Differential pressure switch
Models 306, 386

Applications

- Power generation
- Waste water management
- Oil and gas
- Petrochemical industries

Special features

- Internal Switch point adjustment for critical applications
- Stainless steel case option for corrosive environment
- Switch point repeatability of ±1% of FSR for reliable switching
- Two set-point option for controlling at different process levels

Fig. Left: Differential pressure switch, flameproof
Right: Differential pressure switch, weatherproof

Description

The model 306 differential pressure switch has been designed for control and monitoring applications.
The stainless steel case option enables the pressure switch to perform in harsh operating conditions of the process industry.

The switch point repeatability to ±1% enables reliable switching in critical operating conditions. Low pressure ranges with diaphragm sensor elements enable to meet a variety of applications in oil, gas, power, steel and petrochemical industries.

Adjustable switch differential combinations are available to realize flexible on/off controls. This wide setting range is often needed for the on/off control mode of cyclic applications.

The switch point can be specified on site, with internal adjustment options. Depending on the application, the appropriate variant for the contact version and the electrical connection can be selected. For example, hermetically sealed micro switches are suitable for corrosive ambient conditions.

Specifications

Basic information	
Switch enclosure	■ GM style aluminium pressure die cast, weatherproof to IP66 ■ GA style 304 SS casting, weatherproof to IP66 ■ GA6 style 316 SS casting, weatherproof to IP66 ■ GK style aluminium pressure die cast, weatherproof and flameproof to group IIC as per IS/IEC 60079-1 ■ GR style aluminium pressure die cast, weatherproof to IP66 and flameproof to group IIC
Measuring element	Buna-N diaphragm
Wetted parts	■ Aluminium (standard) ■ 304 SS (optional for model 306) ■ 316 SS (optional for model 306)

Output signal	
Ranges	Several standard ranges between (-)0.6 mbar ... 4 bar
Switching differential	Fixed Refer table 2, 3 & 4
Repeatability of the setpoint (note 3)	±1% of FSR, except range code W188. ±2% of FSR for range code W188
Maximum working pressure	Refer table-4
Scale accuracy (note 6)	±5% of FSR
Switching element (notes 9 & 10)	Instrument quality SPDT microswitch (Notes 10 & 11)

Operating condition	
Permissible ambient temperature	–25°C ... +60°C
Maximum process temperature (note 15)	110°C. For higher temperatures use longer impulse lines. Ask for piping nomogram #441184-4
Ingress protection	IP66
Process connection	1/4" NPT(F) per ASME B1.20.1 standard Other connections through adaptor
Electrical connection	1/2" NPT(F) per ASME B1.20.1 single entry standard Dual entry on request
Mounting	Back panel / wall / Field. Vertical position only

Ordering matrix

Sample model number GM 306 B 5 □ □ □ P C □ ZZ

Switch enclosure

GM style aluminium pressure die cast, weatherproof to IP66 — **GM**

GA style 304 SS casting, weatherproof to IP66 — **GA**

GA6 style 316 SS casting, weatherproof to IP66 — **GA6**

GK style aluminium pressure die cast, weatherproof and flameproof to Gr.IIC as per IS/IEC 60079-1 — **GK**

GR style aluminium pressure die cast, weatherproof to IP66 and flameproof to group IIC as per IS/IEC 60079-1 — **GR**

Model

Basic differential pressure switch having fixed non-adjustable switching differential actuated by a non-metallic diaphragm — **306**

A variant of series 306, employs twin levers each operating a SPDT microswitch actuated by a single sensor through a unique linkage thereby providing two independent adjustable setpoints, each with its own setting scale, spring and switch. Minimum separation between setpoints must be more than sum of on-off differentials or 10% of FSR whichever is higher. (Not available with GR enclosure) — **306**

Sensor material

Buna-N diaphragm — **B**

EPDM (available only in range code W161, W162, W163 & W188) — **E**

Wetted part

Aluminium — **5**

304 SS — **4**

316 SS — **2**

Range code

Refer table-1 — □

Switch code and rating

Refer table-5 — □

Electrical entry code

Refer table-6 — □

Mounting type

Panel — **P**

Wall — **W**

2" pipe — **2**

Universal — **U**

Mounting material

Mild steel — **C**

316 SS — **2**

Maximum working pressure

Refer table-7 — □

Option

Non CE conformity — **ZZ**

CE conformity (not applicable for GR enclosure) — **CE**

The below "Options" are available, consult sales

- Ammonia service (EPDM 'O' ring mandatory)
- Blow out disc
- Seal 'O' ring – EPDM (MWT 130°C, not available in Buna-N diaphragm)
- Optional scale accuracy ±2% (not available in GR)

Table 1: Range code and availability

Range code	Range	306	386
M009 §	(-)2.5 ... 2.5 mbar	✓	×
M012 §	0 ... 5 mbar	✓	×
M040	3 ... 25 mbar	✓	×
M042	5 to 120 mbar	✓	✓
M048	50 ... 350 mbar	✓	✓
B023	0.1 ... 1.5 bar	✓	✓
B028 / K051	0.2 ... 4 bar / Kg/Cm²	✓	✓
W161 ✶	(-)30 ... 150 mmWC	✓	×
W162 ✶	(-)120 ... 120 mmWC	✓	×
W163 ✶	(-)40 ... 10 mmWC	✓	×
W188 §§	(-)30 ... 250 mmWC	×	✓

✶ Available only with 304SS / 306SS wetted parts with 'D' and 'DD' code micro switches in GM / GA enclosures only.

§ W058 is equivalent range code for range ±25 mmWC
W069 is equivalent range code for range 0 to 50 mmWC

§§ Available in GM, GA enclosure only

Table 2: Switching differential for models 306 / 386 – GM / GA enclosures

Range Code	Range	On-off differential in mbar				
		Fixed				
		Models 306				Model 386
		3	D	5	9 / G	D / 3
M009	(-)2.5 ... 2.5 mbar	0.8	0.9	1.5	-	-
M012	0 ... 5 mbar	0.4	0.6	1.4	1.0	-
M040	3 ... 25 mbar	0.8	✶✶	✶✶	✶✶	-
M042	5 to 120 mbar	12	12	12	30	30
M048	50 ... 350 mbar	20	20	25	45	60
B023	0.1 ... 1.5 bar	70	70	90	135	150
B028 / K051	0.2 ... 4 bar / Kg/Cm²	250	300	600	675	500
W161	(-)30 ... 150 mmWC	-	1	-	-	-
W162	(-)120 ... 120 mmWC	-	1	-	-	-
W163	(-)40 ... 10 mmWC	-	1.2	-	-	-
W188	(-)30 ... 250 mmWC	-	-	-	-	1

● Multiply values in Table-2 by 1.3 for DPDT (2 × SPDT) switching.

✶✶ For on-off differential values please consult factory.

Table 3: Switching differential for models 306 / 386 – GK enclosures

Range Code	Range	On-off differential in mbar				
		Fixed				
		Models 306				Model 386
		3	D	5	9 / G	D / 3
M009	(-)2.5 ... 2.5 mbar	1.4	1.6	2.5	-	-
M012	0 ... 5 mbar	0.8	1.0	2.4	1.7	-
M040	3 ... 25 mbar	1.0	**	**	**	-
M042	5 to 120 mbar	20	20	16	50	40
M048	50 ... 350 mbar	35	35	40	75	85
B023	0.1 ... 1.5 bar	120	120	150	230	240
B028 / K051	0.2 ... 4 bar / Kg/Cm²	425	500	800	1145	680

● Multiply values in Table-3 by 1.2 for DPDT (2 × SPDT) switching.

∗∗ For on-off differential values please consult factory.

Table 4: Switching differential for models 306 – GR enclosures

Range Code	Range	On-off differential in mbar		
		Fixed		
		Models 306		
		3 / D	5	9 / G
M009	(-)2.5 ... 2.5 mbar	0.7	2.0	-
M012	0 ... 5 mbar	1.0	**	**
M040	3 ... 25 mbar	16	35	35
M042	5 to 120 mbar	25	35	60
M048	50 ... 350 mbar	100	130	190
B023	0.1 ... 1.5 bar	375	700	1000

● Multiply values in Table-4 by 1.3 for DPDT (2 × SPDT) switching.

∗∗ For on-off differential values please consult factory.

Table 5: Switch code, rating and availability (note 10)

Switch code		Contact version	AC rating	DC rating in Ampere						Availability in models	
				Resistive			Inductive				
SPDT	DPDT			250V	125V	30V	250V	125V	30V	SPDT	DPDT
D	DD	General purpose	15A 250 / 125V	0.2	0.4	2.0	0.02	0.03	1.0	306 & 386	306
3	33	General purpose	15A 250 / 125V	-	-	-	-	-	-	306 & 386	306
5	55	General purpose with good DC rating.	5A 250 / 125V	0.2	0.4	4.0	0.2	0.4	3.0	306	306
9	99	Hermetically sealed, inert gas filled with Silver alloy contact.	1A 115V 400 Hz.	-	-	3.0 ✶	-	-	1.0 ✶	306	306
G	GG	Hermetically sealed, inert gas filled with Gold plated contact.	-	-	-	1.0 ✶	-	-	0.25 ✶	306	306

Note : ✶ For Codes 9, 99, G, GG; DC Rating of Resitive and Inductive is 28V

Table 6: Electrical entry

Size ✶	Single entry		Dual entry	
	GM / GA	GK/GR	GM / GA	GK/GR
1/2" NPT(F) per ASME B1.20.1	A	A	N	N
3/4" NPT(F) per ASME B1.20.1 through adaptor	L	-	O	-
M20 × 1.5 per ISO724 ✶✶	E	E	EB	EB
7 pin plug through connector ✶✶✶	C	-	-	-
9 pin plug through connector	D	-	-	-

✶ Cable gland available on request

✶✶ Possible in GK and GR enclosure as direct. Others through adaptor.

✶✶✶ Possible only in GM enclosure.

Table 7: Maximum working pressure

Range codes	Wetted parts	Maximum working pressure (in bar)
M009, M012, M040	Aluminium	1
M042, M048, B023, B028	Aluminium	15
M009, M012, M040, M042, M048, B023, B028	304 / 316 SS	15
W161, W188	304 / 316 SS	15
W162, W163	304 / 316 SS	7

NOTES

1. Style GM/GA is weatherproof only if all entries and joint faces are properly sealed. Style GK / GR 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 GK / GR instruments to avoid neglect of it while installation.

2. Intrinsic Safety (Exi) — Differrential pressure switches are classified as simple apparatus as they neither generate nor store energy. Hence differential pressure switches in weatherproof (GM/ GA) enclosures also may be used in intrinsically safe systems without certification provided the power source is certified IS. Because of the low voltages and currents it is recommended to use gold contact and / or sealed contacts.

3. Accuracy & Repeatability are not different for all blind differential pressure switches. A shift of ±2% may be observed in setpoint when pressure falls from full static pressure. Settings will also shift with varying temperature.

4. The instrument is calibrated in the mounting position 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.

5. A differential pressure switch is a switching device and not a measuring instrument — eventhough it has a scale with ±5% FSR accuracy to assist setting. For this reason, Test Certificates will not contain individual ON-OFF switching values at different scale readings. Maximum differential obtained alone will be declared, besides other specifications.

6. 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.

7. For switching differential values refer differential tables. Switching differentials furnished are nominal values under test conditions at mid-scale and will vary with range settings and operating conditions.

8. On and off settings should not exceed the upper or lower range value.

9. DPDT action is achieved by two SPDT switches synchronised to practical limits i.e., ±2% of FSR. Deadband for DPDT contacts are higher than that of SPDT as force required to actuate the contacts are more. Please refer respective range table for exact values.

10. 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.

11. Model 301 can be supplied with Nitrile diaphragm for applications where pressure reversal is envisaged.

12. All differential pressure switches are calibrated by applying pressure to HI port, venting LO port to atmosphere. Inspection will also be limited to such a practice..

13. Ambient temperature range: All models are suitable for operating within a range of ambient temperature from (-) 25°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.

14. Fluid Temperature: A differential pressure switch when connected to the process is not subjected to through flow and therefore is 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 piping nomogram #441184–4 for different temperatures.

15. Ensure that impulse pipework applies no stress on sensing element housing and use spanners to hold pressure port/ housing when connections are made.

16. Custom built instruments are available for special service requirements under Special Engineering Category.

17. For less rigorous applications models 306 / 386 with Nitrile diaphragm & Aluminium wetted parts are available at lesser cost.

18. Accuracy figures are exclusive of test equipment tolerance on the claimed values.

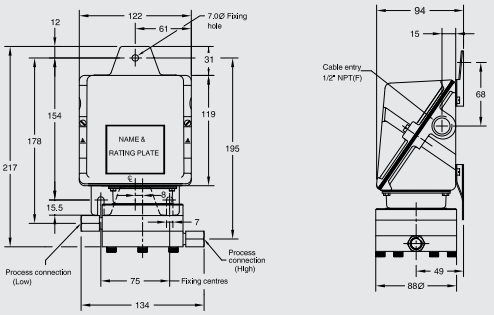
19. All performance data are guaranteed to ±5%.

Dimensions in mm

Range Codes : M042, M048, B023 & B028

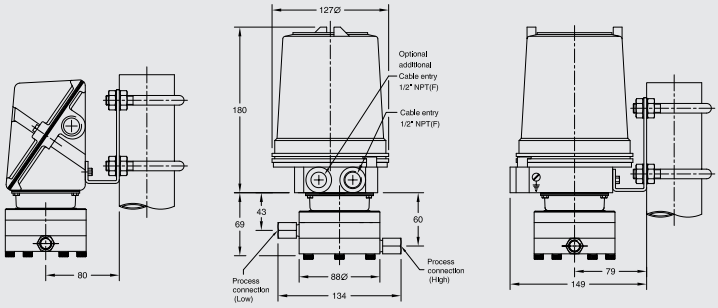
GM enclosure

Surface / wall / pipe mounting



GK enclosure

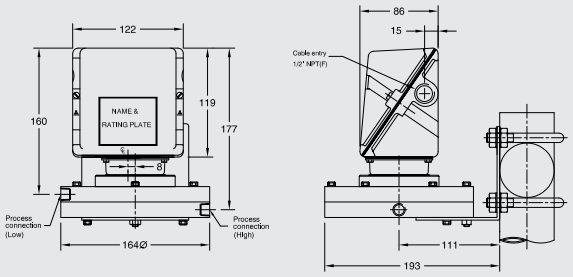
Pipe mounting



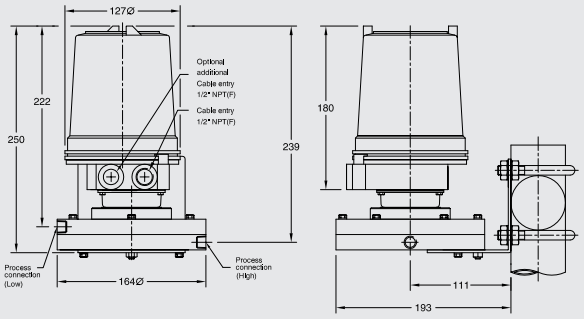
Range Codes : M009, M012 & M040

SS / Aluminium diaphragm

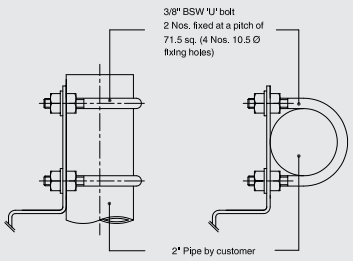
GM enclosure



GK enclosure



2" Pipe mounting details



Notes:

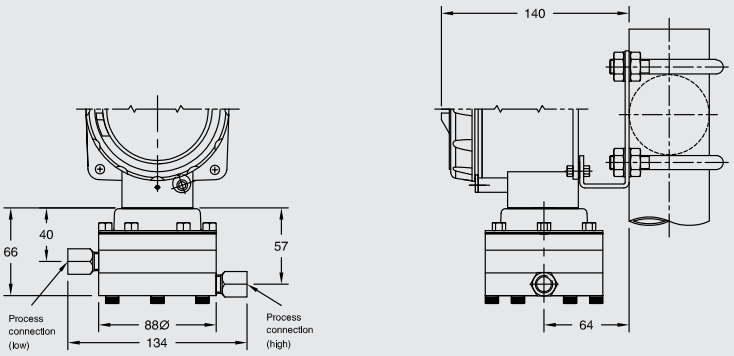
Pipe mounting bracket can be used for surface / wall mounting also.

Use 2× 3/8" × 25 long screws and nuts for surface mounting or coach screws for wall mounting instead of 'U' bolts and nuts.

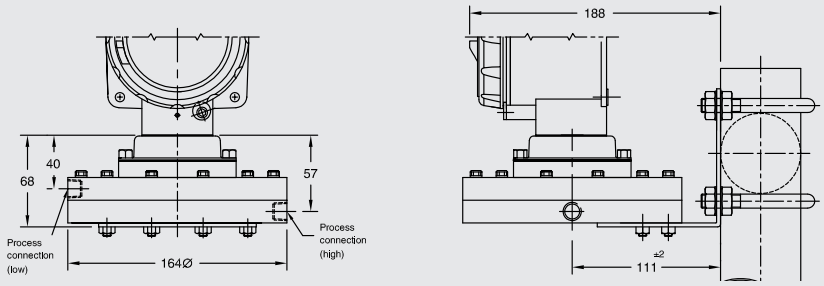
Dimensions in mm

GR enclosure

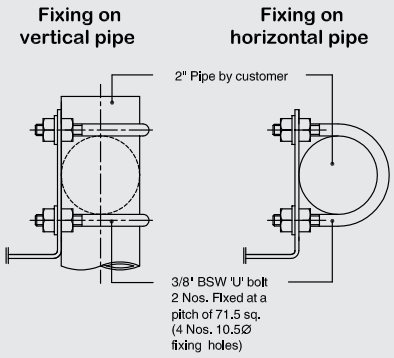
Range Codes: M042, M048, B023, B028



Range Codes: M012, M040 – SS / Aluminium housing



2" Pipe mounting detail



Ordering information

Switch enclosure / Model / Sensor material / Wetted part / Range code / Switch code and rating / Electrical entry code / Mounting type / Mounting material / Maximum working pressure

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