

BELLOWS STYLE GAUGE



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Mid-West
Instrument

Mid-West[®] Instrument

“Bellows Type”

Differential Pressure Gauges & Switches

Model's 105 & 106



**Dry Gauge Design with
No Internal Liquid Fill**



**Over Range Protection high-low and
low-high to rated working pressure
with use of a bi-directional relief valve**

Model 105/106 DP Range: 0-10" H₂O to 0-30 PSID (25 mbar to 3.0 bar)

- Diaphragm Bellows design provides a simple, compact, accurate, direct-acting, low range high accuracy differential pressure indicator.
- Easier and less expensive to service/repair than competitive units.
- Working pressures of 500, 1500, 3000, or 6000 PSIG (400 bar).
- Housing materials: Aluminum, Brass, Carbon Steel, or 316L S.S.
- Internals: Stainless Steel Diaphragm Bellows.
- Available: Elastomers: Buna-N, Viton, Neoprene, Ethylene Propylene
- Mechanical over-range protection high to low and low to high.
- Weather resistant case of Engineered Plastic / Shatter resistant acrylic lens
- Panel Mounting Kit Standard
- Uni-directional or Bi-directional dials are readily available.
- Gauges are optionally available with one or two switches which offer's the ability to have alarm or control.



Model's 105/106 ($\pm 1/2\%$ or $\pm 1\%$ Full Scale Accuracy) System pressure is applied to the internal volume of a bellows and mechanical linkage assembly. As pressure changes, the bellows and linkage assembly move to cause an electrical signal to be produced or to cause a gauge pointer to move. The major components are a two-piece body, multiple diaphragm/bellows sensing element and over-pressure assembly, a torque tube assembly, a range spring and the gauge front assembly. The body halves provide the pressure containment function. They also clamp the sensing element and over-pressure assembly between the halves, isolating the high side and low side pressures of the system. The high side body half also provides a mount for the torque tube assembly and the gauge front assembly.

Model	Accuracy	Min. ΔP Range	Max. ΔP Range	Safe Working Pressure PSIG (bar)	Optional Switches
105	$\pm 1/2\%$ or 1%	0-10" H ₂ O (0-25 mbar)	0-80" H ₂ O (0-200 mbar)	500-6000 (34-400)	1 or 2
106	$\pm 1/2\%$ or 1%	0-80" H ₂ O (0-200 mbar)	0-800" H ₂ O (0-30 PSID)	500-6000 (34-400)	1 or 2

Model's 105/106 assembly incorporates a bi-directional relief valve which provides over-pressure protection in both directions. When over-pressured from the high side, the valve is opened by a mechanical stop as the sensing element deflects to its maximum travel. When over-pressured from the low side, the spring-loaded valve opens when the differential pressure exceeds its maximum rating. The opening of the valve in either direction equalizes the pressure and protects the unit. A range spring is provided to adjust the spring rate of the system to suit the various differential pressure ranges of the instrument.

Mid-West[®] Instrument

Models 105 & 106

“Bellows Type”

Differential Pressure Switch Options



LOCKED LOGIC" SOLID STATE ALARM-CONTROL FOR ALL 105 & 106 GAUGES

SNAP ACTING MICRO-SWITCH for MODEL106 Range: 0-80" to 0-800" H2O.
(NOTE SWITCH OPTIONS FOR 6" DIAL SIZE ONLY)

If your application requires switching in addition to local indication, our all solid state "**Locked Logic**" system is the most accurate available. With no moving cams, levers, etc. it does not affect the accuracy of the gauge on which it is installed. Switch accuracy is the same as the gauge accuracy. Visible set pointers are provided, adjustable to within 5% of full scale of each other. The set points are adjustable from 5 to 95% of full scale. Internal adjustment is standard. 1-2 Independently adjustable switches with Set Point Feedback , SPDT or DPDT Output options, Adjustable deadband option for single SPDT or DPDT output (2 set pointers) Accuracy of Gauge unaffected by the switch. Locked Logic switches require input power to operate.

Model 106 can also be equipped with one ore two independently adjustable SPDT snap acting **Micro-Switches** which can be set on decreasing or on increasing pressure. A switch adjustment screw and a switch lock screw is accessible after removal of the lens and bezel (removal of 4 screws). Interface to the snap acting micro-switch is via color coded 18 AWG flying leads and a 1/2" FNPT conduit connection. Snap acting Micro switches do not require input power to operate.

NOTE: Snap Acting Micro-Switches are not available with Bi-Directional Range Gauges

NOTE: It is strongly recommended that a 3-Valve differential pressure manifold be used in plumbing your model 105/106 to your system. Properly used it should insure that your instrument is not over-ranged or damaged by pressure shocks during pressurization. It will later zeroing, ranging and calibration checking. It is a good practice to purge or flush the instrument loop prior to connecting the instrument.

OPTION	INTERFACE	MARKINGS	ENVIRONMENTAL	COMMENTS
A, B	1/2" FNPT Conduit with 24" LNG, 18 AWG Colored Flying Leads, 3/4" FNPT for (2) DPDT Outputs	NONE	Weather-proof Housing NEMA 4	Requires Input Power to Operate.
C, D	1/2" FNPT Conduit with 24" LNG, 18 AWG Colored Flying Leads, 3/4" FNPT for (2) DPDT Outputs	Class I, Groups B, C & D Class II, Groups E, F & G	Explosion-proof Housing NEMA 7	Requires Input Power to Operate.
G, H	1/2" FNPT Conduit with 18" LNG, 18 AWG Colored Flying Leads	NONE	CSA Listed Weather-proof Housing NEMA 4	Does not require Input Power to Operate.
J, K	1/2" FNPT Condulet Enclosure with 18" LNG, 18 AWG Colored Flying Leads	NONE	CSA Listed Weather-proof Housing NEMA 4	Does not require Input Power to Operate.

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Standard Dial Ranges Models: 105 & 106

Range Type			
PSID	H ₂ O	Kpa	Bar
0-.50	0-10"	0-25	0-.5
0-1	0-20"	0-35	0-1.0
0-2	0-30"	0-60	0-1.75
0-3	0-40"	0-100	0-2.0
0-5	0-50"	0-135	
0-10	0-60"		
0-15	0-70"		
0-20	0-80"		
0-25	0-100"		
0-30	0-150"		
	0-200"		
	0-250"		
	0-300"		
	0-400"		
	0-500"		
	0-600"		
	0-800"		

The above mentioned ranges are some of the most popular requested today. Mid-West Instrument can provide special un-cataloged dial range requirements. As well as dual scale dials, multiple color dials and special decals. Please consult factory for complete information.

Uni-Directional Dial Ranges are available in either LINEAR or SQUARE ROOT FLOW SCALES with any appropriate legend (I.E. PSID, Kpa, IN H ₂ O, GPM, SCFM, ETC) at no extra charge			LINEAR Bi-Directional Dials are available with any appropriate Legend at No Charge	
0-0.5	0-30	0-300	1.0-0-1.0	75-0-75
0-1.0	0-35	0-400	2.0-0-2.0	100-0-100
0-1.6	0-40	0-500	5.0-0-5.0	150-0-150
0-2.0	0-50	0-600	10-0-10	200-0-200
0-3.0	0-60	0-700	15-0-15	300-0-300
0-4.0	0-70	0-800	25-0-25	400-0-400
0-5.0	0-75	0-900	30-0-30	750-0-750
0-6.0	0-80	0-1000	50-0-50	1000-0-1000
0-7.0	0-100	0-1500		
0-8.0	0-135	0-1600		
0-10	0-150	0-2000		
0-15	0-160	0-3000		
0-20	0-200	0-4000		
0-25	0-250	0-5000		
		0-6000		

Model	Min. ΔP Range	Max. ΔP Range
105	0-10" H ₂ O (0-25 mbar)	0-80" H ₂ O (0-200 mbar)
106	0-80" H ₂ O (0-200 mbar)	0-800" H ₂ O (0-30 PSID) (0-2 bar)

Standards: Models 105/106 gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1	NACE MR0175
CSA-C22.2 No. 14.25 and 30	SAE J514
ASME B40.100	NEMA Std. No. 250
EN-61010-1	UL Std. No. 50,508 and 1203

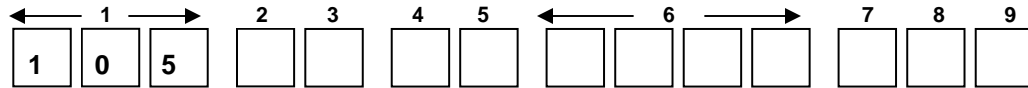
Standard Model Specifications: 105-FE-00-00 / 106-FE-00-00

1500 PSIG Working Pressure, Aluminum Body, Stainless Steel Bellows, Stainless Steel Internals
 Buna-N Seals, 1/4" FNPT Dual Top & Bottom Connections, 6" Uni-Directional Round Dial,
 Weather Resistant Engineered Plastic Case with Shatter Resistant Acrylic Lens,
 Accuracy ±1% Full Scale (Ascending)

Mid-West Instrument

1-800-648-5778

Range 105: 0-10 IN H₂O to 0-80 IN H₂O (0-4 PSID to 0-2.9 PSID)
Range 106: 0-80 IN H₂O to 0-800 IN H₂O (0-3 PSID to 0-30 PSID)



Basic Model

Range: _____



2	Material (Not All Options Available in Combination with other Options)
F	1500 PSIG, Aluminum Body, Stainless Steel Internals
G	3000 PSIG, Aluminum Body, Stainless Steel Internals
M	1500 PSIG, Mild Carbon Steel Body, Stainless Steel Internals
N	3000 PSIG, Mild Carbon Steel Body, Stainless Steel Internals
Q	1500 PSIG, 316 Stainless Steel Body, Stainless Steel Internals
R	3000 PSIG, 316 Stainless Steel Body, Stainless Steel Internals
T	6000 PSIG, 316 Stainless Steel Body, Stainless Steel Internals
X	1500 PSIG, Brass Body, Stainless Steel Internals
Y	500 PSIG, Brass Body, Stainless Steel Internals
3	Dial Size Type
E	Accuracy ±1% Full Scale Uni-Directional Dial w/Engineered Plastic Dial Case (Standard)
F	Accuracy ±1% Total Span Bi-Directional Dial w/Engineered Plastic Dial Case
G	Accuracy ±1/2% Full Scale Uni-Directional Dial w/Engineered Plastic Dial Case (30" WC & above only)**
Z	Special (Un-coded Options) Note **G" Option not available for square root dials
4	Seal Materials
0	Buna-N (Standard)
1	Viton®-A Registered Trademark of Dupont
5	Neoprene
9	Special (Un-coded Options)
5	Process Connections
0	1/4" FNPT Top & Bottom Connections (Standard)
9	Special (Un-coded Options)

Proof Pressure: Two times rated working pressure or 10,000 PSI whichever is lower at ambient temperature.

Temperature Limits:
 "Gauge Only" -40°F (-40°C) to +200°F (+95°C)
 "Locked Logic Switch" -40°F (-40°C) to +160°F (+70°C)
 "Micro Switch" -20°F (-29°C) to +185°F (+85°C)

These limits are based on the entire instrument being saturated to these temperatures. System (process) temperatures may exceed these limitations with proper installation. Contact our customer service representative for details.

Standard Model Specifications – continued Model 105 / 106

6	Additional Options
O	NONE
F	Carbon Steel 2" Pipe Mounting Kit
G	Stainless Steel 2" Pipe Mounting Kit
H	1/4" Carbon Steel Compression Tube Fittings
J	1/4" Stainless Steel Compression Tube Fittings
K	1/2" FNPT Stainless Steel Adapters
N	NACE (Available for Aluminum & Stainless Steel Gauge Bodies only)
Q	CRN (Canadian Registration Number) Only available on Models 105Q & 106Q
S	Shatter Proof Glass Lens
T	Oxygen Cleaning
U	Stainless Steel Tag with S.S. Wire
V	Stainless Steel Tag and S.S. Screw
W	Wall Mount Kit
Y	4-1/2" Dial Case
Z	Special (Un-coded Options)
7	Electrical Configurations Note: G,H,J & K switch option (high port on right when facing dial)
A	One (1) Switch in Weather Proof enclosure
B	Two (2) Switches in Weather Proof enclosure
C	One (1) Switch in explosion proof enclosure Class 1, Groups B, C, & D (Pipe Mounting Kit Standard)
D	Two (2) Switch in explosion proof enclosure Class 1, Groups B, C, & D (Pipe Mounting Kit Standard)
G	One (1) Micro-Switch in Weather Resistant Enclosure (2) (MODEL 106 0-80" to 0-800" H2O only) Accuracy $\pm 2\%$
H	Two (2) Micro-Switches in Weather Resistant Enclosure (MODEL 106 0-80" to 0-800" H2O only) 0-80" - 199" H2O Accuracy $\pm 4\%$ / 0-200" H2O and above Accuracy $\pm 2\%$ (1) (2)
J	One (1) Micro-Switch in Weather Resistant Housing with Condulet Enclosure (2) (MODEL 106 0-80" to 0-800" H2O only) Accuracy $\pm 2\%$
K	Two (2) Micro-Switches in Weather Resistant Housing with Condulet Enclosure (MODEL 106 0-80" to 0-800" H2O only) 0-80" - 199" H2O Accuracy $\pm 4\%$ / 0-200" H2O and above Accuracy $\pm 2\%$ (1) (2)
Z	Special (Un-coded Options)
(1) Accuracies & repeatability values for (2) switch units are based upon (1) switch set low (approx. 25% for FSR) and (1) switch set high (2) CSA Listed, Type 4, Industrial Control Equipment	
8	"Input Options" Electrical Specifications (Select (1) input and (1) output option)
A	8-28 Vdc
B	115 VAC 50/60 Hz
C	220/240 VAC 50/60Hz
N	No Input Required for Micro-Switch Options: G, H, J & K
Z	Special (Un-coded Options)
9	"Output Options" (Resistive Load)
(Resistive load) – 10 Amp @ 28 VDC, 115/230 VAC (50/60 Hz) (1/2" NPT, 24" Flying Leads standard interface) (1/2" NPT, 24" Flying for two (2) DPDT switches)	
A	SPDT Relays
C	SPST Relays
D	Adjustable Deadband, one (1) SPDT output (two (2) control switches only)
E	Adjustable Deadband, one (1) DPDT output (two (2) control switches only)
Micro Switch Electrical Interface: 18", 18 Awg, 600 V, 105°C / Color coded wire leads from 1/2" FNPT Connection	
M	SPDT Micro-Switch Contact Ratings:(MAX) 4 Amps @ 30 VDC / 3 Amps @ 240VAC / 5 Amps @ 120 VAC
Z	Special (Un-coded Options)
Factory preset switches at no charge (specify setting) Contact factory for bi-directional scales	

NOTE: The use of Diaphragm seals is not recommended for Model 105/106 gauges.
Attempts to install such seals on these gauges will void warranty.

Mid-West[®] Instrument



Now Available!

Model 105 TANK LEVEL GAUGE for LIQUID HYDROGEN SERVICE



No Liquid Fill required

*Over-Range Protection
High over Low
and Low over High!*



Mid-West Model 105 bellows design provides a simple, compact, accurate, direct-acting, low range differential pressure level indicator. Accuracy $\pm 1\%$ of Full Scale

Range Model 105: 0-10" H₂O to 0-50" H₂O (25 mbar to 125 mbar)

Benefits:

- Stainless Steel Gauge Front, Stainless Steel Body with Shatter-Proof Glass Lens.
 - Provides superior safety and corrosion resistance.
- Dry gauge design with no internal liquid fill
 - No costly clean up from liquid fill leaking
 - No chance of unacceptable or incompatible fill fluid being in the gauge.
 - No gauge damage/accuracy loss caused by liquid fill expansion or contraction when exposed to temperature extremes in Hydrogen level applications.
- Single bellows design is more compact and light weight.
 - Substantial weight savings over competitive range gauges.
 - Can be panel mounted in a one piece panel.
 - Can be mounted on tanks using std. 2" pipe mount brackets or 3/4" pipe nipple brackets.
- Mid-West Instrument performs Helium leak testing on units for Hydrogen service.

Product Description:

The Model 105 design is an all-stainless steel differential pressure gauge capable of operating at low differential pressures. Safe working pressure is 1500 PSIG standard. The DPI is equipped with a Bi-directional Over Pressure Relief Valve (OPV). When the Differential Pressure exceeds 130% of the range the OPV equalizes the pressure between the Hi and Lo side's 1/4" FNPT Dual top and bottom connections are provided as standard. The DPI is also equipped with a Micro adjust pointer, If necessary the pointer can be re-zeroed. Body is made of stainless steel with 316 Stainless Steel internals. Viton Seals are provided as standard with other elastomers available. Dial is 6" diameter with white lettering on a black dial.(white dial with black lettering optional) The temperature limits are rated at -40°C to 200°F. Proof pressure is two times working pressure at ambient temperatures.

Product Features:

- Ability to create custom dials for horizontal and vertical tanks
- Various Dial layouts available: **Single Scale, Dual Scale and Tri-Scale**
- Micro-Adjust pointer (if necessary the pointer can be re-zeroed)
- In house Oxygen Cleaning (optional)
- Private Labeling (optional)
- White ink on Black dial or Black ink on White dial
- **Industry best lead time reduces inventory requirements**



Gauge Specifications

105	
Accuracy	±1% of Full Scale
DP Range	0-10" H2O to 0-50" H2O (25 mbar to 125 mbar)
Safe Working Pressure	1500 PSIG (3000 PSIG optional)
Body Material	316 Stainless Steel
Dial Case & Bezel	316 Stainless Steel
Internals	316 Stainless Steel Multiple Bellows
Port	Dual Top and Bottom, 1/4" FNPT connections with optional snubbers
Seals	Viton® Standard, other elastomers available
Dial	6" Black dial with White lettering (White dial with Black lettering optional)
Standard Mounting	Panel Mountable
Optional Mounting	2" Pipe Mount
Warranty	Five Year

50 YEARS experience in the field of supplying quality Differential Pressure Gauges.

Proof Pressure: Two times working pressure at ambient temperatures

Temperature Limits: -40°F (-40°C) to 200°F (93°F)

Standards:

ASME B1.20.1 CSA-C22.2 No.14 NEMA Std. No. 250
ASME B40.100 UL Std. No. 50 SAE J514