






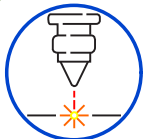
# Diaphragm Process Gauge






Brochure No:  
MKBP1E01A0






## OPTIONS



-  **ZC** Certificate of Accuracy (Factory)
- Z1** Improved Accuracy 1% (Grade A-ASME B40.1)
- ZI** Certificate of Accuracy (NIST)
- ZE** Certificate of Accuracy (TAF)
-  **ZG** Glycerine Filled
- ZH** Halocarbon Filled
- ZS** Silicone Filled
- ZO** Fluorolube Filled
- ZM** Dampened Movement
-  **ZX** Cleaned for Oxygen Service (Use No Oil)
-  **ZN** Complied to NACE

- ZY** Stainless Steel Tag Plate 
- 0Q** Customized Laser Mark 

- 07** Green Set Hand (Window) 
- 06** Red Set Hand (Window) 
- 04** Green Set Hand (Dial) 
- 0A** Red Set Hand (Dial) 
- ZQ** Movement with PTFE or Titanium Coated Gear 

- 0J** FCFC Painting 
- 1** PTFE Coating 

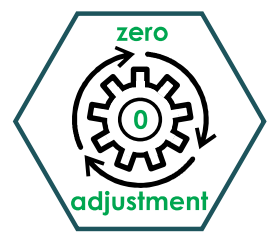
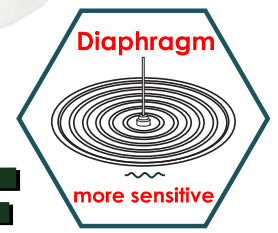
- ZW** Electrical Alarm Contract 
- ZJ** Maximum Pointer 

- 0M** Stop Pin at 6 O'clock 
- 0P** Stop Pin 

- ZP** Polycarbonate Lens 
- ZT** Tempered Safety Glass Lens
- ZL** Laminated Safety Glass Lens



# DIAPHRAGM PROCESS GAUGE



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## INTRODUCTION

## FEATURES

**THE DIAPHRAGM PRESSURE GAUGE** (Schaffer gauge) is an device to measure the pressure. The operation is based on the principle of deformation of an elastic and circular-shaped diaphragm. This solid and highly sensitive diaphragm element is clamped or welded around the rim by upper and lower flanges. The displacement of the diaphragm will be detected on the upper flange side when subjecting to the pressure on the lower flange side. The elastic deformation of the diaphragm is transmitted through a connecting rod fixed at the center of the diaphragm, which in turn drives the rotation of the amplifying movement. This movement caused in this way is used as a measurement of the pressure and indicated by a pointer.

### Process Media

Since the measuring element of the diaphragm pressure gauge may be directly exposed to the medium, you should obtain complete information about the medium and select the correct wetted part materials that would not be affected by medium. The elastic diaphragm is usually made in the form of a thin and circular disc. The material can be constructed in stainless steel to withstand corrosion and high temperatures. It is available in other special alloys, rubber or plastic depending on the process medium. For the aggressive or viscous applications, diaphragms and wetted parts can be in the materials such as tantalum, titanium, gold, hastelloy, coated with PTFE and other highly resistant polymers, or covering with foil.

### Environment

The ambient atmosphere in which the gauge is to be installed will have a direct on the use, serve life, and accuracy of the gauge. Some airborne particles may be corrosive to damage. This atmosphere may attack the inner and outer parts and then damage its pressure system. The case can be in 304 stainless steel, 316 stainless steel or phenol which are seal weatherproof and durable.

### Dial Size

HAWK supplies varied selections of all stainless steel gauge size including 4"(100mm), 4 1/2"(155mm) and 6"(150mm). Selecting enough dial size may let users read easily.

### Temperature

Temperature need be considered when selecting a pressure gauge. The dry type pressure gauge can withstand continuous ambient temperatures as high as +212°F(+100°C), but the glycerine filled gauges max. up to +150°F(+70°C). Minimum temperature limit of the dry gauge is -4°F(-20°C). Liquid filled gauge below +50°F(+10°C) ambient temperature have to be filled a silicone oil. For higher and lower temperature applications, kindly consult the factory.

### Range

Comparing to the Bourdon Tube gauges which can detect pressures starting from 0.6 bar, the diaphragm gauges can measure down to a minimum of 10 mbar. The standard pressure ranges of the diaphragm gauges are between 10 mbar and 40 bar. Diaphragm pressure gauges can be used on normal service up to the full scale value and on pulsation service up to 90% of full scale without loss of accuracy. All diaphragm gauges are over-range protected up to five times of full scale value, but max. up to 40 bar.

### Accuracy

Selecting a gauge with sufficient accuracy to satisfy your requirements. Temperature change will reduce the accuracy of the gauges, check the individual specifications for available accuracy. Accuracy ±1.6 % F.S.-Standard, ± 2.5 % F.S. for gauges with protection foil (PTFE, tantalum or others).

### Process Connections

HAWK pressure gauge are available in wide variety of connections including threads and flanges. Wide connection ports, open connection flanges and purging plugs can be integrated for measuring highly viscous, impure or crystallizing media.

### Applications

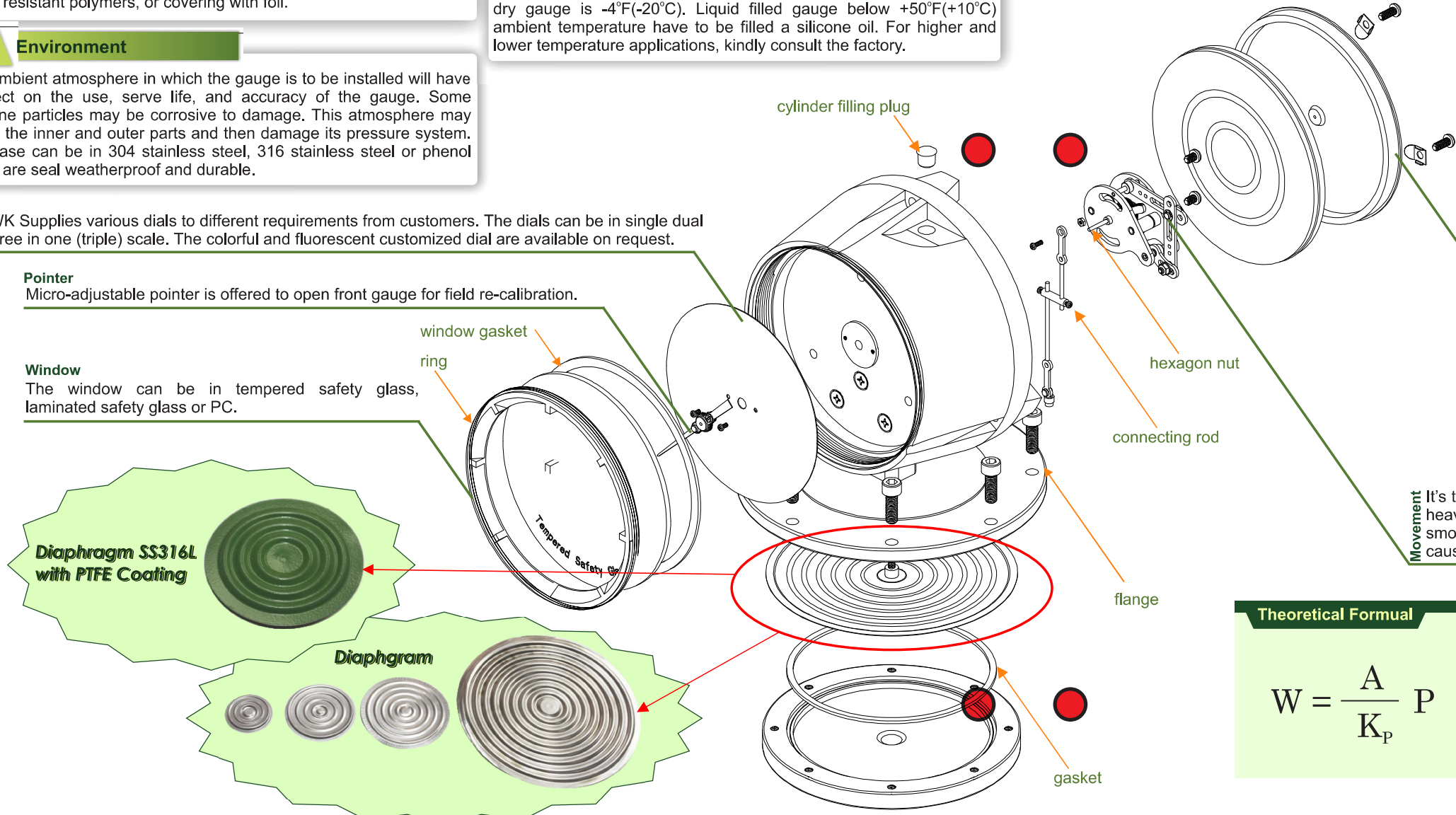
- Used in a variety of process applications, the diaphragm gauges are intended for use where:
- The process medium might freeze or solidify in the pressure connection and sensing element due to changes in ambient temperatures.
  - The measuring medium would corrode or attack the material. Diaphragm gauges with special materials are essential to resist the corrosion such as in the chemical, petrochemical, oil and gas industries.
  - The pressure medium contains suspended solid or is highly viscous to clog the pressure sensing element. In water treatment processes, where viscous, crystallizing, or contaminated liquids are present.
  - When changing process medium, the system requires flushing to prevent contamination.
  - For hygienic reasons absolutely no dead space is required. The in-line instrumentation does not have dead spaces or excessive roughness that could provide an ideal substrate for bio-film formation and microorganism proliferation.
  - Using a "dry cell" mechanism, no system filling fluid is required to avoid possible media contamination.

In summary, the diaphragm pressure gauges are robust and highly versatile devices that can be used in a wide range of industrial applications, providing accuracy, reliability and resistance to the most extreme process condition.

**Dial** HAWK Supplies various dials to different requirements from customers. The dials can be in single dual or three in one (triple) scale. The colorful and fluorescent customized dial are available on request.

**Pointer**  
Micro-adjustable pointer is offered to open front gauge for field re-calibration.

**Window**  
The window can be in tempered safety glass, laminated safety glass or PC.



**Movement** It's the most important part of the gauge. It controls the moving of the pointer. The HAWK heavy duty stainless steel bushed movements provide improved stability and smoothness. Max and min pressure stop can be offered to protect against damage caused by sudden vacuum and over pressure.

**Blow Out Disc** The top/back blow out disc can reduce the possibility of the window failure and projection of parts outward through the front of the gauge.

### Theoretical Formula

$$W = \frac{A}{K_p} P$$

- W : The Displacement of the Diaphragm Center
- A : The Effective Area of the Diaphragm
- K<sub>p</sub> : The Stiffness of the Diaphragm
- P : The Pressure of the Diaphragm

## SPECIFICATIONS

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### GENERAL SPECIFICATIONS

<b>Socket</b> 316 Stainless Steel.	<b>Pointer</b> Anodized aluminum with black finish.
<b>Movement</b> -Stainless steel movement with overload and underload stops...Standard. -Dampened movement...On request.	<b>Accuracy</b> ±1.5% of span...Standard. ±1.0% of span...Option.
<b>Sensing Element</b> Diaphragm.	<b>Zero-Adjustment</b> Micro-adjustable pointer.
<b>Bolts</b> Stainless Steel.	<b>Scale</b> PSI, kPa, Mpa, bar, kg/cm2, inHg, cmHg, torr, mmHg, mmH <sub>2</sub> O, mbar, inH <sub>2</sub> O, oz./in2 (single or dual scale).
<b>Gasket</b> Telfon...Standard, Viton, Buna N.	<b>Connection</b> Thread or Flange/Double Flange.

<b>Upper Housing Material</b> SS316, SS304, SS316L, SS316 with PTFE Coating, SS316 with Titanium Coating.	<b>Weatherproof</b> NEMA 3/3X(IP54)...Standard. NEMA 4/4X(IP65)...Option.
<b>Diaphragm Material</b> SS316L, SS316L with Hastelloy C Foil, SS316L with Monel Foil, SS316L with Tantalum Foil, SS316L with PTFE Coating, SS316L with PTFE Coating/Tantalum Foil, SS316L with Titanium Coating, SS316L with PTFE Lining(Foil), SS316L with Titanium Coating and PTFE Foil, Steel, Steel with Nickel Plated.	<b>Flange Style</b> ANSI Flange 1/2".....5" JIS Flange 10A.....200A DIN Flange DN15.....DN200
<b>Lower Housing Material</b> SS316, SS316L, SS304, Inconel, Monel, Titanium, Tantalum, SS316 with PTFE Coating, SS316 with Titanium Coating, SS316 with PTFE Lining, Hastelloy C/ PTFE(ETFE) Coating.	<b>Flange Rating</b> ANSI Flange 150LB...2500LB DIN PN2.5.....PN400 JIS 10K.....63K
<b>Mounting</b> Stem and surface mounting.	<b>Thread Style</b> 1/4"NPT, 3/8"NPT, 1/2"NPT, 3/4"NPT, 1"NPT, G1/2, G3/8, G1/4, R1/4, M20*1.5, M14*1.0 Male or Female.

### SEPERATE SPECIFICATIONS



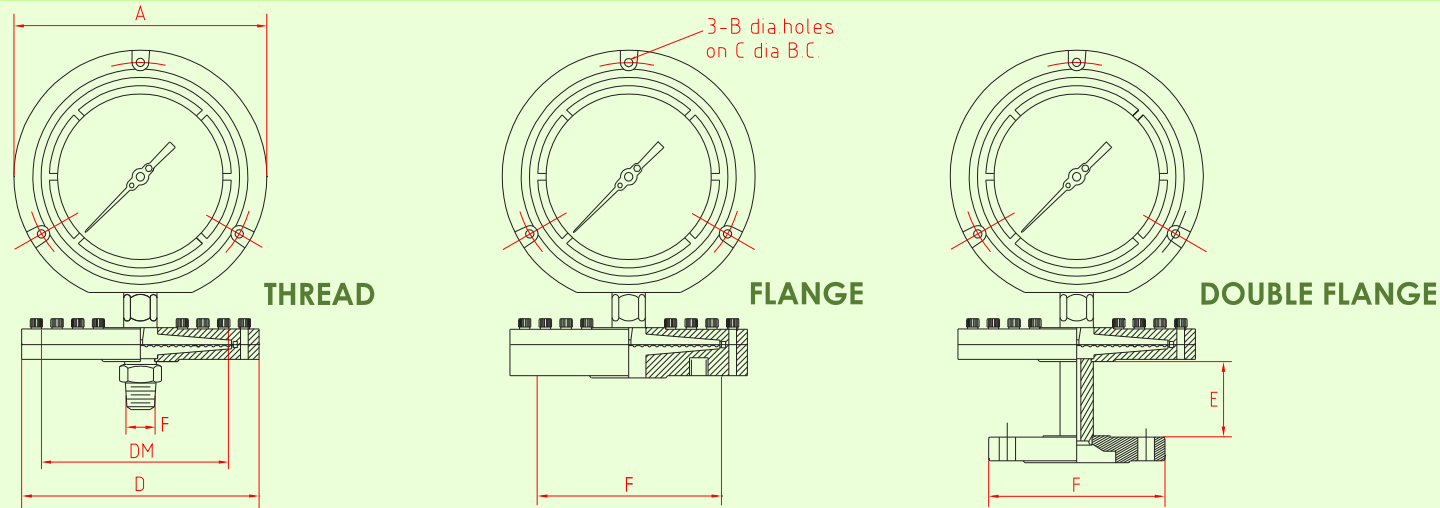
<b>Construction</b>	Solid Front/Blow Out Back	Disc Blow Out Top/Back	Solid Front/Blow Out Back
<b>Dial Size</b>	4 1/2"(115mm)	4"(100mm), 6"(150mm)	4 1/2"(115mm)
<b>Socket to Case Seal</b>	O-ring Style	O-ring Style	Welded Style
<b>Case</b>	Phenol	304 Stainless Steel (316SS - Option)	304 Stainless Steel (316SS - Option)
<b>Ring</b>	Nylon66, removable bezel ring threaded with a gasket	304 Stainless Steel, Polished removable bayonet ring	304 Stainless Steel, Polished removable bayonet ring
<b>Window</b>	Tempered Safety Glass - Standard Polycarbonate or Laminated Safety Glass - Option	Plain Glass - Standard Tempered Safety Glass, Polycarbonate or Laminated Safety Glass - Option	Tempered Safety Glass - Standard Polycarbonate or Laminated Safety Glass - Optional



## DIMENSIONS

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### Model 81 - Phenol Case (Safety Case)



Dimensions, in.(mm)

Type No	Dial Size	Range	DM	A	B	C	D	E	F
81L	4.5"	16...400 mbar	5.11" (130)	5.81" (148)	0.24" (6)	5.36" (137)	3.94" (100)	2.36" (60)	Thread, Flange, Double Flange
81L	4.5"	0.6...25 bar	2.95" (75)	5.81" (148)	0.24" (6)	5.36" (137)	6.30" (160)	2.36" (60)	

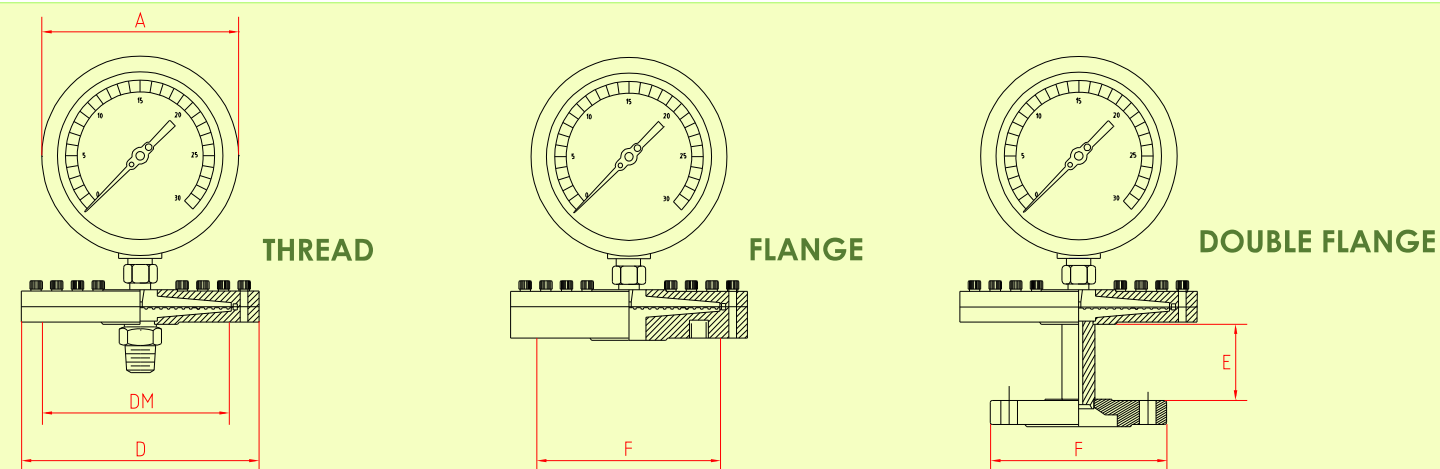
#### Thread

1/4"NPT, 3/8"NPT, 1/2"NPT, 3/4"NPT, 1"NPT, G1/2",  
G3/8", G1/4", R1/4", M20\*1.5, M14\*1.0 Male or Female

#### Flange

ANS1-1/2".....5", Rating-150, 300, 400, 600  
DIN-DN15.....100, Rating-PN2.5-6, 10-40  
JIS-10A.....100A, Rating-JIS10K, 16K, 20k, 30K, 40K

### Model 82 - Stainless Steel Case

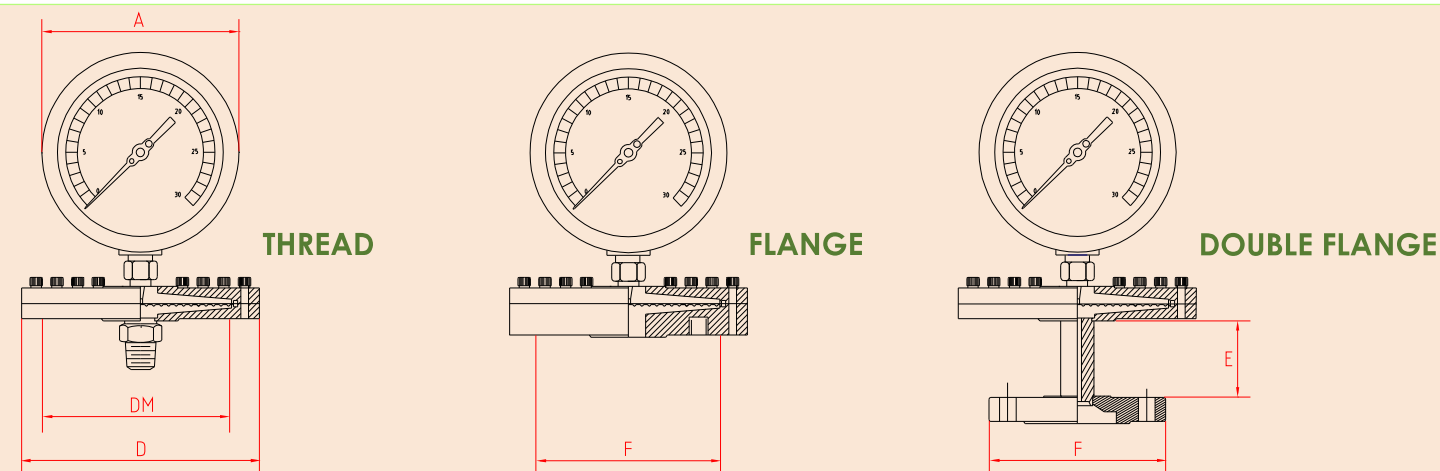


Dimensions, in.(mm)

Type No	Dial Size	Range	DM	A	B	C	D	E	F
82L	4"	16...400 mbar	5.11" (130)	4.33" (110)			3.94" (100)	2.36" (60)	Thread, Flange, Double Flange
82L	4"	0.6...25 bar	2.95" (75)	4.33" (110)			6.30" (160)	2.36" (60)	

Type No	Dial Size	Range	DM	A	B	C	D	E	F
82L	6"	16...400 mbar	5.11" (130)	6.23" (160)			3.94" (100)	2.36" (60)	Thread, Flange, Double Flange
82L	6"	0.6...25 bar	2.95" (75)	6.23" (160)			6.30" (160)	2.36" (60)	

### Model 83 - Stainless Steel Case



Dimensions, in.(mm)

Type No	Dial Size	Range	DM	A	B	C	D	E	F
83L	4.5"	16...400 mbar	5.11" (130)	5.81" (148)			3.94" (100)	2.36" (60)	Thread, Flange, Double Flange
83L	4.5"	0.6...25 bar	2.95" (75)	5.81" (148)			6.30" (160)	2.36" (60)	

#### Thread

1/4"NPT, 3/8"NPT, 1/2"NPT, 3/4"NPT, 1"NPT, G1/2",  
G3/8", G1/4", R1/4", M20\*1.5, M14\*1.0 Male or Female

#### Flange

ANS1-1/2".....5", Rating-150, 300, 400, 600  
DIN-DN15.....100, Rating-PN2.5-6, 10-40  
JIS-10A.....100A, Rating-JIS10K, 16K, 20k, 30K, 40K





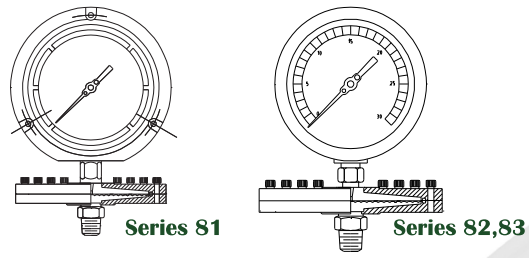
# Diaphragm Process Gauge

P-1E

## ORDER INFORMATION

## ORDER INFORMATIONS

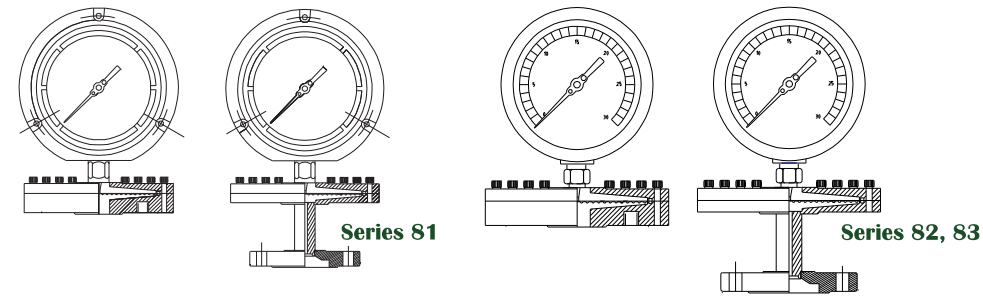
Example: For Thread



**P - 1E 81 45 W S S A M 2 P41 H-ZT**

81L-Phenol safety case	82L-SS case	83L-SS safety case
04-4"(100mm)	45-4.5"(115mm)	06-6"(150mm)
W-SS316L H-SS316L with Hastelloy C Foil M-SS316L with Monel Foil U-SS316L with Tantalum Foil C-Steel N-Steel with Nickel Plated	1-SS316L with PTFE Coating 3-SS316L with PTFE Coating/Tantalum Foil 6-SS316L with Titanium Coating 7-SS316L with PTFE Lining (Foil) 8-SS316L with Titanium Coating and PTFE Foil	
S-SS316 1-SS316 with PTFE Coating	A-SS304 6-SS316 with Titanium Coating	W-SS316L
S-SS316 A-SS304 O-Inconel M-Monel	W-SS316L T-Titanium U-Tantalum	1-SS316 with PTFE Coating 2-Hastelloy C/PTFE(ETFE) Coating 6-SS316 with Titanium Coating 7-SS316 with PTFE Lining
A-Thread		
F-Female		M-Male
2-1/2"NPT	4-1/4"NPT	D-G 1/2"
E-G 1/4"	J-M20*1.5	K-M14*1.5
P41-0-100PSI	P44-0-200PSI	P46-0-300PSI
Please refer to the range table and write down the code you need. Vacuum Compound Pressure		
ZT-Tempered Safety Glass Lens	ZG-Glycerine Filled	Z3-316SS Case
Other options please check the next page		

Example: For Flange and Double Flange



**P - 1E 81 45 W S S F A 3 R P41 H-ZT**

81L-Phenol safety case	82L-SS case	83L-SS safety case					
04-4"(100mm)	45-4.5"(115mm)	06-6"(150mm)					
W-SS316L H-SS316L with Hastelloy C Foil M-SS316L with Monel Foil U-SS316L with Tantalum Foil C-Steel N-Steel with Nickel Plated	1-SS316L with PTFE Coating 3-SS316L with PTFE Coating/Tantalum Foil 6-SS316L with Titanium Coating 7-SS316L with PTFE Lining (Foil) 8-SS316L with Titanium Coating and PTFE Foil						
S-SS316 1-SS316 with PTFE Coating	A-SS304 6-SS316 with Titanium Coating	W-SS316L					
S-SS316 A-SS304 O-Inconel M-Monel	W-SS316L T-Titanium U-Tantalum	1-SS316 with PTFE Coating 2-Hastelloy C/PTFE(ETFE) Coating 6-SS316 with Titanium Coating 7-SS316 with PTFE Lining					
F-Flange		D-Double Flange					
ANSI	A-150LB	B-300LB	C-400LB	D-600LB	E-900LB	F-1500LB	G-2500LB
DIN	H-PN2.5 O-PN64	I-PN4.0 P-PN100	K-PN10 Q-PN160	L-PN16 R-PN250	M-PN25 S-PN320	N-PN40 T-PN400	
JIS	U-PN 5K	V-PN 10K	W-PN 20K	X-PN 40K	Y-PN 63K		
HG20615-97	1-150LB(PN2.0)	2-300LB(PN5.0)	3-600LB(PN11)	4-900LB(PN15)	5-1500LB(PN26)	6-2500LB(PN42)	
HG20592-97	1-PN0.25, PN0.4	2-PN0.6	3-PN1.0, 1.6	4-PN2.5, 4.0	5-PN6.3		
ANSI, DIN, HG20615, JIS	2-3/4"(DN20) 7-2 1/2"(DN65)	3-1"(DN25) 8-3"(DN80)	4-1 1/4"(DN32) 9-4"(DN100)	5-1 1/2"(DN40) 0-5"(DN125)	6-2"(DN50)		
HG20592, PN0.25, 0.6, 1.02, 5, 6.3, 10, 16	B-DN20 G-DN65	C-DN25 H-DN80	D-DN32 I-DN100	E-DN40 J-DN125	F-DN50		
PN0.4, 1.6, 4.0	L-DN20 Q-DN65	M-DN25 R-DN80	N-DN32 S-DN100	O-DN40 T-DN125	P-DN50		
R-RF (Raise Face) M-LMF (Large Male Face) N-LFF (Large Female Face)	O-SMF (Small Male Face) P-SFF (Small Female Face) L-LTF (Large Tongue Face)	G-LGF (Large Groove Face) A-STF (Small Tongue Face) B-SGF (Small Groove Face)	F-FF (Flat Face) J-RJ (Ring Joint Face)				
P41-0-100PSI	P44-0-200PSI	P46-0-300PSI	Please refer to the range table and write down the code you need. Vacuum Compound Pressure				
ZT-Tempered Safety Glass Lens	ZG-Glycerine Filled	Z3-316SS Case	Other options please check the next page				

Catch All You Need



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