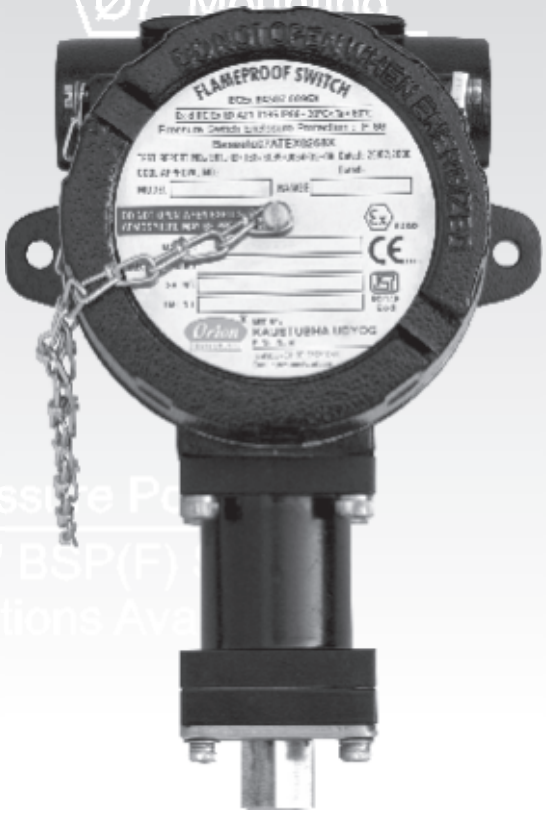
Orion®
INSTRUMENTS

PRESSURE SWITCHES
PRESSURE DIFFERENCE SWITCHES
VACUUM SWITCHES
From 1.5 mbar to 600 bar

FC Flameproof Switch

INSTALLATION AND OPERATING INSTRUCTIONS



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ISO 9001:2015

Website : www.orion-instruments.io

BULLETIN NO. : KA250304

Installation and Operating Instructions for Flameproof Switch

CONSTRUCTION:

A flameproof pressure switch consists of a flameproof body and cover (normally of die cast aluminium / Grey CI / SS), a junction cylinder (aluminium) and the pressure capsule. The pressure in the pressure capsule is converted to a force which is balanced by a spring in the junction cylinder. When the force generated by pressure exceeds / falls above / below the spring force, a microswitch housed in the flameproof enclosure is actuated by a transfer rod.

A separate terminal strip with screwed ends is provided for easy and safe wiring. The cables need to be passed through a conduit entry which is ½ "NPT/ 3/4"NPT or M20 X 1.5, as selected. The other cable / conduit entry, if not used, needs to be suitably plugged.

INSTALLATION

WARNING

Your attention is drawn to the electrical potential that will be present, if the main cover is removed while the switch is connected to a live supply. The electrical supply MUST BE ISOLATED prior to removal of the cover.

Similarly, on pressurized process systems, prior to removal of an instrument, it should be isolated from the pressurized medium or the system pressure should be relieved.

The unit must be specified, installed and operated by competent published personnel, & its use be limited to within the specifications. (all hazardous area models must be installed in accordance with BS EN 50079-14).

Unauthorized modifications repair, or operation outside the specified limits may invalidate the warranty. Servicing should only be carried out by qualified personnel.

On pressure devices, pulsation or surges be anticipated, then a suitable pressure snubber should be fitted.

INSTALLATION DRAWING FOR HIGH PRESSURE RANGES

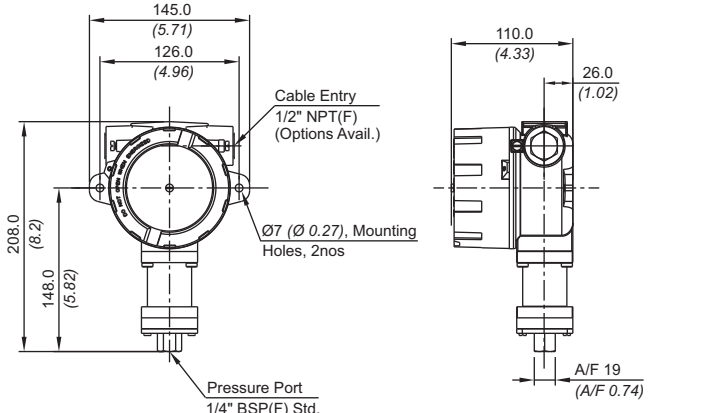


Fig. 1A

INSTALLATION DRAWING FOR HIGH PROOF HIGH RANGE

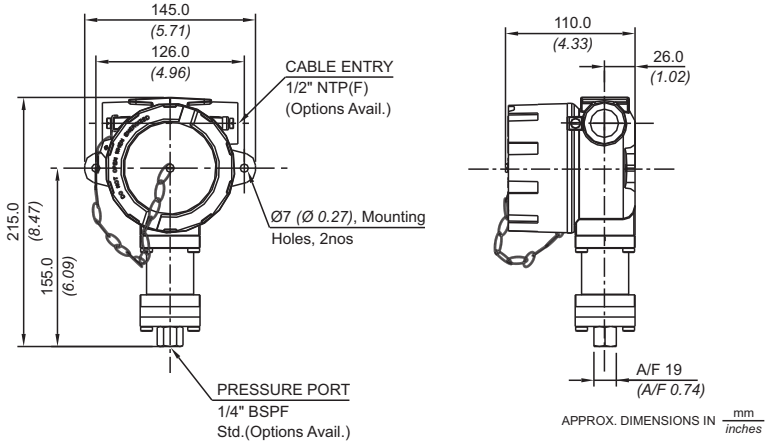


Fig. 1B

FAILURE HAZARD

Pressure switches element/ primary seal failure.

In the event of the above, the process medium will be prevented from entering and pressurizing the main body by relieving it to atmosphere via vent holes.

The process medium temperature should not be allowed to exceed that stated in the product data & under the "OPERATING TEMPERATURES" section in this document. If process temperatures in excess of those stated are possible, then the switch should be remote mounted via a length of tubing or pipe.

PROCESS CONNECTIONS

Pressure & Differential Pressure Switches

Various process entries are available, & the installations will vary dependant on exact type. It is recommended that PTFE tape is used on tapered fittings & the use of the correct size of bonded seal on parallel fittings.

In some cases, flanged end connections too could be provided.

MATERIALS

The materials used in this switch are as follows:--

The Main casing - Aluminum Grade- LM6 or Grey Cast Iron / SS316 Grade Stainless Steel (on demand)

The Cover - Aluminum Grade- LM6 or Grey Cast Iron / SS316 Grade Stainless Steel (on demand)

The wetted parts - SS316 or Neoprene / Teflon (other materials on demand)

Internal switch mechanism - SS

External fasteners - SS

Internal fasteners & springs - S.S / Spring steel

MOUNTING

The high pressure range pressure switches can be mounted in any direction . However, for low range pressure switches, it is advised to mount them in such a way that the diaphragm is vertical .

1) for high range pressure switches,
   a) Pressure switches can be mounted directly in case the mounting is rigid.
   b) For panel mounting, use M6 bolts of appropriate length through the mounting holes. If the equipment is subject to vibration , please use the rubber washer / pads between the panel and the switch.
2) for low pressure ranges :
   a) Pressure switches can be mounted directly in case the mounting is rigid
   b) For pipe mounting, use a pipe mounting bracket that can be provided along with the pressure switch, to clamp the switch on to the pipe.
3) connect the pressure tubing to the pressure port. The pressure port size is generally ¼" BSP/NPT (FEMALE) and 1/2" BSP/NPT (FEMALE), unless specifically ordered otherwise. Other sizes can be obtained via adaptors.

Note: The end user is required to ensure that appropriate certified Ex blanking elements should be utilize to plug unused entries and should not invalidate the type of protection IP66.

The end user is required to ensure that appropriate certified Ex cable glands should be utilize and should not invalidate the type of protection IP66.

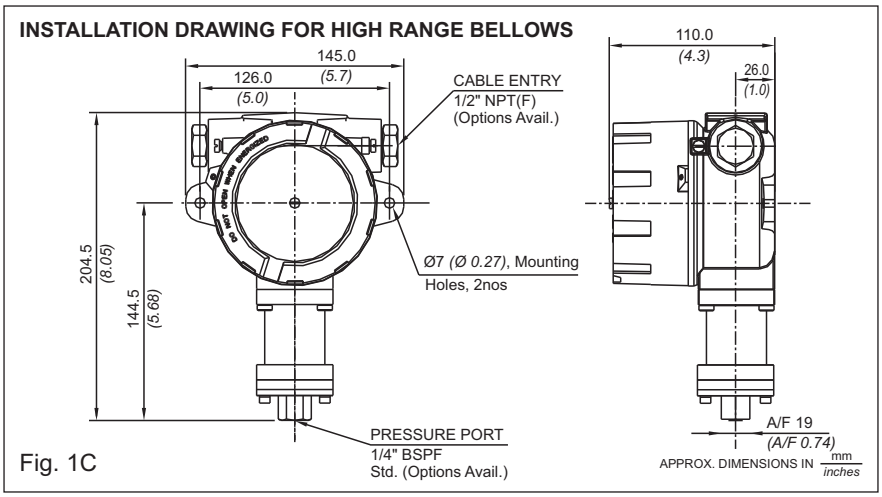


Fig. 1C

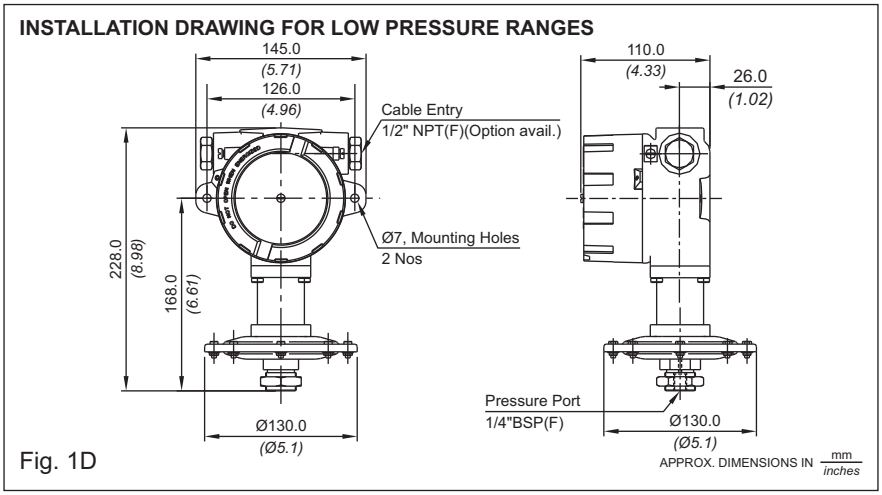


Fig. 1D

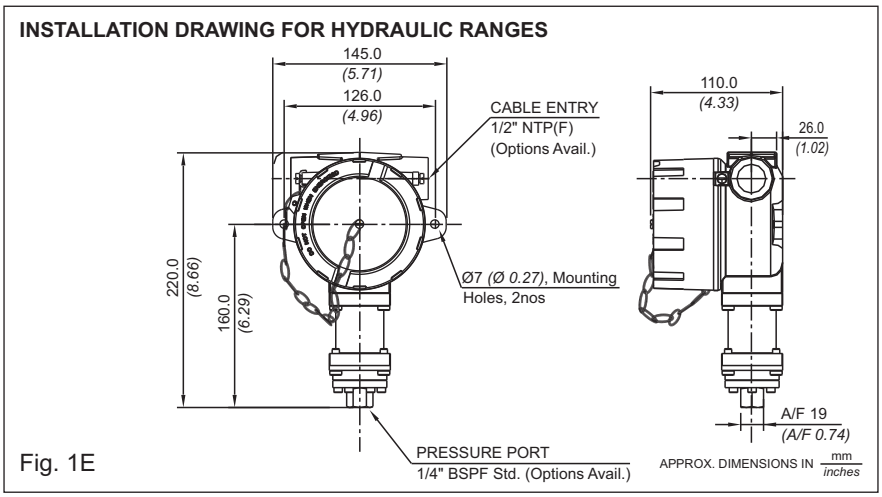


Fig. 1E

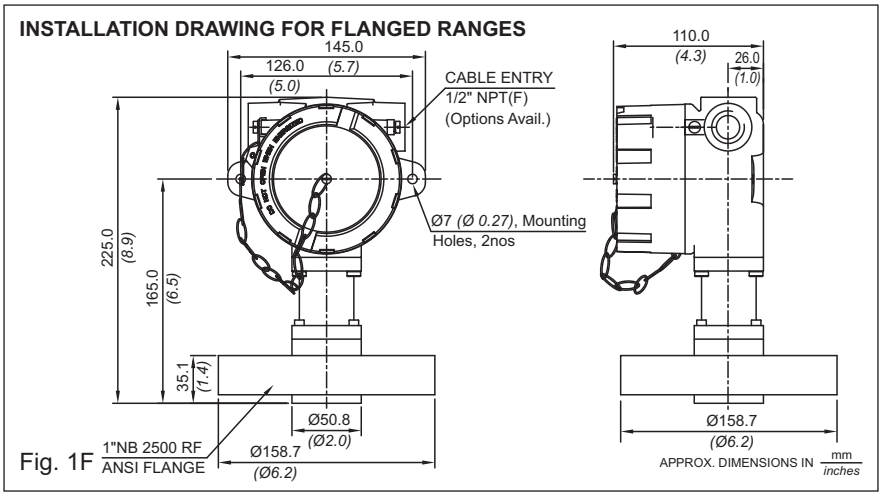


Fig. 1F

ELECTRICAL CONNECTIONS:

Pressure switches will generally have only one SPDT microswitch.

Pressure switches with 2 SPDT microswitches can also be provided on demand.

All models are normally supplied with a straight M20 conduit entry provided on either side of the switch and either one can be plugged, if not in use. These conduit connections can either be fitted with either a suitable gland or directly with conduit to suit the installation.

Access to the terminal is via a removable top cover. The electrical supply must be isolated prior to this activity. Switch connections details are provided on the cover (name plate). This should be referred to when connecting it to the terminal strip as NO/NC. Terminal numbers vary depending on whether switch setting is falling or rising.

Terminals are suitable for cables, single or multi strand, up to 2.5 sq mm. When 2 SPDT microswitches are fitted, they are mechanically linked to give a DPDT switching action.

Reset of the switches could be up to 3% apart due to the inherent differential of microswitches. For specific wiring, refer the figure.

WIRING:

a) Your attention is drawn to the electrical potential that will be present, if the main cover is removed while the switch is connected to a live supply. The electrical supply must be isolated prior to removal of the cover.

b) Remove the cover. Refer fig 3

c) Pass the cable through the cable gland and connect the wiring to the terminal strip as per your wiring diagram.

The color code is as per the details given below:

Terminal 1 (Common) : Red

Terminal 2 (Normally closed) : Black

Terminal 3 (Normally open) : Yellow

OPERATING TEMPERATURES:

The operating condition temperature restrictions for the Flameproof switch FC are as follows:

Ambient: -5°C to +60°C

Operational (all models): -5°C to +80°C (150°C for metallic diaphragms)

Note : Switches with temperature ranges beyond the ones specified above can be supplied on request.

Storage :-5°C to +60°C

INSTALLATION DRAWING FOR HIGH RANGE PRESSURE DIFFERENCE

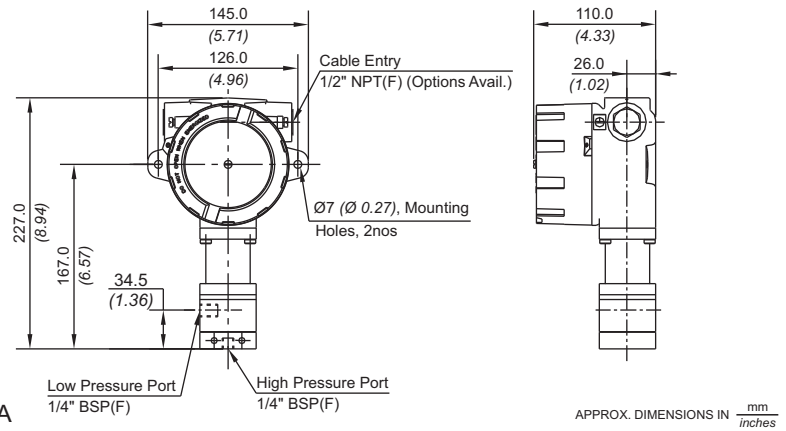


Fig. 2A

APPROX. DIMENSIONS IN mm / inches

INSTALLATION DRAWING FOR HIGH PROOF HIGH RANGE PRESSURE DIFFERENCE

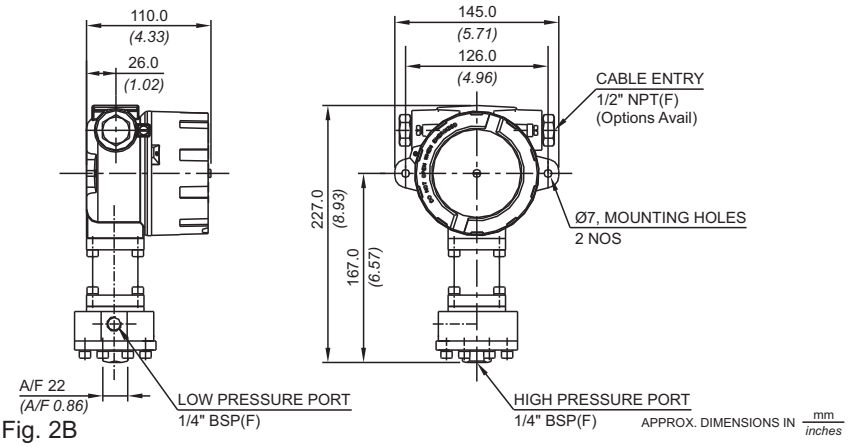


Fig. 2B

APPROX. DIMENSIONS IN mm / inches

INSTALLATION DRAWING FOR HIGH RANGE DP

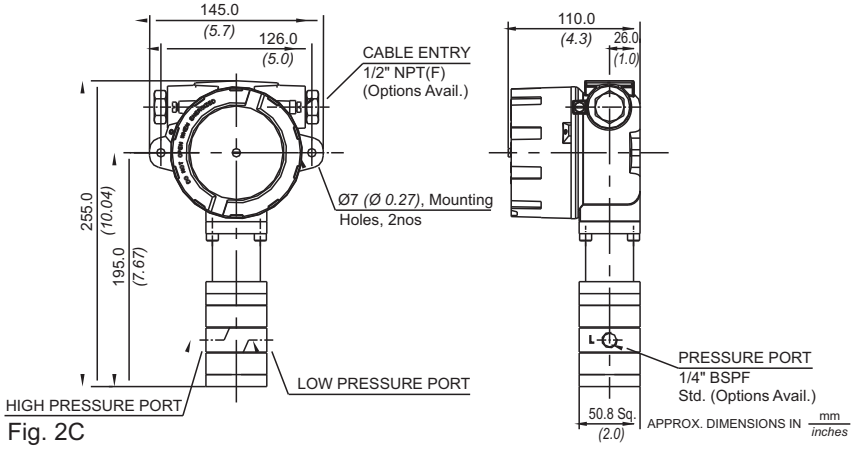


Fig. 2C

APPROX. DIMENSIONS IN mm / inches

INSTALLATION DRAWING FOR LOW RANGE PRESSURE DIFFERENCE

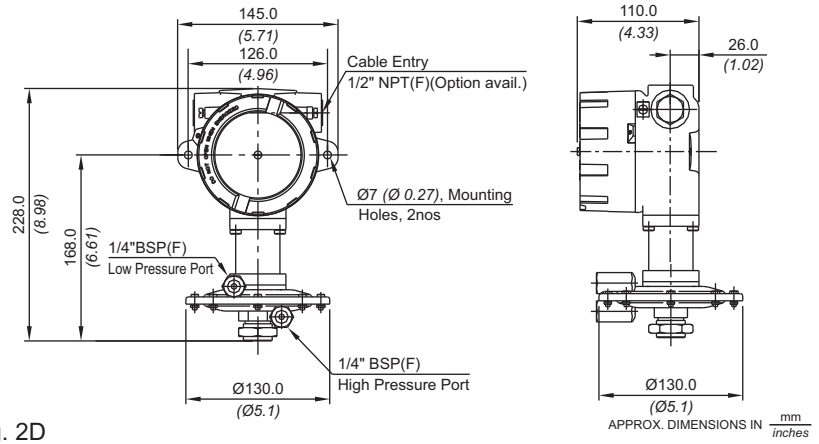


Fig. 2D

APPROX. DIMENSIONS IN mm / inches

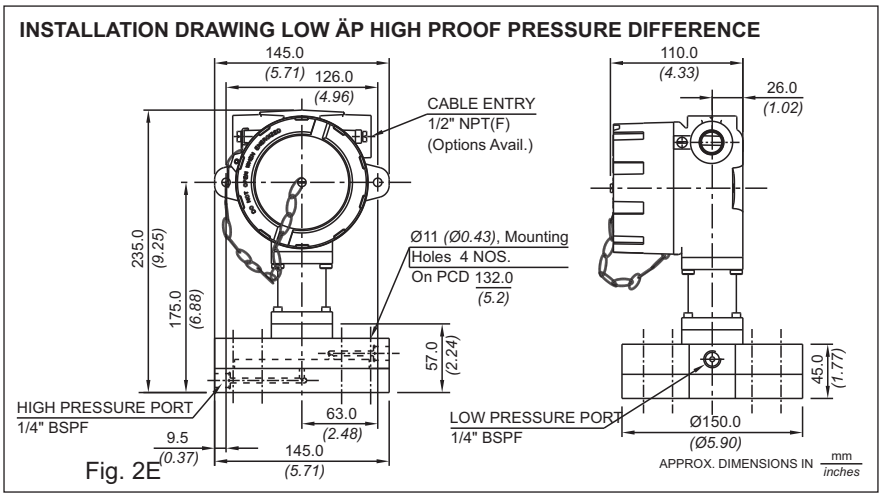


Fig. 2E

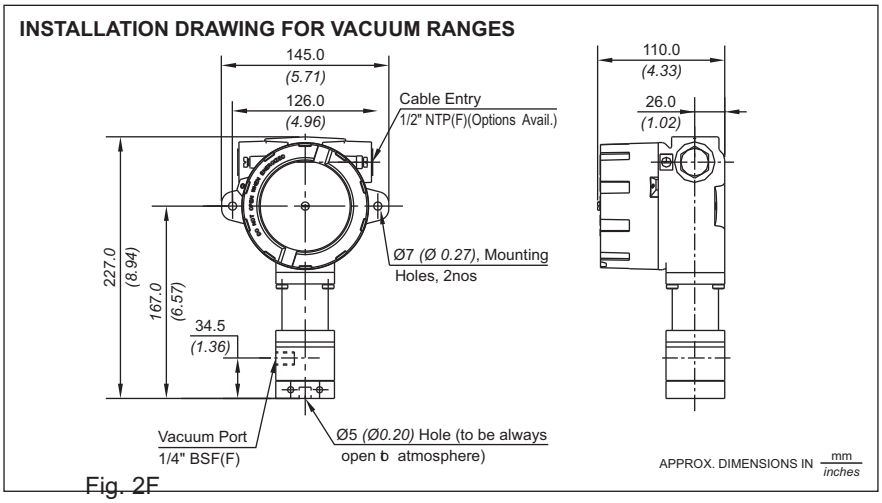


Fig. 2F

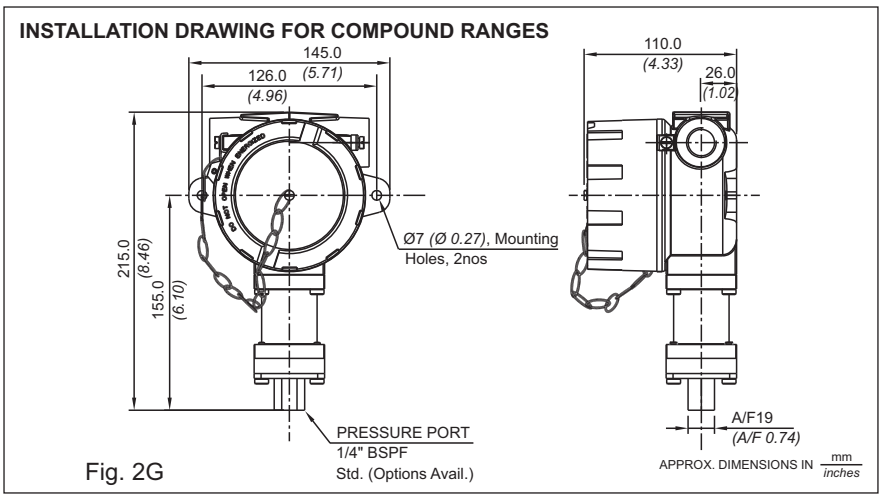


Fig. 2G

WARRANTY CERTIFICATE

Our products are warranted against defect in specified material and workmanship under specified normal service conditions for 12 months after being placed in service but not more than 18 months from t he date of shipment, provided such items are returned free to our works at PUNE.

Company's liability in respect of defective parts is limited to making good by replacement, or repair defects, to be determined by the company. This is, provided the purchaser has given immediate written notice upon discovery of such defects but within the time specified above. The replaced / parts will be supplied ex works.

The company will be relieved of its obligation if any arbitrary attempt to rectify has been undertaken by purchaser/user. This warranty does not cover normal wear and tear and damage due to corrosion or erosion. The company's liability is limited to making good the part or parts which are defective and excludes any and every other obligation for loss or damage, direct or consequential.

The foregoing is in lieu of all other expressed and implied warranties (except of title), including those of merchantability and fitness for a particular purpose.

Although we provide application assistance, either through our literature or personally, it is the responsibility of the customer to determine the suitability of the product in the application. Customer's interpretation and implementation of application suggestions and recommendation by Kaustubha Udyog, general or specific, transmitted verbally or in writing, published or unpublished, is strictly at the buyer's own risk.

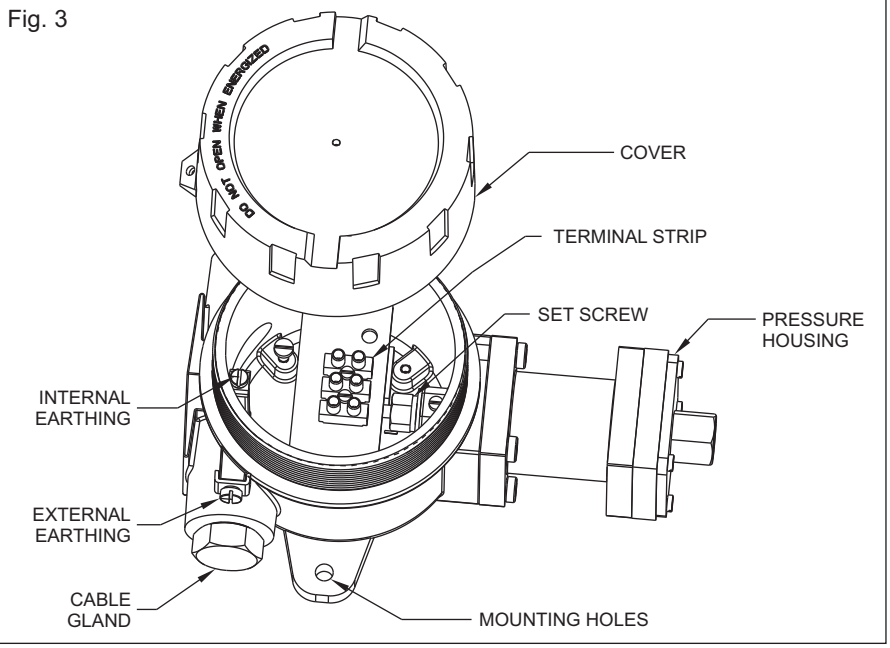
SET POINT ADJUSTMENT:

FOR FLAMEPROOF MODELS Refer figure 3

1. ISOLATE SUPPLY. Remove the cover.
2. i) FLAMEPROOF UNCALIBRATED Models : Turn the setscrew to the extreme negative end.
   ii) FLAMEPROOF CALIBRATED Models : Adjust the desired set point on the scale.
3. Apply the desired pressure to the pressure switch.
4. i) FLAMEPROOF UNCALIBRATED Models : Increase the pressure setting by turning the setscrew till contacts changeover.
   ii) FLAMEPROOF CALIBRATED Models : Proceed to Step 5.
5. Some minor adjustment will be required to achieve the exact point, which can be checked with the help of a proper pressure measurement device.
6. Reassemble the Cover having internal threading onto the Casing having external threading (M100 x 2). Secure the Cover firmly to the Casing by tightening it MANUALLY and applying normal force. Do not overtighten by using any tightening device which can cause damage to the threads.

Tip. :The pressure switches are factory set at half the set point range (unless otherwise specified in a Purchase Order). Step 2 can be omitted if the desired set point is more then the factory setting, for FLAMEPROOF uncalibrated models.

Fig. 3



SETTING AND CALIBRATION

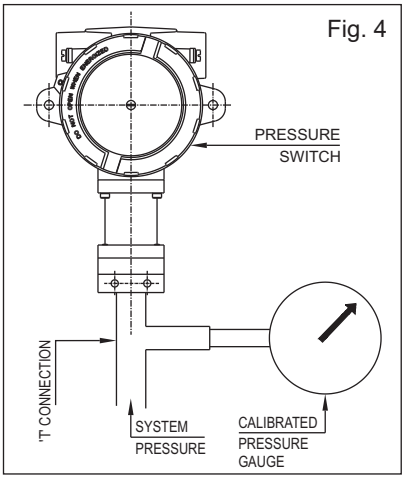
Prior to despatch, switches are checked to ensure the adjustment range is achieved and when requested preset at a specified value against a calibrated test instrument. A switch has tamperproof adjustment accessed by removal of the main cover. Adjustment to the set point is carried out by rotating the nut/shaft to the left to increase or to the right for decreasing the load respectively.

ROUTINE MAINTANENCE:

Routine inspection of the installation should take place at regular intervals. It is recommended that the switch is checked and operated every 5 months. Electrical connections and covers should be checked periodically for tightness. It is recommended that the 'O' rings and diaphragms be renewed every 3-5 years, and microswitch assemblies every 5-10 years dependant upon equipment usage.

SPECIFIC CONDITIONS OF USE

Fig. 4



1. The flamepaths of the push rod and bushing arrangements are specified with maximum gaps smaller than those shown in the standard. The manufacturer should be consulted for values if required for maintenance etc.
2. When used in an explosive dust atmosphere the cable entry devices shall maintain the ingress protection of the enclosure.

IS/IES 60079-1 CM/L - 0007775906	For details of BIS certification, please visit **www.bis.gov.in**

TROUBLE SHOOTING TIPS

WARNING: Isolate the switch electrically and disconnect from pressure source before carrying out trouble shooting, in a safe area. Generally no problems are observed if the pressure switch selection, wiring and the set point is proper. For a pressure switch selection procedure, please consult our sales office.

For properly selected pressure switches, if following symptoms are observed, the likely causes and remedies are as stated below.

SYMPTOM 1: SWITCH DOES NOT OPERATE

1) Wiring may not be correct, Check electrical connections to the pressure switch, if they are as per the wiring diagram.
2) Pressure does not reach the pressure port.

a) Check if the entry to the pressure capsule is not blocked by frozen process or scales or impurities in the process.
   i) If this is the case, try freeing the blocked path by a blunt tool in case of scales and impurities.
   ii) For frozen process, it is advisable to use chemical seals.

DO NOT OPEN THE PRESSURE CAPSULE IN ANY EVENT.

If the cause is none of the above-mentioned probabilities, proceed as per the following steps.

b) Check the system pressure & set point of pressure switch. For use of pressure switch for falling set points, system pressure has to be greater than the cut out point. For use of pressure switch for rising set points, the system pressure may not be reaching the cutout point.
   i) Use 'T' connection & connect calibrated pressure gauge to the 'T' connection as shown in the figure 4.
   ii) Adjust the set points such that the system pressure is greater than the cut out points of the pressure switch.
   iii) If the switch still does not operate, remove the pressure switch physically from the system. There should be continuity between terminals 1 & 2. If no continuity is observed the pressure switch should be returned to the factory.

SYMPTOM 2: LEAKAGE

In case leakage is observed, the pressure switch has to be returned to the factory without opening the pressure capsule. Check for the following likely causes and use a new switch taking proper precautions.

a) System pressure is greater than working pressure: Use an over range protector or a switch with appropriate maximum working pressure.
b) Incompatible wetted parts: The working medium may not be compatible with wetted parts, which damages the sealing of the process from working parts. Use a chemical seal for the pressure switch or use proper compatible wetted parts.
c) Excessive process temperature: Process temperature may exceed maximum allowable temperature.

SPARES AND PART REPLACEMENT:

We strongly recommend for spares and part replacement, kindly contact Kaustubha Udyog, Pune, India. ■

PRESSURE SWITCHES
PRESSURE DIFFERENCE SWITCHES
VACUUM SWITCHES
From 1.5 mbar to 600 bar

FC Adjustable Differential Pressure Switches

INSTALLATION AND OPERATING INSTRUCTIONS

CONSTRUCTION :

A flameproof pressure switch consists of a flameproof body and cover (normally of die cast aluminium / Grey CI / SS), a junction cylinder (aluminium) and the pressure capsule. The pressure in the pressure capsule is converted to a force which is balanced by a spring in the junction cylinder. When the force generated by pressure exceeds / falls above / below the spring force, a microswitch housed in the flameproof enclosure is actuated by a transfer rod.

A separate terminal strip with screwed ends is provided for easy and safe wiring. The cables need to be passed through a conduit entry which is ½ "NPT/ 3/4"NPT or M20 X 1.5, as selected. The other cable / conduit entry, if not used, needs to be suitably plugged.

PRINCIPLE OF OPERATION

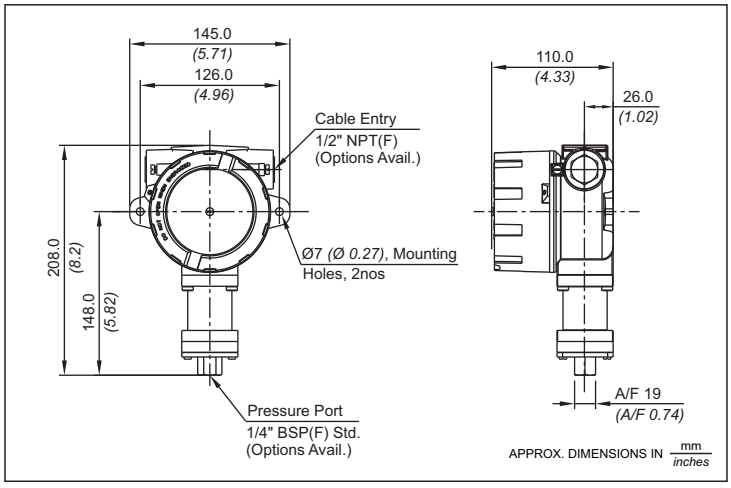
The pressure in the pressure capsule is converted into force by means of a reinforced rubber diaphragm and a calibrated piston, which is balanced by a compression spring from above. When the force generated by the pressure in the pressure capsule exceeds / falls beyond the balancing spring force, an electrical element is actuated.

MOUNTING : (Fig. 1)

The high pressure range pressure switches can be mounted in any direction . However , for low range pressure switches, it is advised to mount them in such a way that the diaphragm is vertical .

1) for high range pressure switches,
   a) pressure switches can be mounted directly in case the mounting is rigid.
   b) For panel mounting, use M6 bolts of appropriate length through the mounting holes. If the equipment is subject to vibration , please use the rubber washer / pads between the panel and the switch.
2) for low pressure ranges :
   a) Pressure switches can be mounted directly in case the mounting is rigid
   b) For pipe mounting, use a pipe mounting bracket that can be provided along with the pressure switch, to clamp the switch on to the pipe.
3) connect the pressure tubing to the pressure port. The pressure port size is generally ¼" BSP/NPT (FEMALE) and 1/2" BSP/NPT (FEMALE), unless specifically ordered otherwise. Other sizes can be obtained via adaptors.

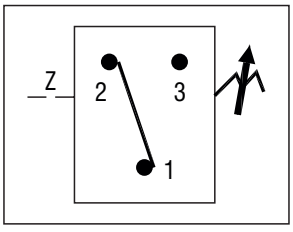
Fig. 1



ELECTRICAL CONNECTIONS : (Fig. 2)

Pressure switches will generally have only one SPDT micro switch.

Fig. 2



Certificate No.: FM72815
ISO 9001:2015

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BULLETIN NO. : KA250305

Fig. 3

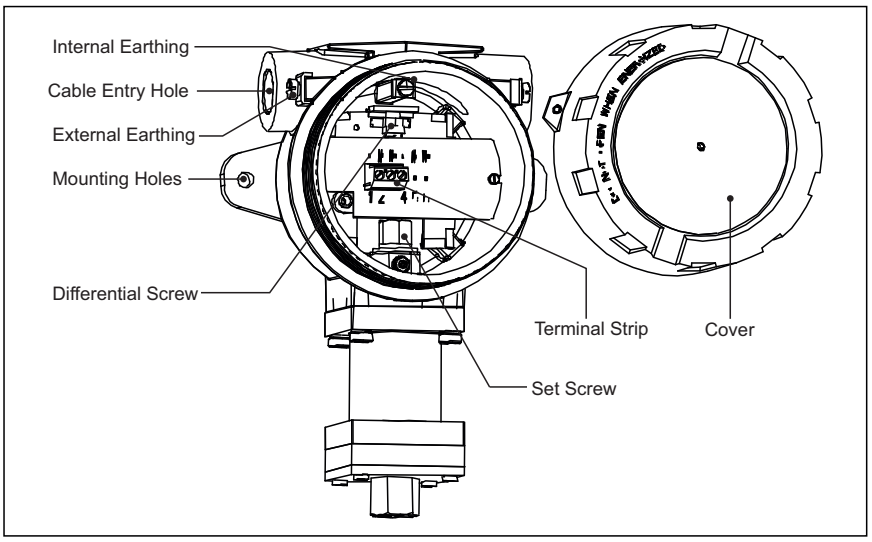
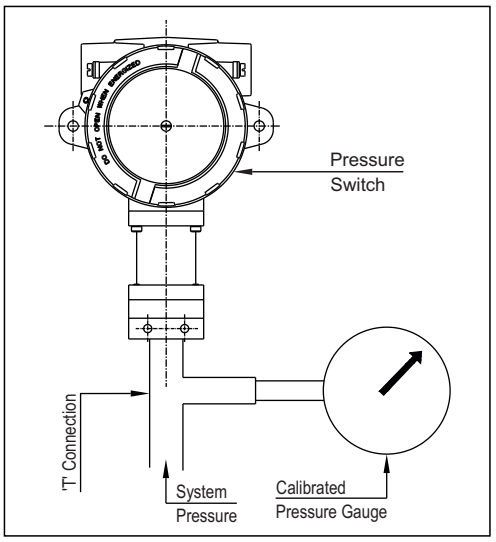


Fig. 4



WIRING:

a) Your attention is drawn to the electrical potential that will be present, if the main cover is removed while the switch is connected to a live supply. The electrical supply must be isolated prior to removal of the cover.

b) Remove the cover. Refer fig 3

c)Pass the cable through the cable gland and connect the wiring to the terminal strip as per your wiring diagram.

The color code is as per the details given below:

Terminal 1 (Common) : Red

Terminal 2 (Normally closed): Black

Terminal 3 (Normally open) : Yellow

SET POINT ADJUSTMENT FOR FC MODELS (Fig. 3)

1) Decide the cut-in (lower) pressure P1 & the cut -out (upper) pressure P2. The differential will be (P2-P1).
2) Remove the cover.
3) a) For FC UNCALIBRATED models
   i. Turn the setscrew to the extreme negative end.
   ii. Turn the differential screw to the extreme negative end.
   iii. Apply the desired cut in (lower) pressure to the pressure switch.
   iv. Increase the pressure setting by turning the setscrew till contact changeover.
   b) For FC CALIBRATED models
   i. Set the cut-in point on the main-scale with the help of the set-screw.
4) Turn the differential screw to the extreme positive end.
5) Apply the desired cutout (higher) pressure to the pressure switch.
6) Decrease the differential pressure setting by turning the differential screw till contacts changeover.
7) Some minor adjustment will be required to achieve the exact cutin (lower)/ cutout (higher) pointy, which can be checked with the help of a proper pressure measurement device.
8) Reassemble the Cover having internal threading onto the Casing having external threading (M100 x 2). Secure the Cover firmly to the Casing by tightening it MANUALLY and applying normal force. Do not overtighten by using any tightening device which can cause damage to the threads.

TROUBLE SHOOTING TIPS

WARNING: Isolate the switch electrically and disconnect from pressure source before carrying out trouble shooting, in a safe area.

Generally no problems are observed if the pressure switch selection, wiring and the set point is proper. For a pressure switch selection procedure, please consult our sales office.

For properly selected pressure switches, if following symptoms are observed, the likely causes and remedies are as stated below.

SYMPTOM 1 : SWITCH DOES NOT OPERATE

1) Wiring may not be correct. Check electrical connections to the pressure switch, if they are as per the wiring diagram.
2) Pressure does not reach the pressure port.
   a) Check if the entry to the pressure capsule is not blocked by frozen process or scales or impurities in the process.
   i) If this is the case, try freeing the blocked path by a blunt tool in case of scales and impurities.
   ii) For frozen process, it is advisable to use chemical seals.

DO NOT OPEN THE PRESSURE CAPSULE IN ANY EVENT.

If the cause is none of the above mentioned probabilities , proceed as per the following steps.

   b) Check the system pressure & set point of pressure switch.
      i) For use of pressure switch for falling setpoints, system pressure has to be greater than the cutout point.
      ii) For use of pressure switch for rising setpoints, system pressure may not be reaching / exceeding the cutout point.
   c) Use 'T'connection & connect calibrated pressure gauge to the 'T' connection as shown in the figure.
   d) Adjust the setpoints such that the system pressure is greater than the cut-out point of the pressure switch.
   e) If the switch still does not operate, remove the pressure switch physically from the system. There should be continuity between terminals 1 & 2. If no continuity is observed, the pressure switch should be returned to the factory.

SYMPTOM 2 : LEAKAGE :

In case leakage is observed, the pressure switch has to be returned to the factory without opening the pressure capsule. Check for the following likely causes and use a new switch taking proper precautions.

a) System pressure is greater than working pressure : Use an overrange protector or a switch with appropriate maximum working pressure.

b) Incompatible wetted parts : The working medium may not be compatible with wetted parts, which damages the sealing of the process from working parts. Use a chemical seal for the pressure switch or use proper compatible wetted parts.

c)Excessive process temperature : Process temperature may exceed maximum allowable temperature, which in turn damages the diaphragms. Use an impulse tubing of proper length for cooling the process temperature. There may be a pressure drop depending on the length of the impulse tube used. Adjust the setpoint of the pressure switch accordingly.

SYMPTOM 3 : CHATTERING :

1) Check the system pressure for surges. Chattering is observed where the system pressure is close to the cutin / cutout point and the surge pressure exceeds the on - off differential. Use a pressure switch with adjustable differential or use surge dampers in your system.

SPECIFIC CONDITIONS OF USE

1.The flamepaths of the push rod and bushing arrangements are specified with maximum gaps smaller than those shown in the standard. The manufacturer should be consulted for values if required for maintenance etc.

2.When used in an explosive dust atmosphere the cable entry devices shall maintain the ingress protection of the enclosure.■

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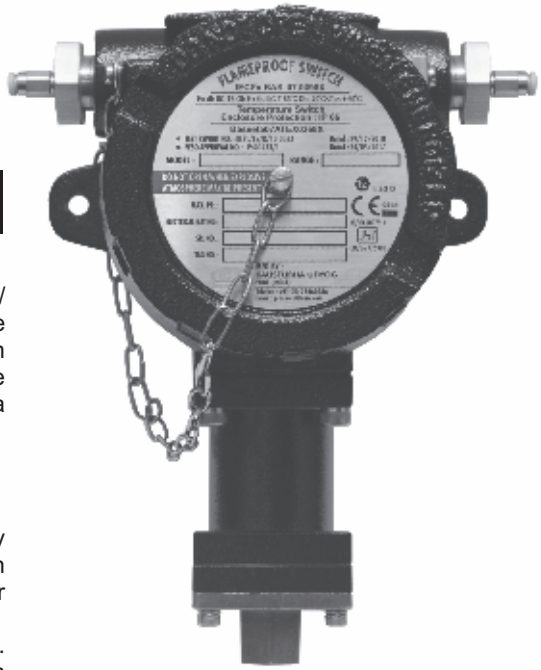
PRESSURE SWITCHES
PRESSURE DIFFERENCE SWITCHES
VACUUM SWITCHES
From 1.5 mbar to 600 bar

FC Air Relay Switches



INSTALLATION AND OPERATING INSTRUCTIONS

CONSTRUCTION :

A FC air relay switch consists of a body and cover (normally of die cast aluminium / Grey CI / SS), a junction cylinder and the pressure capsule. The pressure in the pressure capsule is converted to a force which is balanced by a spring in the junction cylinder. When the force generated by pressure exceeds / falls above / below the spring force, a micro mechanical valve housed in the enclosure is actuated by a transfer rod.

M5 push-in straight fittings are provided to supply and output of air/gas.

PRINCIPLE OF OPERATION

Air relay switches are used where pneumatic logic is required e.g. in extremely hazardous areas. The output is an air supply (or an absence of it), in place of an electrical signal as in pressure switches. The input is air or inert gas (1.5bar to 7 bar pressure).

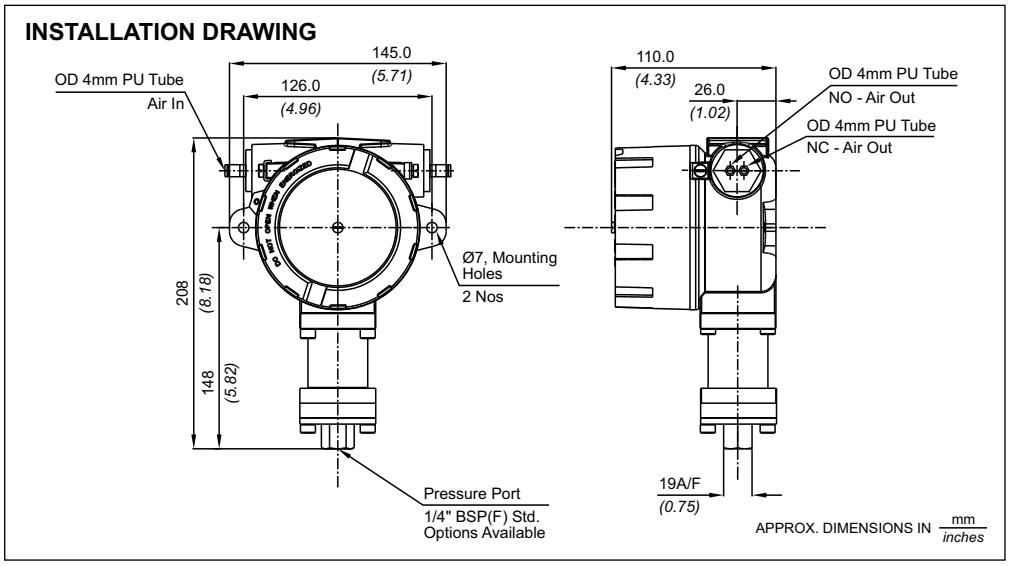
The process pressure is sensed by the pressure capsule of the pressure switch. Depending on the setpoint and the pneumatic valve logic chosen, a lever operates a pneumatic valve closing / opening it.

MOUNTING : (Fig. 1)

The Air Relay pressure switches can be mounted in any direction. It is advised to mount them in such a way that the diaphragm is vertical.

1) Connect the process pressure tubing to the pressure port. The pressure port size is generally 1/4" B.S.P. female, unless specially ordered otherwise. Other sizes can be obtained via adaptors.

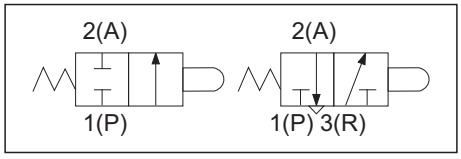
Fig. 1



PNEUMATIC VALVE SPECIFICATIONS

NO valve (P2) = air flows when process pressure < set point
NC valve (P1) = air flows when process pressure > set point
Supply pressure of air/inert gas = 1.5 to 7 bar max

Fig. 2



Certificate No.: FM72815
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Fig. 3

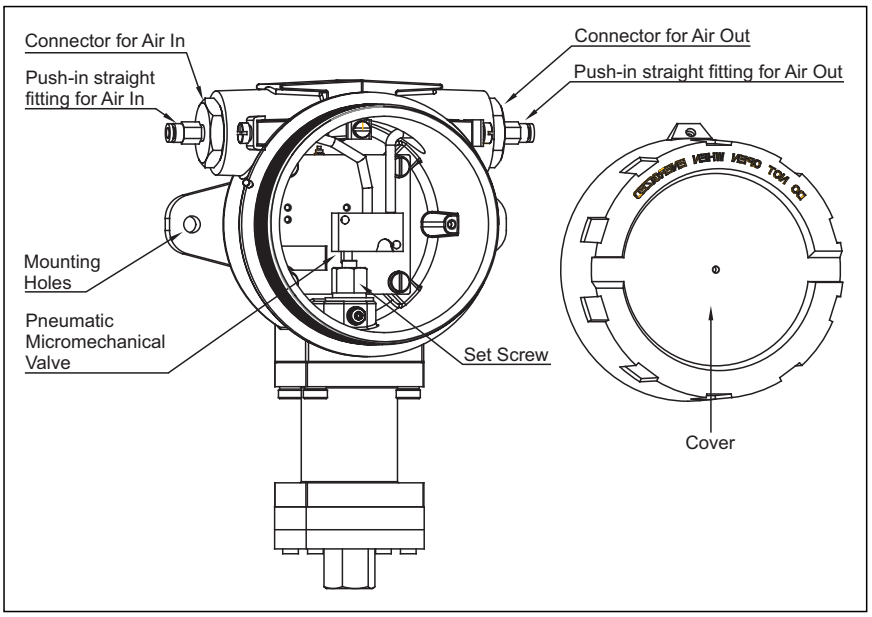
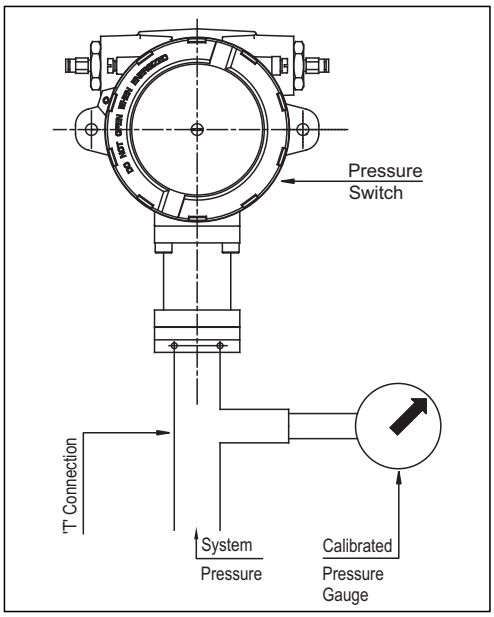


Fig. 4



SET POINT ADJUSTMENT FOR FC MODELS

(Fig. 3)

1) Remove the setscrew cover.
2) i) FC UNCALIBRATED Models : Turn the setscrew to the extreme negative end.
   ii) FC CALIBRATED Models : Adjust the desired setpoint on the scale.
3) Apply the desired cutin (lower) / cutout (higher) pressure to the air relay switch.
4) i) FC UNCALIBRATED Models : Increase the pressure setting by turning the set screw till contacts changeover.
   ii) FC CALIBRATED Models : proceed to Step 5
5) Some minor adjustment will be required to achieve the exact cutin (lower) / cutout (higher) point, which can be checked with the help of a proper pressure measurement device.
6) Reassemble the Cover having internal threading onto the Casing having external threading (M100 x 2). Secure the Cover firmly to the Casing by tightening it MANUALLY and applying normal force. Do not overtighten by using any tightening device which can cause damage to the threads.

Tip : The air relay switches are factory set at half the setpoint range (unless otherwise specified in a Purchase Order). Step 2 can be omitted if the desired set point is more than the factory setting for FC uncalibrated models.

TROUBLE SHOOTING TIPS

Generally no problems are observed if the air relay switch selection and the setpoint is proper. For a switch selection procedure, please consult our sales office.

For properly selected air relay switches, if following symptoms are observed, the likely causes and remedies are as stated below.

Symptom 1: Switch does not operate

1) Pressure does not reach the pressure port.
   a) Check if the entry to the pressure capsule is not blocked by frozen process or scales or impurities in the process.
      i) If this is the case, try freeing the blocked path by a blunt tool in case of scales or impurities.
      ii) For frozen process, it is advisable to use chemical seals.

DO NOT OPEN THE PRESSURE CAPSULE IN ANY EVENT.

If the cause is none of the above mentioned probabilities, proceed as per the following steps.

   b) Check the system pressure & set point of switch. For use of switch for falling setpoints, system pressure has to be greater than cutout point. For use of switch for rising setpoints, the system pressure may not be reaching / exceeding the cutout point.
      i) For adjustable differential models turn the differential screw to the extreme negative end.
      ii) Use 'T' connection & connect calibrated pressure gauge to the 'T' connection as shown in the figure 4.
      iii) Adjust the setpoint such that the system pressure is greater than the cut-out point of the pressure switch.
      iv) If the switch still does not operate, remove the switch physically and should be returned to the factory.

Symptom 2: Leakage

In case leakage is observed, the pressure switch has to be returned to the factory without opening the pressure capsule.

Check for the following likely causes and use a new switch taking proper precautions.

a) System pressure is greater than working pressure : Use an overrange protector or a switch with appropriate maximum working pressure.
b) Incompatible wetted parts : The working medium may not be compatible with wetted parts, which damages the sealing of the process from working parts. Use a chemical seal for the pressure switch or use proper compatible wetted parts.
c) Excessive process temperature : Process temperature may exceed maximum allowable temperature, which in turn damages the diaphragms. Use an impulse tubing of proper length for cooling the process temperature. There may be a pressure drop depending on length of the impulse tube used. Adjust the setpoint of the pressure switch accordingly.

Symptom 3: Chattering

1) Check the system pressure for surges. Chattering is observed where the system pressure is close to the cutin / cutout point and the surge pressure exceeds the on-off differential. Use a pressure switch with an adjustable differential or use surge dampers in your system.

Symptom 4 : Air leakage from the valve

1) The opening of the pneumatic valve is gradual. So the air output pressure will gradually increase / decrease with increase / decrease in process pressure. This is normal. ■

Orion®
INSTRUMENTS

PRESSURE SWITCHES
PRESSURE DIFFERENCE SWITCHES
VACUUM SWITCHES
TEMPERATURE SWITCHES
From 1.5 mbar to 600 bar

FC Temperature Switch

INSTALLATION AND OPERATING INSTRUMENTS

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Installation and Operating Instructions for FC Temperature Switch

CONSTRUCTION:

An FC series flameproof temperature switch is a pressure switch actuated by vapour pressure which is directly proportional to the temperature being sensed. It consists of a flameproof body and cover (normally of die cast aluminium / Grey CI / SS), a junction cylinder (aluminium / SS) and a temperature sensing capsule comprising a capillary and a temperature bulb. The temperature being sensed by the bulb, changes the vapour pressure of the liquid filled in the capillary. This is converted to a force which is balanced by a spring in the junction cylinder. When the force generated by the vapour pressure exceeds / falls above / below the spring force, a microswitch housed in the flameproof enclosure is actuated by a transfer rod.

A separate terminal strip with screwed ends is provided for easy and safe wiring. The cables need to be passed through a conduit entry which is ½ "NPT / 3/4"NPT or M20 X 1.5, as selected. The other cable / conduit entry, if not used, needs to be suitably plugged.

PRINCIPLE OF OPERATION:

Temperature being sensed by the bulb is in direct proportion to the pressure of the liquid filled in the temperature sensing capsule. As the temperature being sensed changes, so does the vapour pressure inside the bulb. This change in pressure is sensed by a diaphragm, a calibrated piston and a compression spring. Once the pressure changes beyond the set limit, an operating rod actuates a microswitch(es) inside the flameproof enclosure.

INSTALLATION:

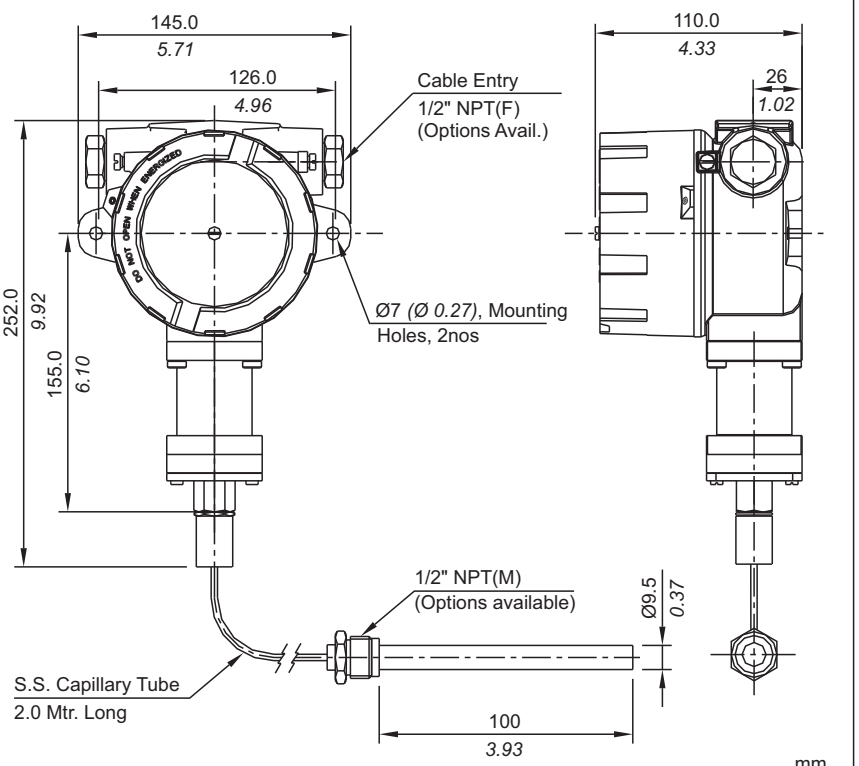
WARNING

Your attention is drawn to the electrical potential that will be present, if the main cover is removed while the switch is connected to a live supply. The electrical supply MUST BE ISOLATED prior to removal of the cover.

Please ensure that the bulb is preferably vertical and below the capillary. The switch unit though can be mounted in any direction. Use a location free from excessive vibration, shock or temperature fluctuation. Heat transfer from vicinity or adjacent process lines could affect working of the unit.

The unit must be specified, installed and operated by competent personnel, & its use be limited to within the published specifications. (All hazardous area models must be installed in accordance with BS EN 50079-14) Unauthorized modifications repair or operation outside the specified limits may invalidate the warranty. Servicing should only be carried out by qualified personnel.

INSTALLATION DRAWING Fig. 1.1



FAILURE HAZARD

Temperature switches element/primary seal failure.

The process medium temperature should not be allowed to exceed that stated in the product data & under the "OPERATING TEMPERATURES" section in this document.

Excessive bending of the capillary, resulting in cracking it, may render the switch inoperable. Ensure the bulb material is compatible to the sensing medium and can sustain pressure of the working medium. When this is not the case, use a thermowell of appropriate material and rating.

PROCESS CONNECTIONS

The remote bulb is of brass and the capillary is provided with a 1/2" NPT(M) (Options Available) gland nut. Using this gland nut, a thermowell of appropriate size, rating and material can be used to suit the

process whose temperature is to be sensed. Thermowells can be provided as accessories, if the specifications are provided by the end user / customer.

MATERIALS

The materials used in this switch are as follows:--
The Main casing - Aluminum Grade- LM6 or Grey Cast Iron / SS316 Grade Stainless Steel (on demand)
The Cover - Aluminum Grade- LM6 or Grey Cast Iron /SS316 Grade Stainless Steel (on demand)
Internal switch mechanism – S.S.
External fasteners – S.S.
Internal fasteners & springs - S.S / spring steel
Temperature Bulb – Brass
Capillary – S.S.

MOUNTING

The temperature switch can be mounted in any direction.

1) The temperature switch can be mounted directly in case the mounting is rigid.
2) For panel mounting, use M6 bolts of appropriate length through the mounting holes. If the equipment is subject to vibration, please use the rubber washer / pads between the panel and the switch.
3) For pipe mounting, use a pipe mounting bracket that can be provided along with the temperature switch, to clamp the switch on to the pipe.
4) Thermowell can be provided as per requirement.

CAUTION : Please ensure that the bulb is preferably vertical and below the capillary. The switch unit though can be mounted in any direction.
FAILURE HAZARD: The copper capillary (Refer fig . 1.3) is used for filling volatile liquid. It should not be bent such that it develops a crack or is broken. The switch will not function after such an event. The length of copper capillary is purposely kept more in the event the sensing temperature capsule has to be refilled.

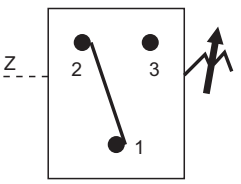
ELECTRICAL CONNECTIONS:

Temperature switches will generally have only one SPDT microswitch.
Temperature switches with 2 SPDT microswitches can also be provided on demand.
All models are normally supplied with a straight M20 conduit entry provided on either side of the switch and either one can be plugged, if not in use. These conduit connections can be fitted either with a suitable gland or directly with conduit to suit the installation.
CAUTION : It is a safety requirement that at least 5 full threads must be engaged. Use only cable glands and plugs certified for use in hazardous area.
Access to the terminal is via a removable top cover. The electrical supply must be isolated prior to this activity. Switch connections details are provided on the cover (name plate). This should be referred to when connecting it to the terminal strip as NO/NC. Terminal numbers vary depending on whether switch setting is falling or rising.
Terminals are suitable for cables, single or multi strand, up to 2.5 sq mm. When 2 SPDT microswitches are fitted, they are mechanically linked to give a DPDT switching action.
Reset of the switches could be up to 3% apart due to the inherent differential of microswitches. For specific wiring, refer the figure.

WIRING:

a)Your attention is drawn to the electrical potential that will be present, if the main cover is removed while the switch is connected to a live supply. The electrical supply must be isolated prior to removal of the cover.
b)Remove the cover. Refer fig 1.3.
c) Pass the cable through the cable gland and connect the wiring to the terminal strip as per your wiring diagram.
The color code is as per the details given below:
Terminal 1 (Common): Red
Terminal 2 (Normally closed): Black
Terminal 3 (Normally open): Yellow
CAUTION : Ensure that wires do not interfere with the operating mechanism. Please use earthing terminals that have been provided, one inside the enclosure and one outside.

Fig. 1.2



OPERATING TEMPERATURES:

The operating condition temperature restrictions for the flameproof switch FC are as follows:
Ambient: -20 degree C to +60 degree C
Operational (all models): as per the ranges
Note: Switches with temperature ranges beyond the ones specified above can be supplied on request.
Storage:-5 degree C to +60 degree C

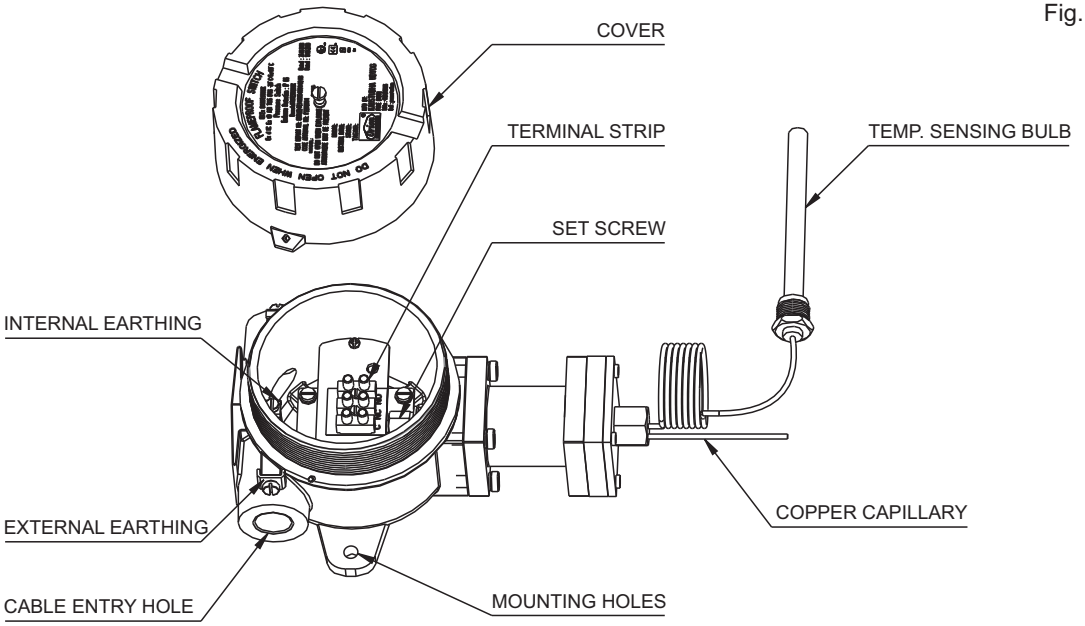
SETTING AND CALIBRATION

Prior to dispatch, switches are checked to ensure the adjustment range is achieved and when requested preset at a specified value against a calibrated test instrument. A switch has tamperproof adjustmentaccessed by removal of the main cover. Adjustment to the set point is carried out by rotating the nut/shaft to the left to increase or to the right for decreasing the load respectively.

ROUTINE MAINTENANCE:

Routine inspection of the installation should take place at regular intervals. It is recommended that the switch is checked and operated every 5 months. Electrical connections and covers should be checked periodically for tightness. It is recommended that the 'O' rings and diaphragms be renewed every 3-5 years, and microswitch assemblies every 5-10 years dependant upon equipment usage.

Fig. 1.3



SET POINT ADJUSTMENT:

FOR FLAMEPROOF MODELS Refer figure 1.3.

1. ISOLATE SUPPLY. Remove the cover.
2. i) FLAMEPROOF UNCALIBRATED Models : Turn the setscrew to the extreme negative end.
   ii) FLAMEPROOF CALIBRATED Models: Adjust the desired set point on the scale.
3. Apply the desired temperature to the sensing bulb of the switch.
4. i) FLAMEPROOF UNCALIBRATED Models setscrew till contacts changeover.
   ii) FLAMEPROOF CALIBRATED Models: Proceed to Step 5.
5. Some minor adjustment will be required to achieve the exact point, which can be checked with the help of a proper temperature measurement device.
6. Replace the cover.

Tip. : The temperature switches are factory set at half the set point range (unless otherwise specified in a Purchase Order). Step 2 can be omitted if the desired set point is more then the factory setting, for FLAMEPROOF uncalibrated models.

TROUBLE SHOOTING TIPS

WARNING: Isolate the switch electrically and disconnect from pressure source before carrying out trouble shooting, in a safe area. Generally no problems are observed if the temperature switch selection, wiring and the set point is proper. For a temperature switch selection procedure, please consult our sales office.

For properly selected temperature switches, if following symptoms are observed, the likely causes and remedies are as stated below.

SYMPTOM 1: SWITCH DOES NOT OPERATE

1) Wiring may not be correct, Check electrical connections to the temperature switch, if they are as per the wiring diagram.

2) The temperature bulb does not sense temperature.

DO NOT TAMPER THE TEMPERATURE BULB IN ANY EVENT.

If the cause is none of the above-mentioned probabilities, proceed as per the following steps.

Check the system temperature & set point of temperature switch.

For use of temperature switch for falling set points, system temperature has to be greater than the cut out point.

For use of temperature switch for rising set points, the system temperature may not be reaching the cutout point.

If the switch still does not operate, remove the temperature switch physically from the system. There should be continuity between terminals 1 & 2. If no continuity is observed the temperature switch should be returned to the factory.

SYMPTOM 2: LEAKAGE

In case leakage is observed, the temperature switch has to be returned to the factory without tampering the temperature bulb.

SPARES AND PART REPLACEMENTS :

We strongly recommend for spares and part replacement, kindly contact Kaustubha Udyog, Pune, India. ■

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