

# INDUSTRIAL SWITCHES

## SPECIFIER'S GUIDE FOR

PRESSURE SWITCHES

PRESSURE DIFFERENCE SWITCHES

VACUUM SWITCHES

TEMPERATURE SWITCHES



# FP *Serisi*



## Using the section

This section helps you make a logical choice in selecting the best product for a particular application. It allows a user familiar with our product line to locate the exact page the product is listed on. For those not familiar with our products, a logical sequence is given to help the user pick the best product for their need.

By taking a few minutes to familiarise yourself with the catalogue organisation, you will find it very easy to locate the product / information you need.

1. The contents page lists the broad outline in which the catalogue is organised, and will help the user familiar with products to select the page on which the product or other useful information is listed.

2. Need Product Selection help ?

Product selection help will start with the "Pictorial Index" on Page 82 & 83, where the products are broadly classified. A brief description of each product group, a typical photo of the product within the group and the page number on which it is listed are given.

If the user is not familiar with the products, a product selection guide is provided on pages 88 through 94, where photos for each product and important specifications are given to help determine and select the best product for the application.

By evaluating and comparing these parameters, a logical selection can be made. Turn to the page on which the product information for the selected product is listed, for :

Capsule Construction details

Physical sizes

Special features

Ranges, hysteresis, electrical ratings etc.

Ordering information

Some applications

The organisation of each of these pages is demonstrated on pages 84 and 85, of this section "How to use this catalogue".

In many cases, more than one product may work. For the most cost effective solution, compare prices and consider alternatives. Remember, the end cost includes initial product price, plus the installation, plus the service.

3. Need the terminology explained? (see page 330)

Turn to page 330 for the definitions and terminology. This will help you familiarize with the terms used throughout the catalogue.

4. Need information on Accessories? (see page 322)

Turn to page 322 for information on important accessories. These will give information on only important accessories, and information needed, when these are to be supplied with our products.

5. Need selection guidance? (see page 331)

A logical procedure on page 331 will help you to consider most of the important factors when selecting a pressure switch.

6. Need other products ? (see page 332)

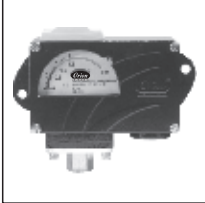
Products other than those listed in this catalogue are referenced on these pages. Separate catalogues for these products are available.

# Pictorial Index

## PRESSURE SWITCHES

### HIGH RANGE

**HIGH RANGE**



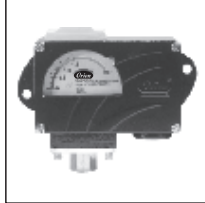
Page No. 96

**HIGH PROOF  
HIGH RANGE**



Page No. 100

**BELLOWS**



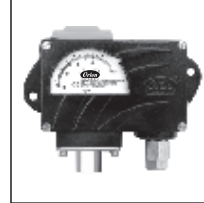
Page No. 104

**LARGE BORE  
HIGH RANGE**



Page No. 108

**AIR RELAY  
RANGE**



Page No. 112

**FLANGED  
RANGE**



Page No. 116

### LOW RANGE

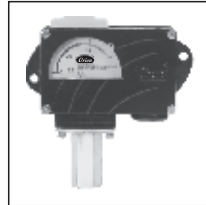
**LOW  
RANGE**



Page No. 120

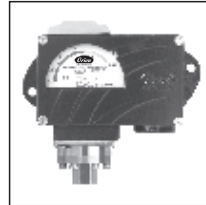
### HYDRAULIC RANGE\*

**HYDRAULIC  
RANGE**



Page No. 124

**HYDRAULIC  
DIAPHRAGM RANGE**



Page No. 128

## DUAL SWITCHES



Page No. 132

## PRESSURE DIFFERENCE SWITCHES

### HIGH RANGE

**HIGH RANGE**



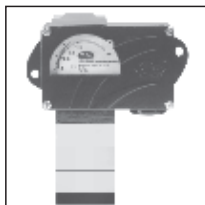
Page No. 136

**HIGH PROOF  
HIGH RANGE**



Page No. 140

**HIGH RANGE  
DP**



Page No. 144

### LOW RANGE

**ULTRA LOW  
RANGE**



Page No. 148

**LOW  
RANGE**



Page No. 150

**LOW ΔP  
HIGH PROOF  
RANGE**



Page No. 154

\*Hydraulic ranges are ranges typically from 2 bar to 600 bar, used in oil applications. However, these switches can be used for other media depending on wetted parts compatibility.

# Pictorial Index

## VACUUM SWITCHES

### VACUUM

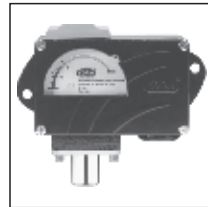


Page No. 158

## COMPOUND SWITCHES

### HIGH RANGE

#### HIGH RANGE



Page No. 162

### LOW RANGE

#### LOW RANGE



Page No. 166

## TEMPERATURE SWITCHES



Page No. 170

\*Hydraulic ranges are ranges typically from 2 bar to 600 bar, used in oil applications. However, these switches can be used for other media depending on wetted parts compatibility.



# HOW TO USE this section

6. Photos - will appear on the relevant top of the page for products. If there are mounting variations / styles, all the styles for standard products will appear for easy identification. Options, if included in the photograph, are for demonstration only, and are not a part of the standard equipment. For accessories, the photos are not given due to the sheer variety and range available.

7. Logo - will appear on right hand top of page to identify the manufacturer.

8. Characteristics - Range tables and their relevant data, e.g the range covered, the differentials and maximum working pressures will generally appear on the right hand page. Additional technical details will also be mentioned, wherever required, on the right hand side of the page.

9. Ordering guide - A guide as to how to order the particular series' variations will appear on right hand bottom of the page. Only the variations available within a particular product family / series will appear here. Any additional accessories or modifications required for the product need to be mentioned in text by the user.


10. Some applications - will appear at the bottom left of the page. This is for easy understanding of the specific use of the switch.

11. Installation and operating instructions - This will include the principle of operation and mounting instructions and will appear on the right hand page

12. Numerous combinations are possible when pressure switches are provided with accessories like chemical seals, snubbers, remote seals, pipe mounting brackets, combination of switches mounted in a panel etc. Users are requested to provide the details of accessories required in text / drawings, as separate identification codes are provided for pressure switches fitted and supplied with accessories.

**FP ULTRA LOW RANGE PRESSURE DIFFERENCE SWITCHES**

Ultra Low Range Pressure Difference Switches with User Adjustable Knob



**Salient Features**

- Easy to See, Easy to Use!**  
Set Point easily user adjustable with visible scale in Pascal. (no need of pressure gauge)
- Enclosure**  
Robust Gravity Die Cast Aluminium
- Long Lasting!**  
10<sup>7</sup> switching operations
- Trusted all over!**  
Tested and Proven

**Technical Specifications**

Media: Air, non-flammable gases and non-aggressive gases  
 Housing Material: IP 66 Gravity Die Cast Aluminium  
 Protection Category: IP66 with cover.  
 Ranges: 20 Pa to 4000 Pa  
 Maximum Working Pressure: 0.1 bar  
 Electrical Rating: Maximum 1.0A (4 A) / 250VAC  
 Electrical Connection: Standard Terminal Strip provided  
 Cable Entry: ½" NPT  
 High Pressure and Low Pressure Port: 1/8" BSP(F)  
 Media Temperature: 80°C max.  
 Ambient Temperature: -5°C to 60°C

Range Code (Orion)	Adjustment Range for Upper Switching Pressure Pa (mm wg)	Switching Differential Set to Pa (mm wg)
FP80	20-200 (2.039-20.395)	10 (1.020)
FP81	40 - 100 (4.079 - 10.197)	20 (2.039)
FP82	40 - 200 (4.0479 - 20.395)	20 (2.039)
FP83	50 - 500 (5.099 - 50.987)	20 (2.039)
FP85	200 - 1000 (20.395 - 101.974)	100 (10.197)
FP86	500 - 2500 (50.987 - 254.935)	150 (15.296)
FP87	1000 - 4000 (101.974 - 407.896)	250 (25.494)

**How to order FP series Low Range Pressure Difference Switches**  
 Please specify the Range Code e.g., FP82 or FP85 as per range selection table.

Bulletin No. KA121024

**148**

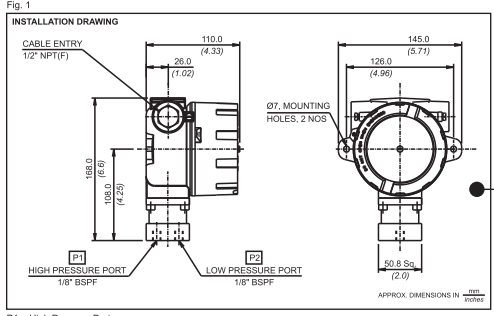
**ULTRA LOW RANGE PRESSURE DIFFERENCE SWITCHES FP**

**INSTALLATION AND OPERATING INSTRUCTIONS**

**Principle of Operation**  
 When the effective force generated by the pressure difference in the lower and upper chamber of the pressure capsule exceeds/falls beyond the balancing spring forces, an electrical element is actuated.

**Mounting**  
 The detailed mounting dimensions are shown in Fig. 1.  
 1) Pressure Switches can be mounted on a plate/inside a panel using Ø7 mounting holes provided.  
 2) For any other process connection, please use an adaptor.

**Fig. 1**  
**INSTALLATION DRAWING**



P1 = High Pressure Port  
 P2 = Low Pressure Port

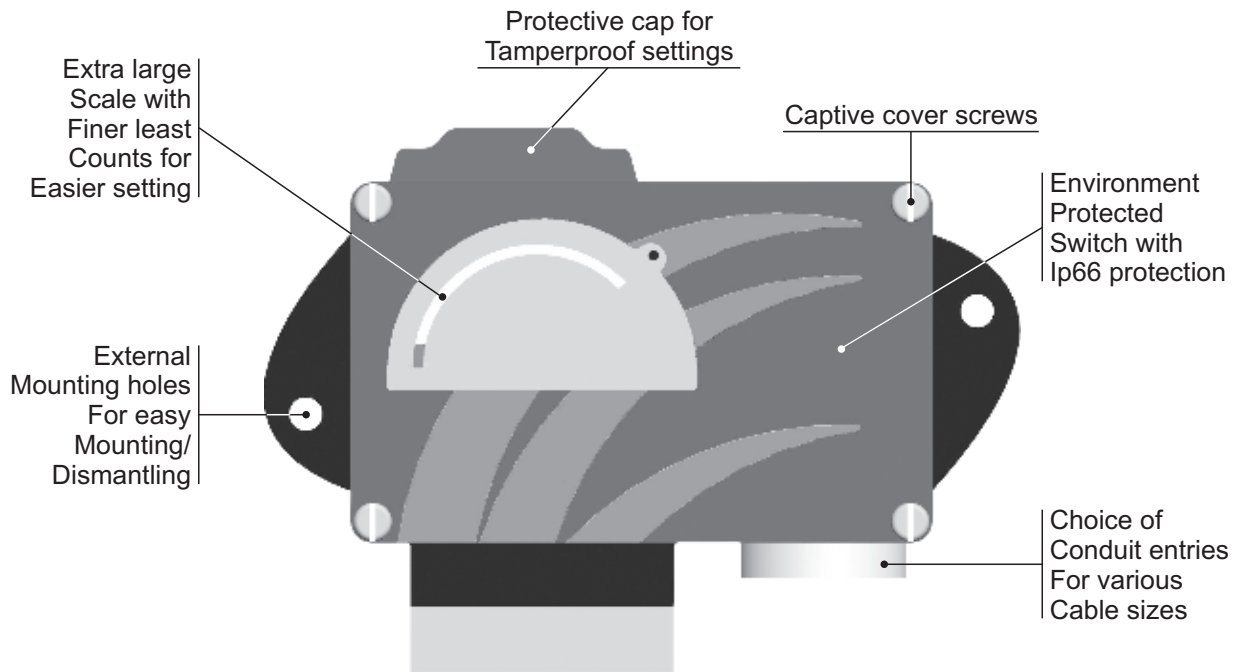
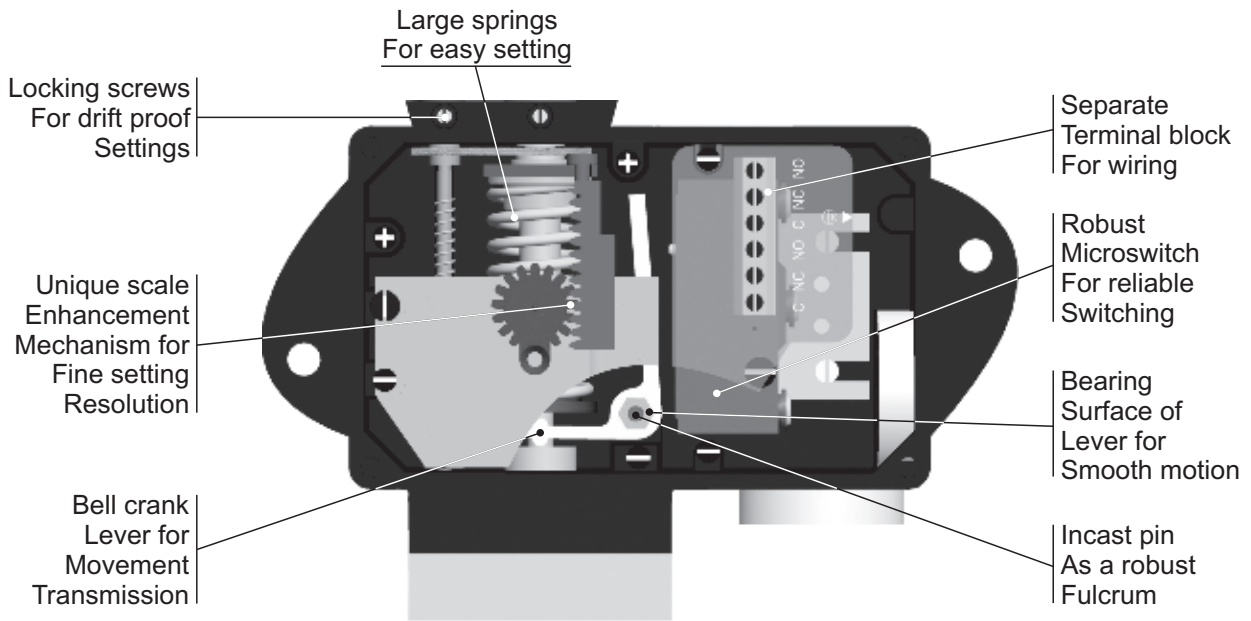
Note : 1. Use two screws only, for mounting  
 2. Remove transport protection from P1 and P2

**CAUTION :**  
 Install pressure switch vertically. Installing it at an angle more than 30° to vertical may result in malfunction.

Bulletin No. KA121024

**149**

# Switch Construction





# Switch Construction

The versatile construction of MD switches allows configuration by selecting the following main subassemblies / components :

## a) Main body casing :

This is aluminium pressure die cast, and has an IP 66 protection factor. This houses a lever mechanism , as also a scale enhancement mechanism, which is displayed on the page alongside. The cover has captive screws, and the scale, when provided, is clearly visible through a transparent window.

The cable entries in this casing can be of the following types :

- 1/2" NPT
- 3/4" NPT
- M20 X 1.5

Other cable glands to MIL standards can be fitted optionally on request.

## b) The electrical element (s) :

Choice of electrical elements to suit end use are offered, like :

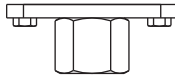

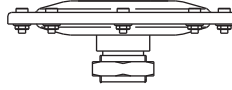

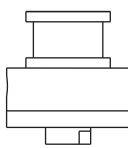
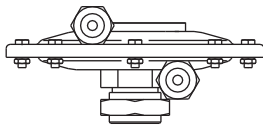
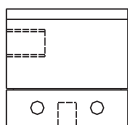
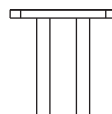
- A1 : General purpose applications
- A2 : Hermetically sealed for corrosive environments
- A3 : gold plated contacts for low voltage applications
- A4 : DPDT configuration
- A5 : for high DC ratings
- A7 : 2SPDT switching elements

It is possible to have more options of electrical elements not published here, to suit individual end use.

The deadband (or hysteresis / on-off differential) of the switches will change with the change of the electrical element (s). The approximate values for each range (for standard microswitches offered) are published in this catalogue

## c) The pressure capsule :

To suit the setpoints , the working media and the function of the switch in the application:

<p><b>High Pressure Ranges</b> (typically from 0.067 barg to 25 barg)</p> 	<p><b>High Proof High Pressure Ranges</b> (typically from 0.067 barg to 25 barg, Pmax = 70 bar)</p> 	<p><b>Low Pressure Ranges</b> (typically from 1.5 mbarg to 350 mbarg)</p> 	<p><b>High Range Pressure Difference Switches</b> (typically from 0.1 barg to 25 barg)</p> 
<p><b>High Proof High Range PD Switches</b> (typically from 0.1 barg to 25 barg, Pmax = 200 bar)</p> 	<p><b>Low Range Pressure* Difference Switches</b> (typically from 1.5 mbarg to 350 mbarg)</p> 	<p><b>Vacuum Switches</b> (typically from 760 mm Hg to atmospheric pressure)</p> 	<p><b>Hydraulic Pressure Ranges</b> (typically from 0.5 barg to 400 barg)</p> 

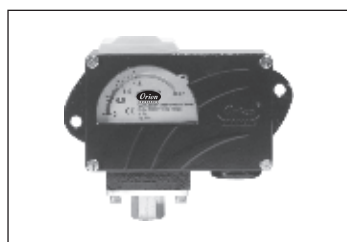
\*The pressure capsule can be modified to take high proof pressures [typically 100 bar for high and low pressure switches, or pressure difference switches (from high pressure side)].

Several accessories like chemical seals, pipe mounting brackets etc can be supplied with these switches to suit the media to be sensed. All of these are not listed, though most popular ones can be found on pages 322 through 328.

Please do get in touch with us for any of your applications, not addressed in this catalogue. We would be glad to offer you a solution.



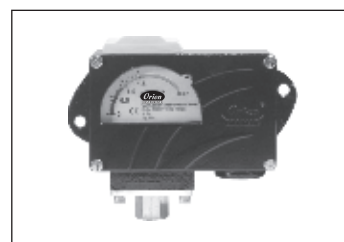
## Product Selection Guide



Page No. 96



Page No. 100



Page No. 104

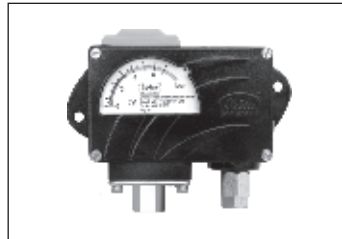
Switch type	High Pressure Ranges	High Proof High Pressure Ranges	High Range Bellows
Repeatability (% FSR)	± 1	± 2	± 2
Range covered	0.067 bar to 25 bar	0.067 bar to 25 bar	0.1 bar to 25 bar
Enclosure Protection	IP 66		
Enclosure Material	Pressure die-cast aluminium		
Sensing element	Diaphragm		Bellows
	Standard	Nylon reinforced neoprene diaphragm protected by Teflon	SS 316
Optional	Teflon, SS316L, Hastelloy C, Monel	SS 316L / Teflon	
Pressure housing	SS 316		SS 316
	Standard	Hastelloy C, Monel	
Optional			
Other Wetted Parts	SS316, Teflon		
Optional wetted parts through chem. seal	SS316, Hastelloy, Inconel Alloy, Monel, Nickel, Platinum, Tantalum, Titanium, Zirconium, Silver, PTFE		
Temp. of working medium	For non-metallic diaphragm: 80°C maximum. For metallic diaphragm: 150°C maximum For higher temperature, please use impulse tubing/chemical seals.		
Switching element	SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.		

Accessories can be supplied with most of the switches. Please consult sales office.

# Product Selection Guide



Page No. 108



Page No. 112



Page No. 116

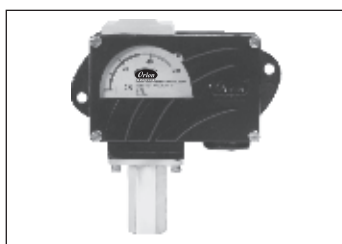
Large Bore High Range		Air Relay		Flanged		Switch type
± 2		± 2		± 2		Repeatability (% FSR)
0.1 bar to 25 bar		0.067 bar to 25 bar		0.1 bar to 200 bar		Range covered
IP66						Enclosure Protection
Pressure die-cast aluminium						Enclosure Material
Diaphragm Nylon reinforced neoprene diaphragm protected by Teflon SS316L, Teflon, Monel		Diaphragm Nylon reinforced neoprene diaphragm protected by Teflon Teflon, SS316L		Diaphragm Nylon reinforced neoprene diaphragm protected by Teflon SS316L, Hastelloy C, Titanium, Monel, Tantalum		Sensing element Standard Optional
SS316 Monel		SS 316		Flange SS316L Hastelloy C, Titanium, Monel, Tantalum		Pressure housing Standard Optional
Teflon, SS316				Teflon		Other Wetted Parts
						Optional wetted parts through chem. seal
For non-metallic diaphragm: 80°C maximum. For metallic diaphragm: 150°C maximum For higher temperature, please use impulse tubing/chemical seals.						Temp. of working medium
SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.						Switching element

WETTED PARTS

## Product Selection Guide



Page No. 120



Page No. 124



Page No. 128

Switch type	Low Pressure Ranges	Hydraulic Ranges	Hydraulic Diaphragm
Repeatability (% FSR)	± 2	± 1	± 2
Range covered	1.5 mbar to 350 mbar	5 bar to 400 bar	0.5 bar to 400 bar
Enclosure Protection	IP 66		
Enclosure Material	Pressure die-cast aluminium		
Sensing element	Diaphragm	Piston	Diaphragm
	Nylon reinforced neoprene diaphragm protected by Teflon	SS	SS316L
Optional	Teflon	SS 316L / Teflon	
Pressure housing	SS 316	SS 316	SS 316
	M.S.		
Other Wetted Parts	M.S., SS, Nitrile, Al., Neoprene	Viton, Teflon, SS	Teflon
Optional wetted parts through chem. seal			
Temp. of working medium	For non-metallic diaphragm: 80°C maximum. For metallic diaphragm: 150°C maximum For higher temperature, please use impulse tubing/chemical seals.		
Switching element	SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.		

Accessories can be supplied with most of the switches. Please consult sales office.

\* Higher ranges available on request

# Product Selection Guide



Page No. 132



Page No. 136



Page No. 140

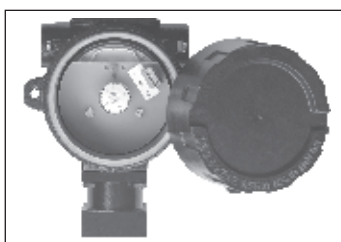
Dual High Range	High Range Pressure Difference Switches	High Proof High Range Pressure Difference Switches	Switch type
± 2	± 1	± 2	Repeatability (% FSR)
0.067 bar to 200 bar	0.1 bar to 3.6 bar*	0.1 bar to 3.6 bar*	Range covered
IP 66			Enclosure Protection
Pressure die-cast aluminium			Enclosure Material
Diaphragm Nylon reinforced neoprene Teflon, SS316L	Diaphragm Nylon reinforced neoprene Teflon	Diaphragm Nylon reinforced neoprene Teflon	Sensing element Standard Optional
SS 316	Aluminium SS 316, Hastelloy C, Monel	SS 316 Hastelloy C, Monel	Pressure housing Standard Optional
Teflon	Teflon, SS316		Other Wetted Parts
			Optional wetted parts through chem. seal
For non-metallic diaphragm: 80°C maximum. For metallic diaphragm: 150°C maximum For higher temperature, please use impulse tubing/chemical seals.			Temp. of working medium
SPDT Snap action switch A8 : General purpose rated at 5A, 250 VAC,	SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.		Switching element

WETTED PARTS

## Product Selection Guide



Page No. 144



Page No. 148



Page No. 150

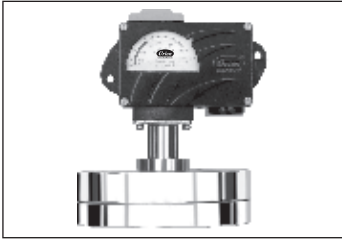
Switch type	High Range DP	Ultra Low Range	Low Range Pressure Difference Switches
Repeatability (% FSR)	± 1	± 1	± 2
Range covered	0.1 bar to 25 bar	20 Pa to 4000 Pa	1.5 mbar to 350 mbar
Enclosure Protection	IP 66		
Enclosure Material	Pressure die-cast aluminium	Gravity die-cast aluminium	Pressure die-cast aluminium
Sensing element Standard Optional	Diaphragm Nylon reinforced neoprene diaphragm protected by Teflon Teflon, SS316L	Diaphragm Silicone	Diaphragm Nylon reinforced neoprene Teflon
Pressure housing Standard Optional	SS 316 Aluminium	Aluminium	M.S. SS 316
Other Wetted Parts	Teflon, SS316		M.S., SS, Nitrile, Al., Neoprene
Optional wetted parts through chem. seal			
Temp. of working medium	For non-metallic diaphragm: 80°C maximum. For metallic diaphragm: 150°C maximum For higher temperature, please use impulse tubing/chemical seals.		
Switching element	SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.	Maximum 1 A(0.4A)/250VAC	SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.

WETTED PARTS

Accessories can be supplied with most of the switches. Please consult sales office.

\* Higher ranges available on request

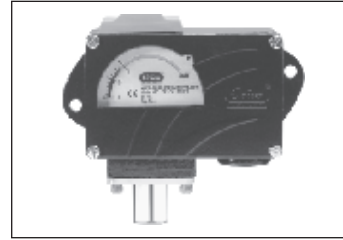
# Product Selection Guide



Page No. 154



Page No. 158



Page No. 162

Low ΔP High Proof Pressure Difference Switches	Vacuum Switches	High Range Compound Switches	Switch type
± 2	± 1	± 2	Repeatability (% FSR)
5 mbar to 350 mbar	760 mmHg to 100 mmHg	-1 bar to 3.6 bar	Range covered
IP 66			Enclosure Protection
Pressure die-cast aluminium			Enclosure Material
Diaphragm Nylon reinforced neoprene Teflon			Sensing element Standard Optional
SS 316	Aluminium SS 316	SS 316	Pressure housing Standard Optional
Teflon, SS	Teflon, SS316		Other Wetted Parts
			Optional wetted parts through chem. seal
For non-metallic diaphragm: 80°C maximum. For metallic diaphragm: 150°C maximum For higher temperature, please use impulse tubing/chemical seals.			Temp. of working medium
SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.			Switching element

WETTED PARTS

# Product Selection Guide



Page No. 166



Page No. 170

Switch type	Low Range Compound Switches	Temperature Switches
Repeatability (% FSR)	± 2	± 1
Range covered	-150 mm wc to 250 mm wc	25 °C to 215 °C
Enclosure Protection	IP 66	
Enclosure Material	Pressure die-cast aluminium	
Sensing element	Diaphragm Nylon reinforced neoprene diaphragm protected by Teflon	Bulb/Probe Brass
	Optional Teflon	
Pressure housing	SS 316	
Standard		
Optional		
Other Wetted Parts	SS, Nitrile, Al., M.S.	
Optional wetted parts through chem. seal		
Temp. of working medium	For non-metallic diaphragm: 80°C maximum. For metallic diaphragm: 150°C maximum For higher temperature, please use impulse tubing/chemical seals.	
Switching element	SPDT Snap action switch A1 : General purpose rated at 15A, 250 VAC, 0.2 A, 250 VDC resistive. For other switching elements please contact sales office.	

WETTED PARTS

Accessories can be supplied with most of the switches. Please consult sales office.

\* Higher ranges available on request



# FP ULTRA LOW RANGE PRESSURE DIFFERENCE SWITCHES

## Ultra Low Range Pressure Difference Switches with User Adjustable Knob



### Salient Features

#### Easy to See, Easy to Use!

Set Point easily user adjustable with visible scale in Pascal. (no need of pressure gauge)

#### Enclosure

Robust Gravity Die Cast Aluminum

#### Long Lasting!

10<sup>6</sup> switching operations

#### Trusted all over!

Tested and Proven

#### Technical Specifications

**Media:** Air, non-flammable gases and non-aggressive gases

**Housing Material:** IP 66 Gravity Die Cast Aluminium

**Protection Category:** IP66 with cover.

**Ranges:** 20 Pa to 4000 Pa

**Maximum Working Pressure:** 0.1 bar

**Electrical Rating:** Maximum 1.0A (.4 A) / 250VAC

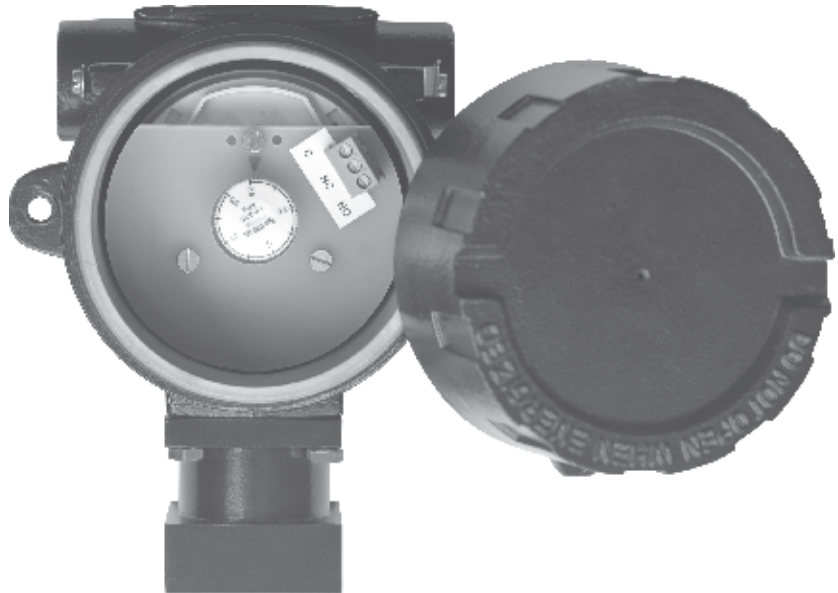
**Electrical Connection:** Standard Terminal Strip provided

**Cable Entry:** ½" NPT

**High Pressure and Low Pressure Port:** 1/8" BSP(F)

**Media Temperature:** 80°C max.

**Ambient Temperature:** -5°C to 60°C



Range Selection Table

Range Code (Orion)	Adjustment Range for Upper Switching Pressure Pa (mm wg)	Switching Differential Set to Pa (mm wg)
FP80	20-200 (2.039-20.395)	10 (1.020)
FP81	40 - 100 (4.079 - 10.197)	20 (2.039)
FP82	40 - 200 (4.0479 - 20.395)	20 (2.039)
FP83	50 - 500 (5.099 - 50.987)	20 (2.039)
FP85	200 - 1000 (20.395 - 101.974)	100 (10.197)
FP86	500 - 2500 (50.987 - 254.935)	150 (15.296)
FP87	1000 - 4000 (101.974 - 407.896)	250 (25.494)

### How to order FP series Low Range Pressure Difference Switches

Please specify the Range Code e.g.. FP82 or FP85 as per range selection table.

## INSTALLATION AND OPERATING INSTRUCTIONS

### Principle of Operation

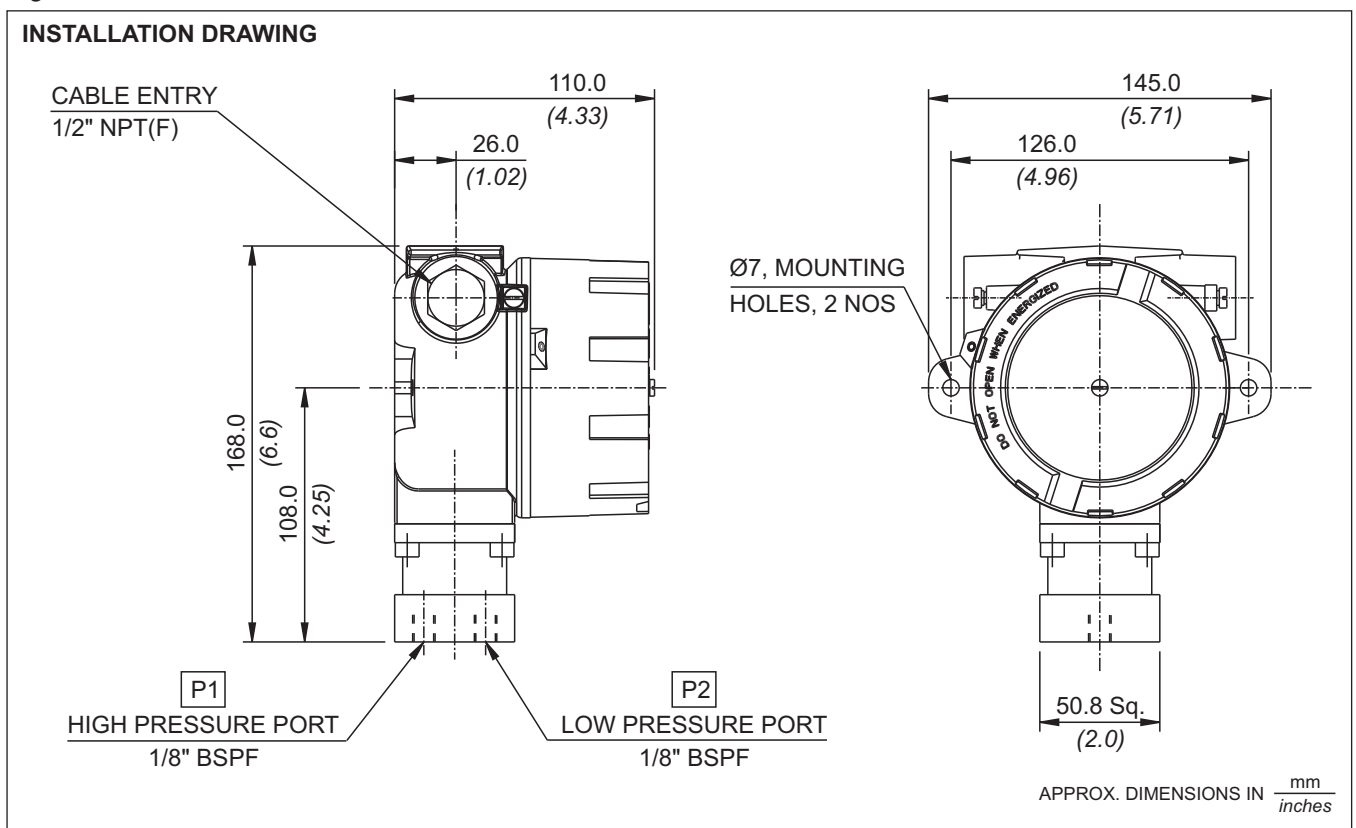
When the effective force generated by the pressure difference in the lower and upper chamber of the pressure capsule exceeds/falls beyond the balancing spring forces, an electrical element is actuated.

### Mounting

The detailed mounting dimensions are shown in Fig. 1.

- 1) Pressure Switches can be mounted on a plate/inside a panel using  $\varnothing 7$  mounting holes provided.
- 2) For any other process connection, please use an adaptor.

Fig. 1



P1 = High Pressure Port  
P2 = Low Pressure Port

- Note :
1. Use two screws only, for mounting
  2. Remove transport protection from P1 and P2

### CAUTION :

Install pressure switch vertically. Installing it at an angle more than  $30^\circ$  to vertical may result in malfunction.

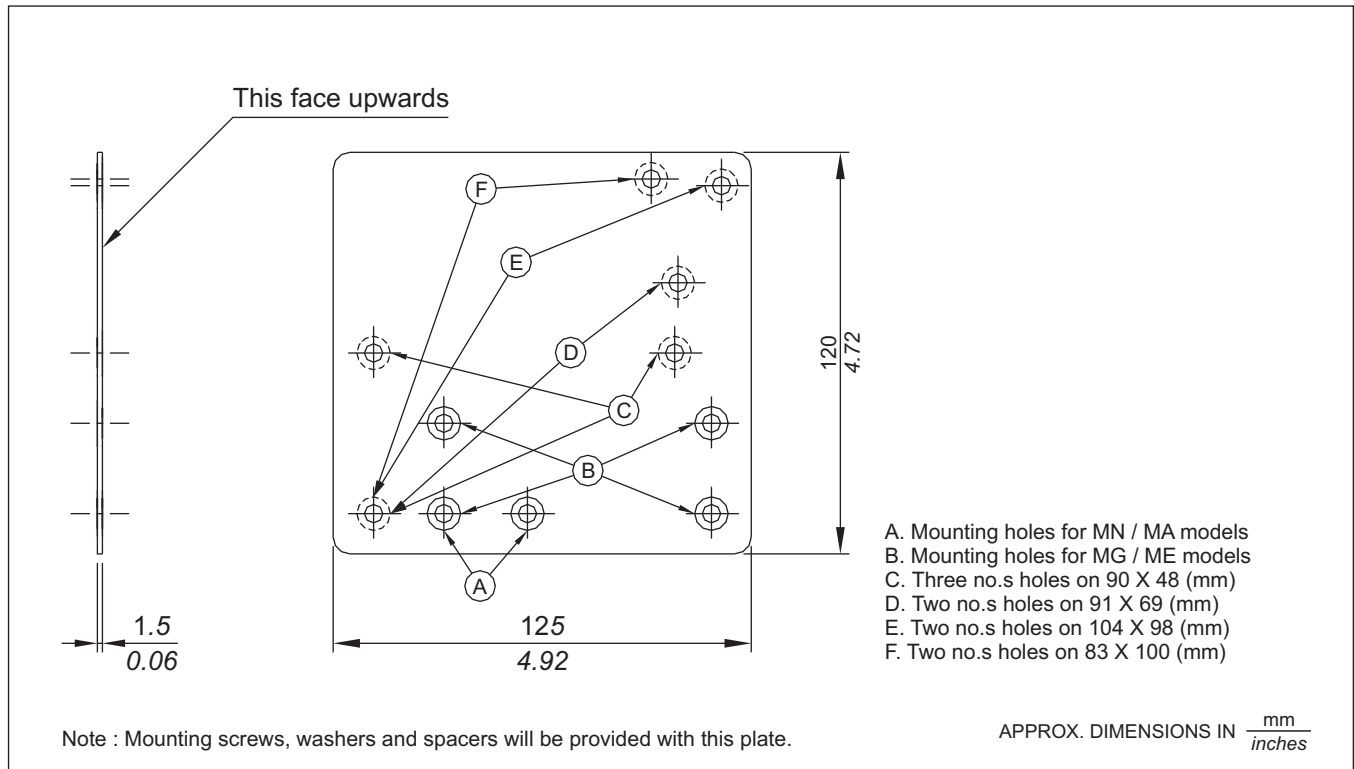
# ACCESSORIES

Following accessories can be provided with pressure switches to make it suitable for any particular application.

- |  |   |
|--|---|
| Flameproof enclosures                          | syphons   |
| Chemical seals (or diaphragm seals)            | manifolds   |
| adaptors to suit customer's process connection | pipe mounting brackets                                      |
| switch savers                                  | mounting plates to suit other makes on the market           |
| impulse tubes                                  | snubbers  |
|  | tag plates (to display tag no. and identify the instrument) |

Installation drawings of most common and fast moving accessories are given. The wetted parts, wherever applicable, are not specified due to the extreme variety available.

## MOUNTING PLATE

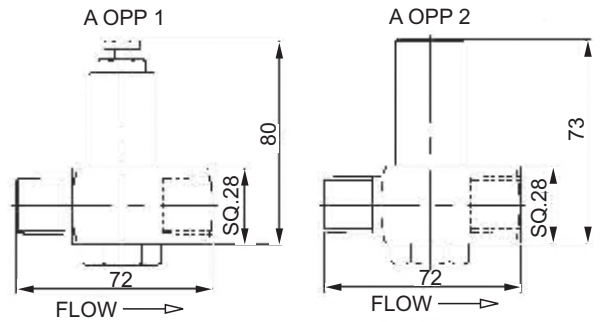


# ACCESSORIES

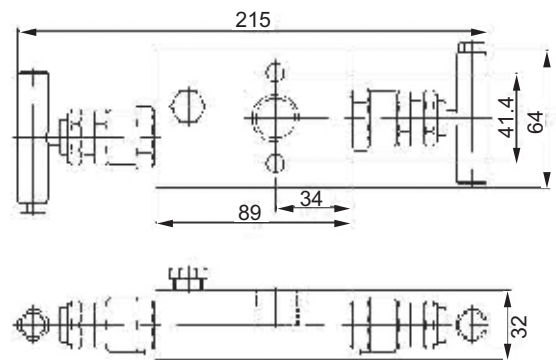
## Gauge Saver



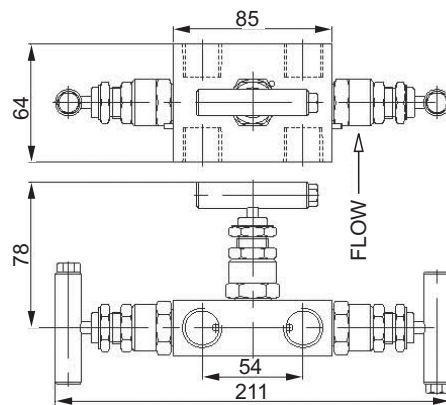
A OPP 1 = Set Pressure: 0.6 to 2.0 bar  
 A OPP 2 = Set Pressure: 2.5 to 200 bar



## 2 Valve Manifold



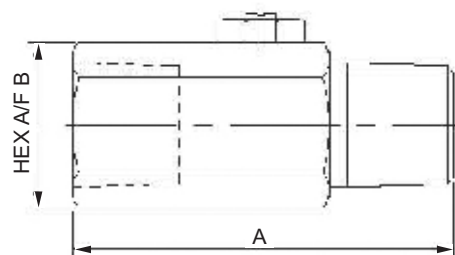
## 3 Valve Manifold



## Snubber



SIZE	A	B
1/4"NPT	55	25
3/8"NPT	55	25
1/2"NPT	63	28
G1/2"	63	28



# ACCESSORIES

## CHEMICAL SEALS (DIAPHRAGM SEALS):

### General description:

Diaphragm seals are partitions used with pressure switches which prevent the measured medium from entering the pressure capsule of the pressure switch. Diaphragm seals solve many problems encountered in sensing, which are otherwise impossible to solve with only pressure switches. Some of the examples are:

- protection of pressure switch from aggressive, highly viscous solidifying or crystallizing measured media
- protection from high measured medium temperatures or fluctuations in temperature
- protection from vibrations by coupling via capillaries
- dead zone free sensing arrangements for particular hygienic applications
- use of special materials or surface coatings of the wetted parts for special applications.

**CAUTION:** Pressure switch and diaphragm seal are always a closed system and should not be separated by unauthorised persons.

When the pressure switch is to be kept away from undesirable temperatures or vibrations, a capillary can be used to connect the pressure switch and the diaphragm seal. Capillaries also have a throttling effect which is often desirable in pulsating process pressures. During setpoint adjustment, the weight of the liquid column between the diaphragm seal and the pressure switch needs to be taken into consideration, if they are mounted at different elevations.

Depending on the application, a variety of media with different properties are used as transmission liquids. For most of the general applications, silicon oil can be used. For food industries, a transmission liquid compatible with the process needs to be used.

A variety of chemical seals can be supplied with pressure switches and only the most commonly used arrangements / assemblies are shown here.

In most of the cases, the common wetted parts and diaphragms are of SS316. Alternate wetted materials that can be provided are:

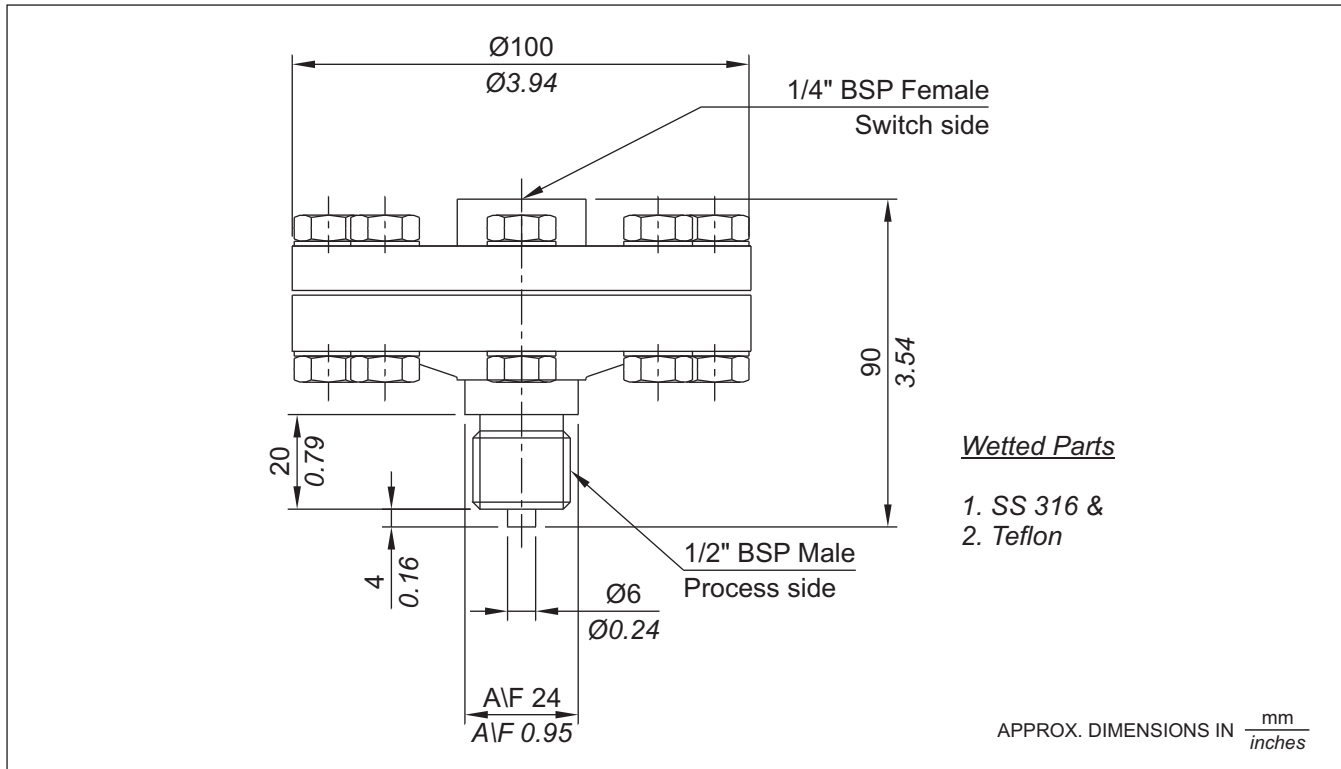
- HASTELLOY B2
- HASTELLOY C4
- HASTELLOY C22
- HASTELLOY C276
- INCONEL ALLOY 600
- MONELALLOY 400
- MONELALLOY K500
- NICKEL
- PLATINUM
- TANTALUM
- TITANIUM
- ZIRCONIUM
- SILVER
- PTFE

The on - off differentials of pressure switches fitted with chemical seals are likely to be higher than those mentioned in the catalogue. There is also a possibility of time lag (for sensing) being introduced, depending on the length of the tubing between the pressure switch and the seal.

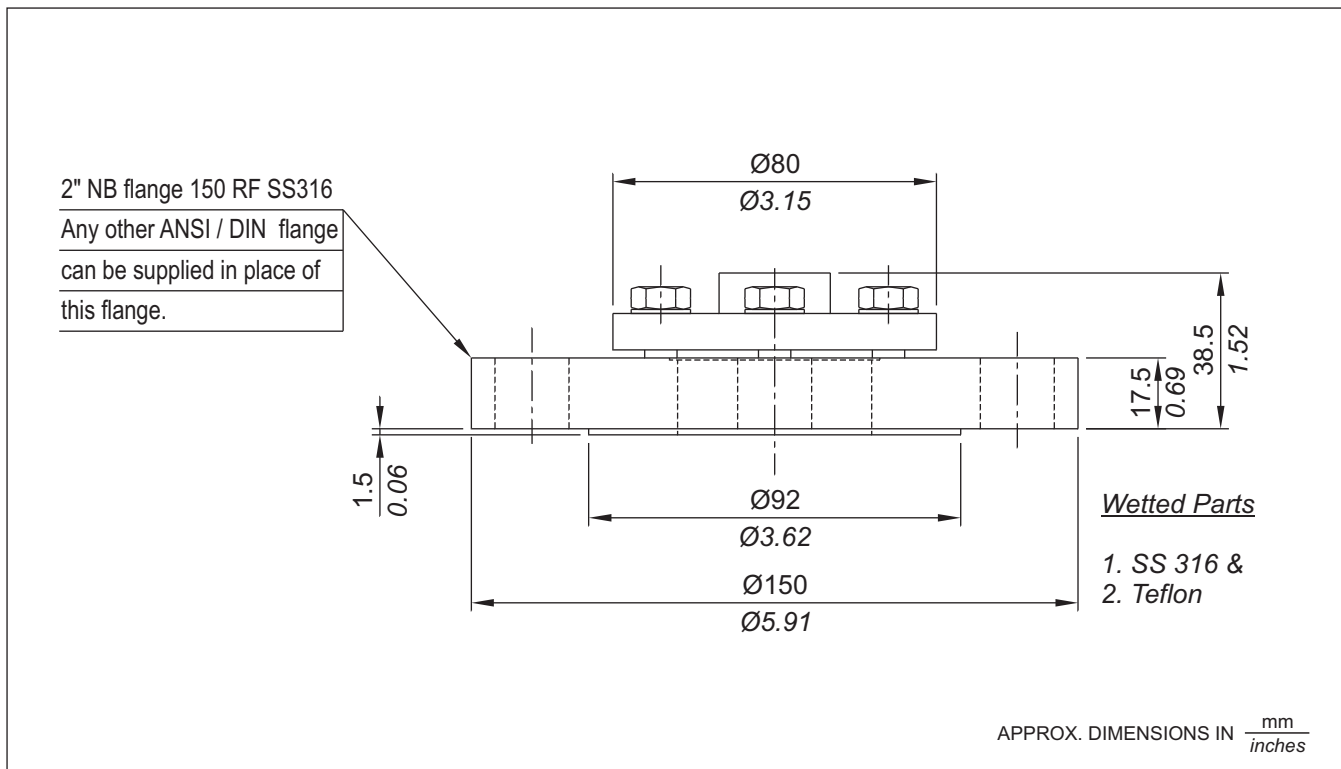
While ordering, customer's are requested to specify all the process parameters including ambient conditions, operating conditions, the process to be sensed and response times allowable, temperature of the seal under sensing conditions and temperature outside the measuring / sensing sequences (e.g as in rinsing sequences) so that a proper sealing system can be suggested.

# ACCESSORIES

## STANDARD CHEMICAL SEAL SUITABLE FOR THREADED CONNECTION : (Type A)

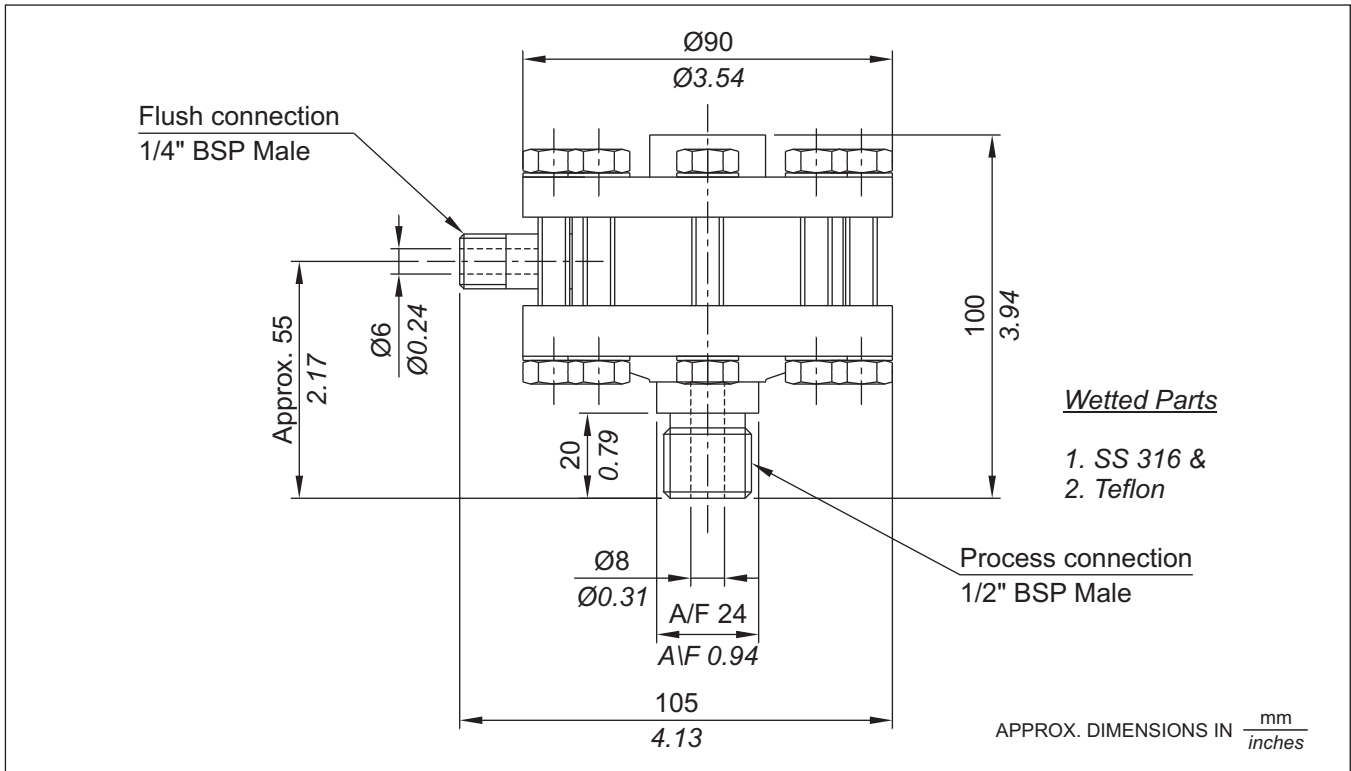


## CHEMICAL SEAL SUITABLE FOR VARIABLE FLANGED CONNECTION : (Type B)

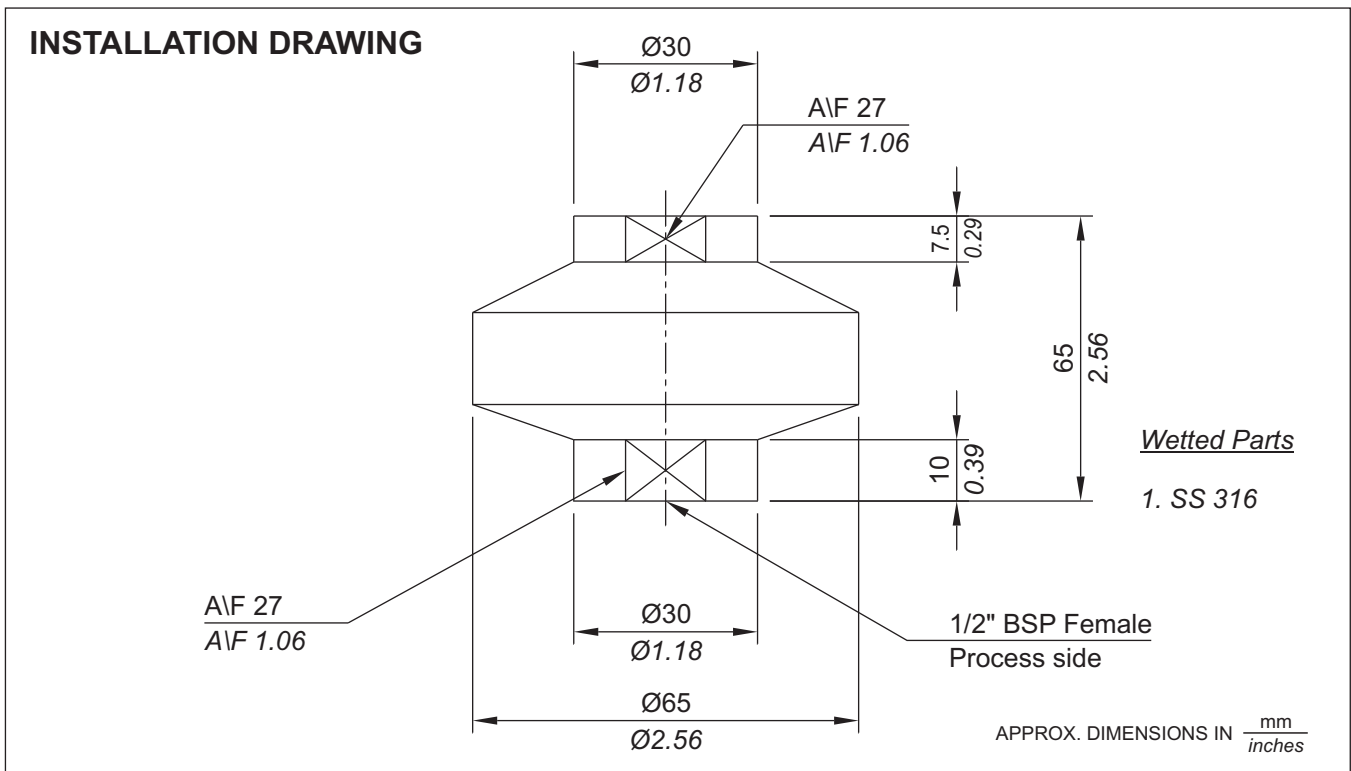


# ACCESSORIES

## FLUSH TYPE CHEMICAL SEAL (Type C)



## FULL WELDED CHEMICAL SEAL (Type D)





## GENERAL SPECIFICATIONS AND APPLICATION NOTES

1. All the pressure switches contained in this catalogue are gauge pressure switches.
2. Pressure switches are switching instruments and not measuring ones. As such, the word "calibration" is used for the markings made on the scale to indicate the approximate setpoint of the pressure switch. No "calibration certificate" for this indication can be given in the proper sense of the word. However, the pressure switches can be supplied preset at user specified setpoints, provided the setpoints are indicated during the ordering stage itself.
3. Process temperature : can be 80 deg. C maximum. A pressure switch being a dead end, is not subjected to continuous process temperature(as in case of flow). As such, a proper length of impulse tubing of proper material (or chemical seals with adequate tubing) will substantially bring down the temperature, well within the specified limits. Normal pressure switches (without any modifications) have been used with working media having a temperature of upto 350 deg. C, only by employing an additional impulse tube.
4. Ambient temperature: can be from -10 deg. C to 60 deg. C for most of the standard pressure switches. Care should be taken that no icing occurs inside the enclosure where the atmospheres are humid, when pressure switches are used in subzero ambient temperature areas. Pressure switches for use in wider ambient temperatures can be developed should your application fall in such areas. If the process is likely to freeze / crystallize / solidify within this ambient range, chemical seals should be used alongwith the pressure switches.
5. All the pressure switches are tested on kerosene / air prior to despatch. For applications involving food grade material / oxygen service or processes not compatible with kerosene, such a note should be specifically made while ordering, so that pressure switches are tested accordingly.
6. All data published is under standard test conditions. Following conditions generally apply for Laboratory Evaluation tests:

Temperature	: Ambient room temperature (21 °C)
Humidity	: Ambient (50%)
Proof pressure	: 1.5 times maximum working pressure
Cycling rate	: 30 cycles/minute
Pressure rise	: compatible with above cycling rate (maximum)
Life in no. of cycles	: 100,000 minimum

The life and characteristics of pressure switches can be affected by temperature, humidity, airborne contamination, vibration and frequency of operation of the pressure switches. For specific switch selection, customers are requested to evaluate switch performance under actual application conditions or by simulating all the extreme application conditions and requirements. Laboratory Evaluation test data can never substitute customer's own product evaluation.

The life of the pressure switches can be increased by incorporating changes in design or by substituting certain components. Customers are requested to contact our sales office for any such specific requirements.

## DEFINITIONS & TERMINOLOGY FOR PRESSURE ACTUATED SWITCHES

**Pressure Switch:-** A pressure switch is an instrument that automatically senses a change in pressure and opens or closes an electrical switching element when a pre-determined pressure point is reached.

**Pressure sensing element:-** A pressure sensing element is the portion of the pressure switch that transmits motion due to change in pressure.

**Electrical switching element:-** The electrical switching element in a pressure switch opens or closes an electrical circuit in response to the actuating force it receives from the pressure sensing element. Orion pressure switches are fitted with single pole double throw (SPDT) snap action switch(es) as electrical switching element (s) for maximum reliability.

**Normally open switching element:-** No current can flow through the switching element until the switch is actuated.

**Normally closed switching element:-** Current flows through the switching element until the switch is actuated.

**Set Point:-** The set point is expressed in terms of exact pressure at which the snap-action switch is actuated to either open or close the electrical circuit (depending on how the switch is wired).

**Differential (Dead band, Hysteresis):-** Differential is the difference between the actuation point and the deactuation point, e.g. if a pressure switch is set to operate at 5 bar on increasing pressure, the switch will close when the pressure rises to that point. As the pressure drops to, say, 4.8 bar the switch may open (this is the deactuation point). The differential of this switch is then 0.2 bar, the difference between the set point of 5 bar and deactuation point of 4.8 bar. Differential is sometimes referred to as "deadband" or "hysteresis".

**Set Point in relation to increasing pressure & decreasing pressure:-** A pressure switch may be set to actuate at any desired point on rising pressure or falling pressure. The former is described as "set to actuate on increasing (or rising) pressure" & the latter as "set to actuate on decreasing (or falling) pressure". The preferred actuation must be specified clearly on orders for pressure switches that are to be factory set.

**Range :-** The span within which the set point of a pressure-actuated switch may be adjusted.

**Proof Pressure :-** Proof pressure is the highest pressure to which a switch may be subjected without permanent damage.

**Maximum working pressure (MWP) :-** The nominal pressure level that a system will operate at, including workload.

**Differential pressure :-** The difference between a reference pressure and a variable pressure.

**Wetted parts :-** The parts which come in contact with the working medium.

# HOW TO SELECT A PRESSURE SWITCH FOR YOUR APPLICATION

Following are the general guidelines which should help you arrive at a proper selection of a pressure switch for your application.

## Step 1.

**Service life of the switch.** Expected service life is the first consideration to be made in selecting a pressure switch, regardless of sensitivity or pressure desired. A second consideration in choosing a pressure switch is the speed of cycling, regardless of the service life. A sensing element made of metal sheets is likely to fatigue at cycling speeds above 20 cycles per minute and is not recommended for service life of more than 1 million cycles. Orion and Parus pressure switches use nylon reinforced rubber or piston as a sensing element and have been tested at a cycling frequency of 30 cycles / minute for more than a million cycles. The working medium to be controlled must be considered and to simplify selection, wetted parts are indicated on the catalogue pages.

## Step 2.

**Proof pressure** - Choice of type of pressure switch must also be governed by the highest pressure to which it will ever be subjected. The highest pressure in the system including surges, should not be more than the proof pressure of the switch. It must be remembered that, though there are surges in the system, a pressure gauge may register a constant reading, the surges being dampened out by the orifice in the gauge.

## Step 3.

**Function of the switch.** Three types of Orion pressure switches, based on function, are described below, a) Single setting pressure switches : They sense a single pressure source and open or close a single electrical circuit by means of a snap action electrical switch. b) Pressure difference switches : They sense a change in relationship between two pressures and open or close a single electrical circuit by means of a snap action electrical switch. c) Adjustable differential pressure switches: They sense two pressure limits, within a desired adjustable range, from a single pressure source and open or close a single electrical circuit by means of a snap action electrical switch.

## Step 4.

**Selection of adjustable range.** The range should be selected such that the setpoint lies as close as possible to the middle of the total adjustable range. This will ensure the most favourable combination of accuracy and life.

## Step 5.

**Working medium.** The working medium should be compatible with the wetted parts. For easier selection, the wetted parts are given in the catalogue pages. The maximum temperature of the working medium is also important. A pressure switch, being a dead end, is not subjected to continuous temperature. If the temperature of the working medium exceeds 80 deg. C, an impulse tubing of appropriate length should be used between the process connection and pressure port of the switch. Where the working medium is likely to freeze at the sensing element, a diaphragm seal (chemical seal) with appropriate wetted parts should be used. In case of excessive temperature or mounting the pressure switch remotely, pressure switches can also be supplied with remote seals. The filling medium has to be compatible with the working medium, and needs to be specified while ordering. (Specially in case of food related industries / processes)

## Step 6.

**Environment.** The environment in which the pressure switch will operate is very important. Orion pressure switches can be supplied in weatherproof enclosures for outdoor service. For use of pressure switches in hazardous areas Orion pressure switches can be supplied in flameproof enclosures.