

Differential pressure switch

Models 301, 303, 304, 381, 384

WIKA data sheet PV 35.56

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 $\pm 1\%$ of FSR for reliable switching
- Two set-point option for controlling at different process levels



Fig. Left: Model 301, GK flameproof enclosure
Fig. Right: Model 301, GM weatherproof enclosure

Description

The model 300 differential pressure switch has been designed for control and monitoring applications.

The switch point repeatability of $\pm 1\%$ enables reliable switching in critical operating conditions.

The switch point can be set at site on site, with internal adjustment feature. 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 hazardous ambient conditions.

The stainless steel case option enables the pressure switch to perform in harsh operating conditions of the process industry.

High static pressure option with diaphragm sensor elements enable to meet a variety of applications in oil, gas, power, steel and petrochemical industries.

Specifications

Basic information	
Switch enclosure	<ul style="list-style-type: none"> ■ 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	316L SS diaphragm
Wetted parts	<ul style="list-style-type: none"> ■ 304 SS ■ 316 SS ■ 316L SS

Output signal	
Ranges	Several standard ranges between 3 mbar to 15 bar
Switching differential	<ul style="list-style-type: none"> ■ Fixed ■ Wideband adjustable Refer table 2, 3 & 4
Repeatability of the setpoint (note 3)	± 1% of FSR
Maximum working pressure	110 bar for models 301, 303 & 381 250 bar for models 304 & 384 50 bar for range code B039 80 bar for range code B040
Scale accuracy (note 6)	±5% of FSR
Switching element (notes 9 & 10)	Instrument quality SPDT microswitch

Operating condition	
Permissible ambient temperature	-10°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 direct Other connections through adaptor
Electrical connection	1/2" NPT(F) per ASME B1.20.1 single entry standard Dual entry on request
Mounting	<ul style="list-style-type: none"> ■ Panel ■ Wall ■ 2" pipe ■ Universal

Ordering matrix

Sample model number	GM	301	3	4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	P	C	<input type="checkbox"/>	CE
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 stainless steel diaphragm		301									
Same as 301, but with auxiliary mechanism permitting switching differential adjustment over a wide band (not available with GR enclosure) set point.			303								
Same as 301 but suitable for higher static pressure upto 250 bar				304							
A variant of series 301, 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)					381	384					
Sensor material											
316L SS diaphragm			3								
Buna-N diaphragm (pressure reversal, MWP 40 bar)				B							
Monel diaphragm					M						
Wetted part											
304 SS				4							
316 SS					2						
316L SS						3					
Monel							M				
Range code											
Refer table-1					<input type="checkbox"/>						
Switch code and rating											
Refer table-5						<input type="checkbox"/>					
Electrical entry code											
Refer table-6							<input type="checkbox"/>				
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											<input type="checkbox"/>
Option											
CE conformity (not applicable for GR enclosure)											CE

For available other options refer table-8

Table 1: Range code and availability

Range code	Range	301 / 304	303	381 / 384
M040	3 ... 25 mbar	✓	×	✓
M042	5 ... 120 mbar	✓	✓	✓
M048	50 ... 350 mbar	✓	✓	✓
B023	0.1 ... 1.5 bar	✓	✓	✓
B028 / K051	0.2 ... 4 bar / Kg/Cm ²	✓	×	✓
B032 / K102 ★	0.7 ... 7 bar / Kg/Cm ²	✓	×	✓
B034 / K103 ★	1.5 ... 15 bar / Kg/Cm ²	✓	×	×
B039 / K076 ★★	10 ... 40 bar / Kg/Cm ²	✓	×	×
B040 / K099 ★★	10 ... 60 bar / Kg/Cm ²	✓	×	×

★ 55, 9, G micro switches are not available

★★ Available only in 301 with 316L SS only

Table 2: Switching differential for models 301 / 304 / 381 / 384, GM / GA enclosures

Range Code	Range	On-off differential in mbar					
		Fixed					Adjustable
		Models 301 / 304				Model 381 / 384	Model 303
		D / 3	4	5	9 / G	D / 3 / 4	W
M040	3 ... 25 mbar	6	10	6	10	7.5	-
M042	5 ... 120 mbar	9	10	10	12	20	45 ... 70
M048	50 ... 350 mbar	15	18	20	30	40	70 ... 200
B023	0.1 ... 1.5 bar	60	60	85	120	250	300 ... 900
B028	0.2 ... 4 bar	175	200	350	500	400	-
B032	0.7 ... 7 bar	300	350	500	-	600	-
B034	1.5 ... 15 bar	800	800	1350	-	-	-

Table 3: Switching differential for models 301 / 304 / 381 / 384, GK enclosures

Range Code	Range	On-off differential in mbar					
		Fixed					Adjustable
		Models 301 / 304				Model 381 / 384	Model 303
		D / 3	4	5	9 / G	D / 3 / 4	W
M040	3 ... 25 mbar	10	10	10	7	12	-
M042	5 ... 120 mbar	11	12	16	20	30	45 ... 70
M048	50 ... 350 mbar	20	25	40	50	55	90 ... 200
B023	0.1 ... 1.5 bar	100	100	140	200	350	425 ... 900
B028	0.2 ... 4 bar	300	340	520	900	600	-
B032	0.7 ... 7 bar	600	600	750	-	1000	-
B034	1.5 ... 15 bar	1500	1350	1750	-	-	-

Table 4: Switching differential for models 301 / 304, GR enclosures

Range Code	Range	On-off differential in mbar			
		Fixed			
		Models 301 / 304			
		D / 3	4	5	9 / G
M040	3 ... 25 mbar	10	12	10	15
M042	5 ... 120 mbar	12	12	20	20
M048	50 ... 350 mbar	25	25	30	40
B023	0.1 ... 1.5 bar	100	100	115	200
B028	0.2 ... 4 bar	300	300	500	750
B032	0.7 ... 7 bar	500	500	650	-
B034	1.5 ... 15 bar	1500	1500	1600	-

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

- For style GM/GA enclosures apply a multiplication factor of 1.3 to values in Table 2.
- For style GK enclosure apply a multiplication factor of 1.2 to values in Table 3.
- For style GR enclosures apply a multiplication factor of 1.3 to values in Table 4.
- In case of adjustable on-off differential models the multiplication factor is to be applied only to the lower limit of the differential values. Upper limit values remain unchanged.
- **For instruments with chemical seal**, switching differentials will be higher. Apply a Multiplication factor of 1.3 for SPDT and 1.5 for DPDT to values given in table for GM housings and apply a multiplication factor of 1.2 for SPDT and 1.5 for DPDT to values of table for GK housings.

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

Switch code		Contact version	AC rating	DC rating in Ampere						Availability in models	
SPDT	DPDT			Resistive			Inductive			SPDT	DPDT
				250V	125V	30V	250V	125V	30V		
D	DD	General purpose	15A 250 / 125V	0.2	0.4	2.0	0.02	0.03	1.0	301, 304, 381 & 384	301 & 304
3	33	General purpose	15A 250 / 125V	-	-	-	-	-	-	301, 304, 381 & 384	301 & 304
W	WW	General purpose	15A 250 / 125V	-	-	-	-	-	-	303	303
4	44	With Gold alloy contact.	1A 125V	-	0.5	0.5	-	0.25	0.25	301, 304, 381 & 384	301 & 304
5	55	General purpose with good DC rating.	5A 250 / 125V	0.2	0.4	4.0	0.2	0.4	3.0	301 & 304	301 & 304
9	99	Hermetically sealed, inert gas filled with Silver alloy contact.	1A 115V 400 Hz.	-	-	3.0 ★	-	-	1.0 ★	301, 304, 381 & 384	301 & 304
G	GG	Hermetically sealed, inert gas filled with Gold plated contact.	-	-	-	1.0 ★	-	-	0.25 ★	301, 304, 381 & 384	301 & 304

Note : In model 381 and 384 DPDT for individual set point are not available,
 For model 381 specify only one character for switch code D, 4, etc
 ★ For Codes 9, 99, G, GG; DC Rating of Resistive 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 x 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	Sensor material	Maximum working pressure	Code
M042, M048, B023, B028, K051, B032, K102, B034, K103	Buna-N	40	A5
B039, K076	316L SS	50	B8
B040, K099	316L SS	80	B9
M040, M042, M048, B023, B028, K051, B032, K102, B034, K103	316L SS, Monel	110	B4
M040, M042, M048, B023, B028, K051, B032, K102, B034, K103	316L SS, Monel	250	B7 *

* Available in Models 304 and 384

Table 8: Options

Details	Model		
	30 / 303	304	381 / 384
Ammonia Service (EPDM 'O' ring mandatory) / Environment	✓	✓	✓
Oxygen service	✓	✓	✓
NACE Preparation *	✓	✓	✓
PVC Cover for Armour	✓	✓	✓
Blow out disc (not available in GR)	✓	✓	✓
Special repeatability ●	✓	✓	✓
Chemical Seal	✓	✓	✓

* Available only with '316L SS' wetted parts

● Not possible in range codes M040, B032 and B034

NOTES

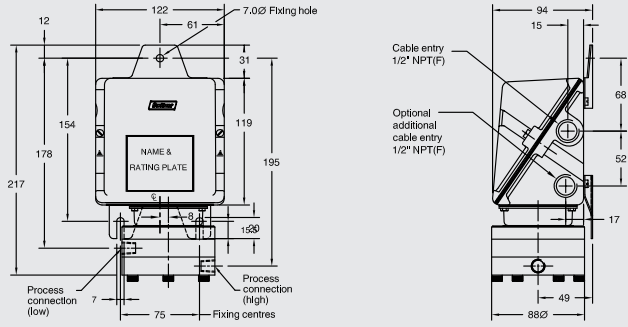
1. Style GM/GA is weatherproof only if all entries and joint faces are properly sealed. Style GK / GR is weatherproof only if cover 'O' ring is retained in position and flameproof only if proper FLP cable gland is used. It is recommended to procure cable glands along with GK / GR instruments to avoid neglect of it while installation.
2. Intrinsic Safety (Exi) — Differential 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 $\pm 2\%$ 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 $\pm 5\%$ 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., $\pm 2\%$ 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 $\pm 5\%$.

Dimensions in mm

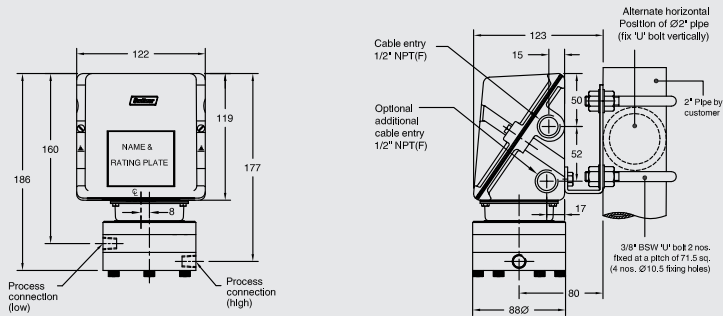
Model 301 / 303 / 381 Range Codes M042, M048, B023, B028, B032 & B034

GM enclosure

Surface / Wall mounting

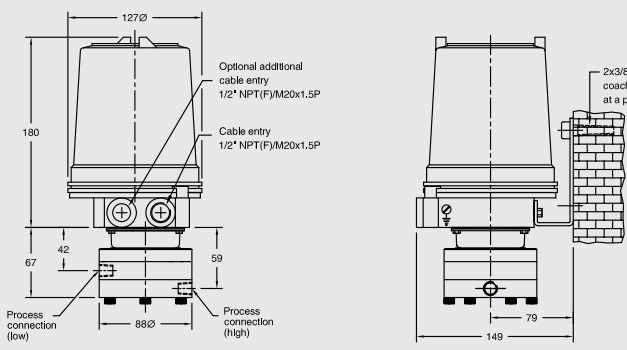


Pipe mounting

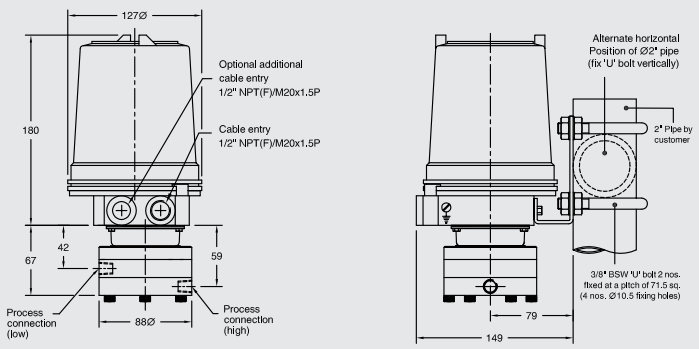


GK enclosure

Surface / Wall mounting



Pipe mounting

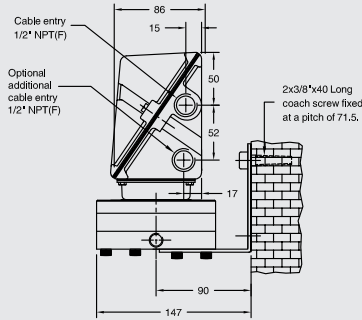
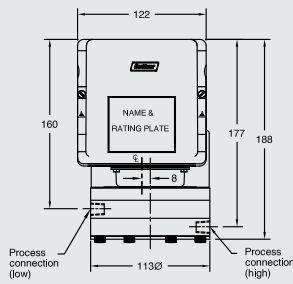


Dimensions in mm

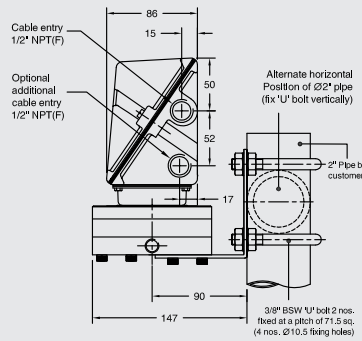
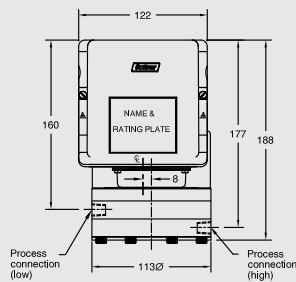
Model 301 / 381 Range Code M040

GM enclosure

Surface / Wall mounting

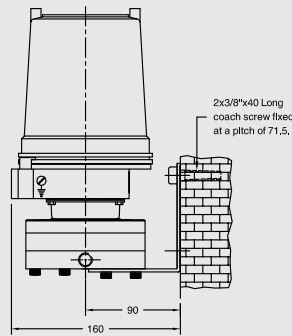
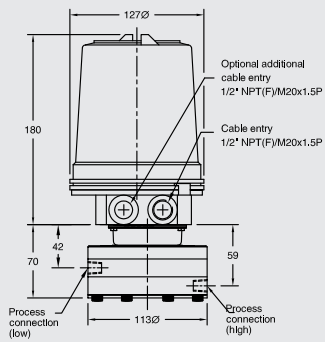


Pipe mounting

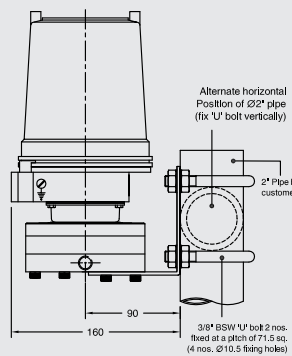
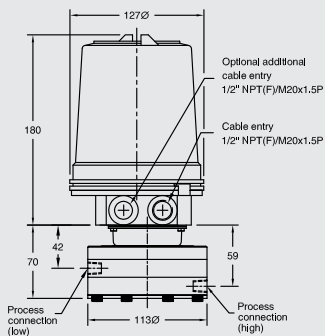


GK enclosure

Surface / Wall mounting



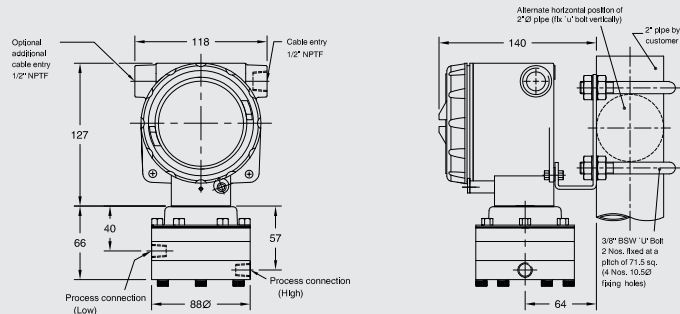
Pipe mounting



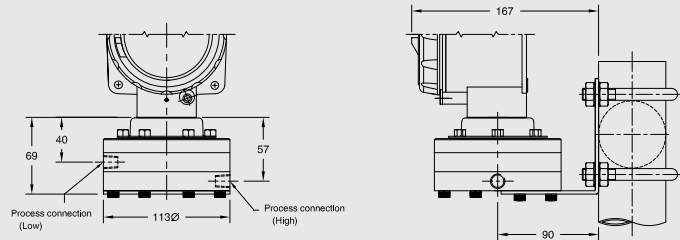
Dimensions in mm

GR enclosure, model 301

Range Codes: M042, M048, B023, B028, B032 & B034

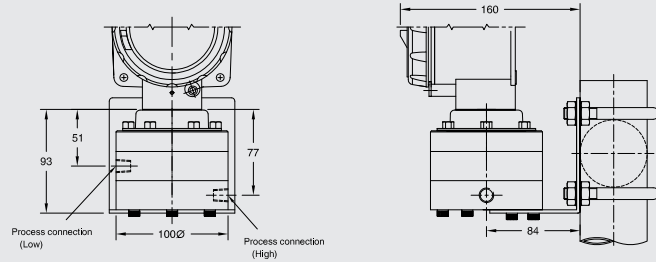


Range Code: M040

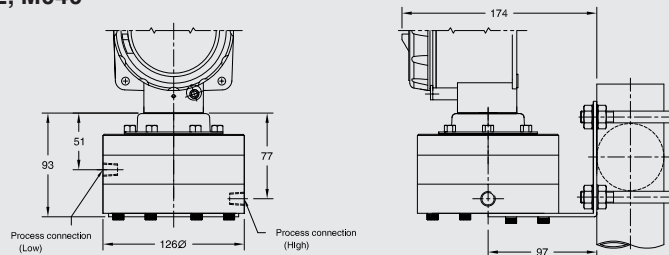


GR enclosure, model 304

Range Codes: B023, B028, N032, B034



Range Code: M048, M042, M040



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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