

# Mid-West<sup>®</sup> Instru

## “Bourdon Tube Type

### Differential Pressure Gauge & Switches Model 109

INSTRUMENTS • CONTROLS • VALVES

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**ARCO**

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**“LOCKED LOGIC” ALARM CONTROLS**  
(Available with 1 or 2 switches for alarm & control)

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

**Model 109 DP Range:** 0-15 PSID (0-1.0 bar) to 0-6000 PSID (0-400 bar)

- Bourdon Tube design provides a simple, compact, accurate, direct-acting, 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 Stainless Steel
- Internals: Copper-Alloy or Stainless Steel Bourdon Tube.
- Available Elastomers: Buna-N, Viton, Neoprene, Ethylene Propylene
- Mechanical over-range protection to maximum working pressure
- Weather resistant dial case of Engineered Plastic with Shatter resistant acrylic lens
- Panel Mounting 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 109** ( $\pm 1/2\%$  or  $\pm 1\%$  Full Scale Accuracy) System pressure is applied to the inside of a slightly flattened arc- shaped tube. As pressure increases, the tube tends to restore to its original round cross-section. This change in cross-section causes the tube to straighten. Since the tube is permanently fastened at one end, the tip of the tube traces a curve that is the result of the change in angular position with respect to the center. Powered by a test quality Bourdon Tube assembly, the assembly is encapsulated in a high pressure chamber that is fitted with a pressure connection to the inside of the Bourdon Tube and a second connection to the pressure chamber.

Model	Accuracy	Min. $\Delta P$ Range	Max. $\Delta P$ Range	Safe Working Pressure PSIG (bar)	Optional Switches
109	$\pm 1/2\%$ or $1\%$	0-15 PSID (0-1.0 bar)	0-6000 PSID (0-400 bar)	500-6000 (34-400)	1 or 2

**Model 109** 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.



# “Bourdon Tube Type” Differential Gauge Switch Options Model 109



## "LOCKED LOGIC" SOLID STATE ALARM-CONTROL FOR ALL 109 GAUGE (NOTE - 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

OPTION	INTERFACE	MARKINGS	ENVIRONMENTAL	COMMENTS
<b>A, B</b>	1/2" Conduit with 24" 18 AWG Color Coded Flying Leads 3/4" FNPT for (2) DPDT Outputs	None	NEMA 4X	Requires Input Power to operate.
<b>C, D</b>	1/2" Conduit with 24" 18 AWG Color Coded Flying Leads 3/4" FNPT for (2) DPDT Outputs	NONE Class I, Div 1, Groups B, C, & D Class II, Div 1, Groups E, F, & G.	NEMA 4X NEMA 7(OPTIONAL)	Explosion-proof enclosure. Requires Input Power to Operate.

"MODEL 109 ELECTRICAL CONFIGURATIONS"	
<b>A</b>	One (1) Switch in Weather Proof enclosure
<b>B</b>	Two (2) Switches in Weather Proof enclosure
<b>C</b>	One (1) Switch in explosion proof enclosure Class I, Groups B, C, & D <b>(Pipe Mounting Kit Standard)</b>
<b>D</b>	Two (2) Switch in explosion proof enclosure Class I, Groups B, C, & D <b>(Pipe Mounting Kit Standard)</b>
"INPUT OPTIONS" ELECTRICAL SPECIFICATIONS (Select (1) input and (1) output option)	
<b>A</b>	8-28 Vdc
<b>B</b>	115 VAC 50/60 Hz
<b>C</b>	220/240 VAC 50/60Hz
<b>Z</b>	Special <b>(Un-Coded Options)</b>
"OUTPUT OPTIONS" ELECTRICAL SPECIFICATIONS (Resistive Load)	
<b>(Resistive load) – 10 Amp @ 28 VDC, 115/230 VAC (50/60 Hz)</b> (1/2" NPT, 24" Flying Leads standard interface) (1/2" NPT, 24" Flying for two (2) DPDT switches)	
<b>A</b>	SPDT Relays
<b>C</b>	SPST Relays
<b>D</b>	Adjustable deadband, one (1) SPDT output (two (2) control switches only)
<b>E</b>	Adjustable deadband, one (1) DPDT output (two (2) control switches only)

Factory preset switches at no charge (Specify Setting)

**Proof Pressure:** Two times rated working pressure 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)

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.

**Standards:** Model 109 gauge either conforms to and/or is 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 |

# Mid-West<sup>®</sup> Instrument

## Standard Dial Ranges Model: 109

Range Type					
PSID	H <sub>2</sub> O	Kpa	Bar	Bi-Directional	Dual Scale
0-15	0-400"	0-160	0-1.6	15-0-15 PSID	0-15 PSID & 0-1 Kg/cm <sup>2</sup>
0-20	0-500"	0-200	0-2.5	25-0-25 PSID	0-25 PSID & 0-1.75 Kg/cm <sup>2</sup>
0-25	0-600"	0-250	0-4.0	30-0-30 PSID	0-30 PSID & 0-200 Kpa
0-30		0-400	0-6.0	50-0-50 PSID	0-50 PSID & 0-350 Kpa
0-50		0-600	0-7.0	75-0-75 PSID	0-60 PSID & 0-400 Kpa
0-60		0-700		100-0-100 PSID	0-100 PSID & 0-700 Kpa
0-75				150-0-150 PSID	0-100 PSID & 0-7 Kg/cm <sup>2</sup>
0-100				200-0-200 PSID	
0-150				300-0-300 PSID	
0-200				400-0-400 PSID	
0-250				750-0-750 PSID	
0-300				1000-0-1000 PSID	
0-500					
Up to 6000					

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.

Model	Min. ΔP Range	Max. ΔP Range
109	0-15 PSID (0-1.0 bar)	0-6000 PSID (0-400 bar)

Uni-Directional Dial Ranges are available in either LINEAR or SQUARE ROOT FLOW SCALES with any appropriate legend ( I.E. PSID, Kpa, IN H <sub>2</sub> 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			

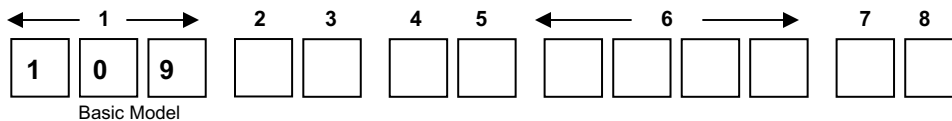
## Standard Model Specifications: 109-FE-00-00

1500 PSIG Working Pressure, Aluminum Body, Stainless Steel Bourdon Tube, Stainless Steel Internals  
Buna-N Seals, 1/4" FNPT Back Connections (Stainless Steel), 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: 0-15 PSID to 0-6000 PSID (0-1.0 bar to 0-400 bar)**



Range: \_\_\_\_\_



2	Material
<b>C</b>	1500 PSIG, Aluminum Body, Copper Alloy Internals (1/4" FNPT Connections / Carbon Steel)
<b>D</b>	3000 PSIG, Aluminum Body, Copper Alloy Internals (1/4" FNPT Connections / Carbon Steel)
<b>F</b>	1500 PSIG, Aluminum Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>G</b>	3000 PSIG, Aluminum Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>M</b>	1500 PSIG, Mild Carbon Steel Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>N</b>	3000 PSIG, Mild Carbon Steel Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>Q</b>	1500 PSIG, 316 Stainless Steel Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>R</b>	3000 PSIG, 316 Stainless Steel Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>T</b>	6000 PSIG, 316 Stainless Steel Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>U</b>	1500 PSIG, Brass Body, Copper Alloy Internals (1/4" FNPT Connections / Brass)
<b>V</b>	500 PSIG, Brass Body, Copper Alloy Internals (1/4" FNPT Connections / Brass)
<b>X</b>	1500 PSIG, Brass Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
<b>Y</b>	500 PSIG, Brass Body, S.S. Internals (1/4" FNPT Connections / 316 Stainless Steel)
3	Dial Size Type
<b>E</b>	Accuracy ±1% Full Scale Uni-Directional Dial w/Engineered Plastic Dial Case ( <b>Standard</b> )
<b>F</b>	Accuracy ±1% Total Span Bi-Directional Dial w/Engineered Plastic Dial Case ( <b>±3% above 1500-0-1500 PSI</b> )
<b>G</b>	Accuracy ±1/2% Full Scale Uni-Directional Dial w/Engineered Plastic Dial Case ( <b>Not available above 1000 PSID</b> )
<b>Z</b>	Special ( <b>Un-coded Options</b> ) <span style="float: right;"><b>Note: **G** Option not available for square root dials</b></span>
4	Seal Materials
<b>0</b>	Buna-N ( <b>Standard</b> )
<b>1</b>	Viton®-A Registered Trademark of Dupont
<b>2</b>	Neoprene
<b>5</b>	Ethylene Propylene
<b>6</b>	Perfluorelastomers
<b>9</b>	Special ( <b>Un-coded Options</b> )
5	Process Connections
<b>0</b>	1/4" FNPT Back Connections ( <b>Standard</b> )
<b>5</b>	1/2" FNPT Back Connections ( <b>Stainless Steel</b> )
<b>9</b>	Special ( <b>Un-coded Options</b> )

## Standard Model Specifications – continued Model 109

6	Additional Options
<b>O</b>	NONE
<b>B</b>	Drain & Bleed Connections (1/8" FNPT) Brass
<b>C</b>	Drain & Bleed Connections (1/8" FNPT) 316 Stainless Steel
<b>F</b>	Carbon Steel 2" Pipe Mounting Kit ( <b>Standard on Explosion Proof Locked Logic Units</b> )
<b>H</b>	1/4" Carbon Steel Compression Tube Fittings
<b>J</b>	1/4" Stainless Steel Compression Tube Fittings
<b>L</b>	Liquid Fill
<b>M</b>	Maximum Indicator Follower Pointer ( <b>Not available with Liquid fill option</b> )
<b>N</b>	NACE ( <b>Available for Aluminum &amp; Stainless Steel Gauge Bodies only</b> )
<b>Q</b>	CRN (Canadian Registration Number) <b>Only available on Models 109F, M or Q.</b>
<b>S</b>	Shatter Proof Glass Lens
<b>T</b>	Oxygen Cleaning
<b>U</b>	Stainless Steel Tag with S.S. Wire
<b>V</b>	Stainless Steel Tag and S.S. Screw
<b>W</b>	Wall Mount Kit
<b>Y</b>	4-1/2" Dial Case
<b>Z</b>	Special ( <b>Un-coded Options</b> )
7	Electrical Configurations
<b>A</b>	One (1) Switch in Weather Proof enclosure
<b>B</b>	Two (2) Switches in Weather Proof enclosure
<b>C</b>	One (1) Switch in explosion proof enclosure Class I, Groups B, C, & D ( <b>Pipe Mounting Kit Standard</b> )
<b>D</b>	Two (2) Switch in explosion proof enclosure Class I, Groups B, C, & D ( <b>Pipe Mounting Kit Standard</b> )
8	"Input Options" Electrical Specifications (Select (1) input and (1) output option)
<b>A</b>	8-28 Vdc
<b>B</b>	115 VAC 50/60 Hz
<b>C</b>	220/240 VAC 50/60Hz
<b>Z</b>	Special (Un-coded Options)
"Output Options" (Resistive Load)	
( <b>Resistive load</b> ) – 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)	
<b>A</b>	SPDT Relays
<b>C</b>	SPST Relays
<b>D</b>	Adjustable deadband, one (1) SPDT output (two (2) control switches only)
<b>E</b>	Adjustable deadband, one (1) DPDT output (two (2) control switches only)
<b>Z</b>	Special (Un-coded Options)
Not All Options Available in Combination with other Options	

**NOTE:** The use of Diaphragm seals is not recommended for Model 109 gauge.  
Attempts to install such seals on these gauges will void warranty.

**MID-WEST INSTRUMENT** has been serving a variety of industries (Power, Chemical, Petro-Chemical, HVAC, Water Filtration etc... for over 50 years. Over 1,000,000 DP Gauges have been produced bearing the Mid-West name or private branded for our OEM customers!

Mid-West understands that in today's demanding environment, flexibility, quick response time and the ability to ship most of our product line in 2 weeks or less is essential to our customers.

Standard configurations can be customized and modified to suit our customer's needs for ease of installation or retrofit. If you are in need of additional information please visit our web site at [www.midwestinstrument.com](http://www.midwestinstrument.com) or contact us toll free at **1-800-648-5778** and one of our knowledgeable sales coordinators will be happy to assist you.