



DIFFERENTIAL PRESSURE SWITCHES

FLAMEPROOF + WEATHERPROOF

GR SERIES

- **GOOD REPEATABILITY**
- **TAMPERPROOF SET POINT ADJUSTER WITH LOCKING DEVICE**
- **OVERTRAVEL STOP**
- **RUGGED DESIGN**



Model 301 in GR Flameproof Enclosure

Series 300 Pressure Difference Switches in Style GR Flameproof cum Weatherproof housing is designed and made to the latest standards to comply with current international philosophy of process instrumentation. The series is compact, easy to install and features high sensitivity over the fully adjustable range together with

very high static pressure capability. The sensing element is mounted external to the switch mechanisms which are of stainless steel for arduous atmospheres and high humidity. Enclosures, sensing element and switching modes can be combined to offer the variety needed to suit the different applications.

GENERAL SPECIFICATIONS

| | | | |
|--------------------------|---|-------------------------------|--|
| Enclosure | Aluminium Pressure Die cast, weatherproof to IP:66 & flameproof to Gr.IIA, IIB or IIC (<i>Note 1</i>) | Switching differential | Fixed, non-adjustable, refer table. |
| Ranges | Several std. ranges between 0~5 mbar to 1.5~15 bar | Max. Working Pressure | Refer table |
| Sensor | 316L SS Diaphragm for Models 301 / 304 Nitrile Diaphragm for Model 306 | Ambient Temperature | (-)25°C to (+)60°C |
| Wetted parts | 304SS / 316SS for Models 301/304 Aluminium for Model 306 304 SS / 316 SS optional for ranges B6D & C6D in Model 306 | Max. Process Temp. | 110°C. For higher temperatures use longer impulse lines. (<i>Note 13</i>) Ask for piping nomogram #441184-4 |
| Repeatability | ±1% FSR (<i>Note 3</i>) | Connection | |
| Switching Element | Instrument quality SPDT (Form C) microswitch (<i>Notes 9 & 10</i>) | Process | 1/4" NPTF Std. Others through Adaptor |
| | | Electrical | 3/4" ET(F) Std. and 1/2" NPTF optional. |
| | | Mounting | Back panel / wall / Field Vertical position only |
| | | Conformity | Generally to BS 6134:1991 |

ORDERING MATRIX

ENCLOSURE

Aluminium die cast flameproof cum weatherproof. CIMFR approved to Gr.IIA, IIB & IIC of IS:2148:2004 for flameproofness and IP:66 for weatherproofness. _____ **GR**

MODEL

This is the basic differential pressure switch having a low non-adjustable switching differential actuated by a stainless steel diaphragm. _____ **301**

Same as 301 but suitable for higher static pressures upto 250 bar. _____ **304**

Elastomer diaphragm actuated non-adjustable differential model for low ranges with limited MWP _____ **306**

MATERIALS OF WETTED PARTS

Models 301 / 304

316L SS diaphragm with 304 SS pressure chambers. _____ **04**

316L SS diaphragm with 316 SS pressure chambers. _____ **02**

316L SS diaphragm with 316 SS pressure chambers. Conforming to NACE Std. MR-01-75 – _____ **ON**

Nitrile diaphragm with 304 SS pressure chambers for applications with pressure reversal. _____ **B4**

Nitrile diaphragm with 316 SS pressure chambers for applications with pressure reversal. _____ **B2**

Model 306

Nitrile diaphragm with Aluminium wetted parts — _____ **B5**

Nitrile diaphragm with 304 SS pressure chambers. (Ranges B6D & C6D only) _____ **B4**

Nitrile diaphragm with 316 SS pressure chambers. (Ranges B6D & C6D only) _____ **B2**

RANGE CODE

Refer Table 1 _____

SWITCH CODE AND RATING

Refer Table 2 _____

ELECTRICAL ENTRY CODE

Refer Table 3 _____

DIAPHRAGM CHEMICAL SEALS

Diaphragm chemical seals can be provided as optional extra with capillary and threaded / flanged connection, duly evacuated and filled with suitable filling liquid. This device permits the use of differential pressure switches with viscous / aggressive fluids and permits higher process temperatures. Switching delay will happen unless the pressure change is very gradual.

While ordering it is important to specify ambient and process temperatures, setpoint, maximum process pressure, relative elevation between connection and switch head, nature of process medium and whether reactive to common filling liquids should the diaphragm seal leak into the process.

Table 1 : RANGE CODE & AVAILABILITY

| RANGE CODE | RANGE | MWP (bar) | | | |
|------------|----------------|-----------|-----|-----|-----|
| | | 301 | 304 | 306 | |
| | | | | AL | SS |
| B6D | 0 to 5 mbar | --- | --- | 1 | 15 |
| C6D | 3 to 25 mbar | 110 | 250 | 1 | 15 |
| E1D | 5 to 120 mbar | 110 | 250 | 15 | --- |
| E8D | 50 to 350 mbar | 110 | 250 | 15 | --- |
| G5B | 0.1 to 1.5 bar | 110 | 250 | 15 | --- |
| J0B | 0.2 to 4 bar | 110 | 250 | 15 | --- |
| B7K | 0.7 to 7 bar | 110 | 250 | --- | --- |
| P8B | 1.5 to 15 bar | 110 | 250 | --- | --- |

Table 2 : SWITCH CODE RATING & AVAILABILITY

| SWITCH CODE (SPDT) | AC RATING | DC RATING IN AMPS | | | | | | SPDT | DPDT |
|--------------------|----------------|-------------------|------|------|-----------|------|------|------|------|
| | | RESISTIVE | | | INDUCTIVE | | | | |
| | | 220V | 110V | 24V | 220V | 110V | 24V | | |
| D | 15A 250 / 125V | 0.2 | 0.4 | 2.0 | 0.02 | 0.03 | 1.0 | ✓ | ✓ |
| 3 | 15A 250 / 125V | N.R. | N.R. | N.R. | N.R. | N.R. | N.R. | ✓ | ✓ |
| 4 | 1A 125V | N.A. | 0.5 | 0.5 | N.A. | 0.25 | 0.25 | ✓ | ✓ |
| 5 | 5A 250 / 125V | 0.2 | 0.4 | 4.0 | 0.2 | 0.4 | 3.0 | ✓ | ✓ |
| 6 | 0.1A 125V | N.R. | N.R. | 0.1 | N.R. | N.R. | N.A. | ✓ | ✓ |
| 7 | N.R. | N.R. | N.R. | 1.0 | N.R. | N.R. | 0.5 | ✓ | ✓ |
| 8 | 5A 250 / 125V | N.A. | N.A. | 5.0 | N.A. | N.A. | 3.0 | ✓ | ✓ |
| J | 5A 250V | N.A. | N.A. | 5.0 | N.A. | N.A. | 3.0 | ✓ | ✓ |
| K | 1A 125V | N.A. | N.A. | 1.0 | N.A. | N.A. | 0.5 | ✓ | ✓ |
| S | 5A 250 / 125V | 0.25 | 0.5 | 3.0 | 0.1 | 0.2 | 2.0 | ✓ | ✓ |

Codes 3 & D – For General purpose usages. Code 8 – Environmentally sealed switch with Silver alloy contact.
 Code 4 – With Gold alloy contact. Code J – Hermetically sealed, inert gas filled with Silver alloy contact.
 Code 5 – For General purpose with good DC rating. Code K – Hermetically sealed, inert gas filled with Gold plated contact.
 Code 6 – With Gold alloy contact (Low Rating) Code S – IP:67 sealed microswitch with silver – Nickel contact.
 Code 7 – Environmentally sealed switch with Gold plated contact.

For DPDT, change switch code '3' to '33', '4' to '44', etc., while ordering

N.A. – Not Available N.R. – Not Recommended

Table 3 : ELECTRICAL ENTRY CODE

| Size * | Single Entry | Dual Entry |
|----------------|--------------|------------|
| 3/4" ETF | A | M |
| 1/2" NPTF | B | N |
| M20 x 1.5 F ** | D | P |

* Cable gland available on request.
 ** Cable Entry is optional. Available on request

NOTES

- Gr.IIA & IIB of IS:2148 is equivalent to NEC CL.1, Gr.C & D. Gr.IIC of IS:2148 is equivalent to NEC CL.1, DIV.1, Gr.A & B.
- Enclosure is weatherproof only if cover 'O' ring is retained in position and flameproof only if proper FLP cable gland is used. It is recommended to procure cable glands along with instruments to avoid neglect of it while installation.
- Accuracy & Repeatability are not different for all blind pressure switches. A shift of $\pm 2\%$ may be observed in setpoint when pressure falls from full static pressure. Settings will also shift with varying temperature.
- The instrument is calibrated in the mounting position as depicted in the drawing. Mounting in any other direction will cause a minor range shift, especially in low and compound ranges. Ranges above 1 bar will not experience this shift.
- A differential pressure switch is a switching device and not a measuring instrument. For this reason, Test Certificates will not contain individual ON-OFF switching values at different scale readings.
- Select working range of the instrument such that the set value lies in the mid 35% of the range i.e., between 35% and 70% of range span.
- Switching differentials furnished are nominal values under test conditions at mid-scale and will vary with range settings and operating conditions.
- On and off settings should not exceed the upper or lower range value.
- DPDT action is achieved by two SPDT switches synchronised to practical limits i.e., $\pm 2\%$ of FSR. Deadband for DPDT contacts are higher than that of SPDT as the force required to actuate the contacts are more. Please refer respective range table for exact values.
- Contact life of microswitches are 5×10^5 switching cycles for nominal load. To quench DC sparks, use diode in parallel with inductance, ensuring polarity. A 'R-C' network is also recommended with 'R' value in Ohms equal to coil resistance and 'C' value in micro Farads equal to holding current in Amps.
- Model 301 can be supplied with Nitrile diaphragm for applications where pressure reversal is envisaged.
- Ambient temperature range: All models are suitable for operating within a range of ambient temperature from (-) 10°C to (+) 60°C provided the process does not freeze within this range. Below 0°C , precautions should be taken in humid atmospheres to prevent frost formation inside the instrument from jamming the mechanism. Occasional excursions beyond this range are possible but accuracy might be impaired. The microswitch is the limiting factor which should never exceed the limits (-) 50°C to (+) 80°C .
- Fluid Temperature: A differential pressure switch when connected to the process is not subjected to through flow and therefore not fully exposed to the fluid temperature. Use of adequate length of impulse piping will greatly reduce excessive heating of the sensing element. For e.g., connection of 7.5 cm of 12 mm dia impulse piping will reduce water temperature of 100°C to 65°C at an ambient temperature of 50°C . Ask factory for temperature nomogram for different temperatures.
- Ensure that impulse pipework applies no stress on sensing element housing and use spanners to hold pressure port / housing when connections are made.
- Custom built instruments are available for special service requirements under Special Engineering Category.
- Accuracy figures are exclusive of test equipment tolerance on the claimed values.**
- All performance data are guaranteed to $\pm 5\%$.**

SWITCHING DIFFERENTIAL DATA

| Range Code | Range | On-off Differential in mbar | | | | | | | | | |
|------------|----------------|-----------------------------|------|------|-----------|-------|-----------|-----|-----|-----------|-------|
| | | Models 301 / 304 | | | | | Model 306 | | | | |
| | | D / 3 / 6 | 4 | 5 | 7 / 8 / S | J / K | D / 3 / 6 | 4 | 5 | 7 / 8 / S | J / K |
| B6D | 0 to 5 mbar | --- | --- | --- | --- | --- | 0.7 | 0.7 | 2.0 | --- | 1.4 |
| C6D | 3 to 25 mbar | 10 | 12 | 10 | 20 | 15 | 1.0 | * | * | --- | * |
| E1D | 5 to 120 mbar | 8 | 10 | 20 | 30 | 20 | 16 | 16 | 15 | --- | 35 |
| E8D | 50 to 350 mbar | 15 | 20 | 30 | 60 | 40 | 25 | 25 | 35 | 85 | 60 |
| G5B | 0.1 to 1.5 bar | 80 | 90 | 115 | 175 | 200 | 100 | 100 | 130 | 375 | 190 |
| J0B | 0.2 to 4 bar | 250 | 300 | 500 | 600 | 750 | 375 | 400 | 700 | 1000 | 1000 |
| B7K | 0.7 to 7 bar | 375 | 450 | 650 | --- | --- | --- | --- | --- | --- | --- |
| P8B | 1.5 to 15 bar | 1100 | 1300 | 1600 | --- | --- | --- | --- | --- | --- | --- |

* For on-off differential values please consult factory

On-off differential values for DPDT switching, DPDT (2xSPDT)

- Apply a multiplication factor of **1.3** to values in table.
- For range codes B7K & P8B in models 301, 304 DPDT switching using switch codes D, 3, 6 & 4 only is possible.
- For B7K & P8B ranges 7, 8, J, K, S, 77, 88, JJ, SS & KK switch codes are not possible.
- **Special Engineering** : In model 301 following higher DP ranges are offered with 316L SS bellows.
 - B1K range 10 to 40 bar, maximum out of balance pressure 60 bar.
 - B2K range 10 to 60 bar, maximum out of balance pressure 80 bar.
- **Switching differentials for Instruments with chemical seal** : Apply a Multiplication factor of 1.3 for SPDT and 1.5 for DPDT to values given in table.

Chemical Seals are available in Model 301 for range codes G5B, J0B, B7K & P8B only . Chemical Seals are not available in Model 306.

OPTIONS / ACCESSORIES

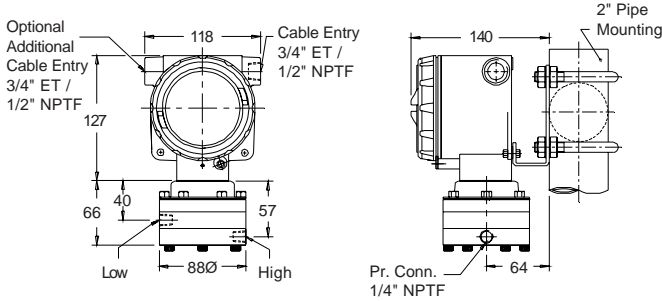
- Damping coil for minimising process pulsations — increases instrument's life many times.
- Breather / Drain for flameproof enclosures
- Snubbers
- Brass / SS double compression cable glands to suit cable OD of 1/2", 15 mm & 17 mm.
- Degreasing for Oxygen service & special parts for Ammonia service.



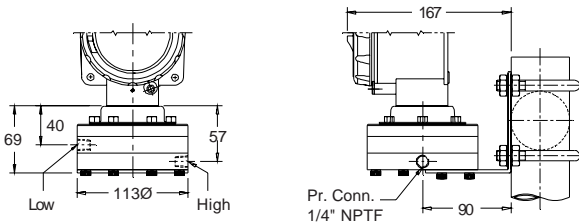
MOUNTING DIMENSIONS

Model GR 301

Ranges : E1D, E8D, G5B, J0B, B7K, P8B

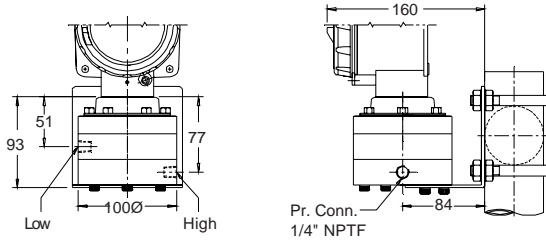


Range : C6D

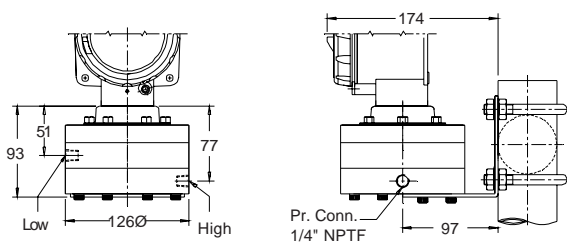


Model GR 304

Ranges : G5B, J0B, B7K, P8B

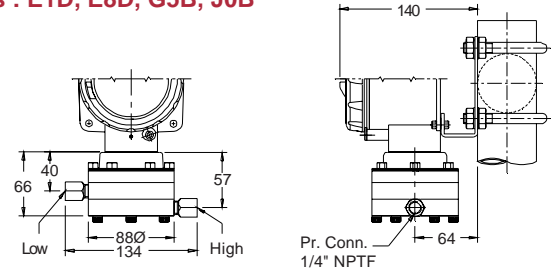


Ranges : E8D, E1D, C6D

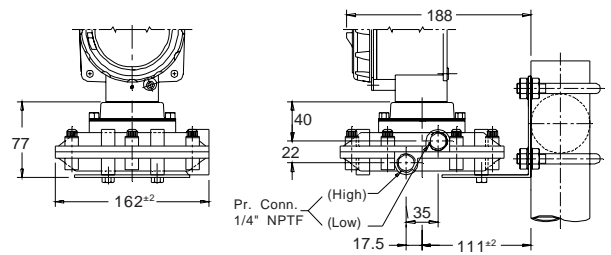


Model GR 306

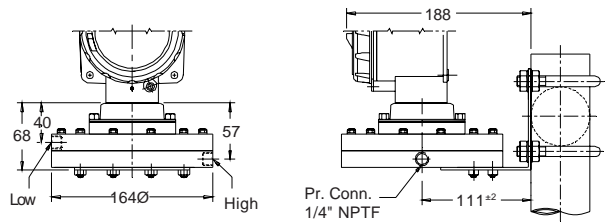
Ranges : E1D, E8D, G5B, J0B



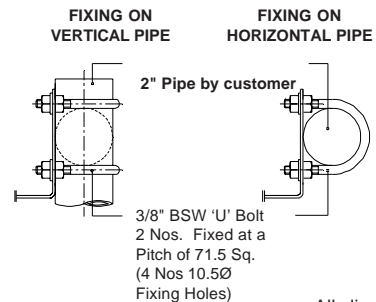
Ranges : B6D, C6D – ALUMINIUM HOUSING



Ranges : B6D, C6D – SS HOUSING



2" PIPE MOUNTING DETAIL



All dimensions are in mm

This is not a contractual document. Prior notification of changes in specifications is impracticable due to continuous improvement

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