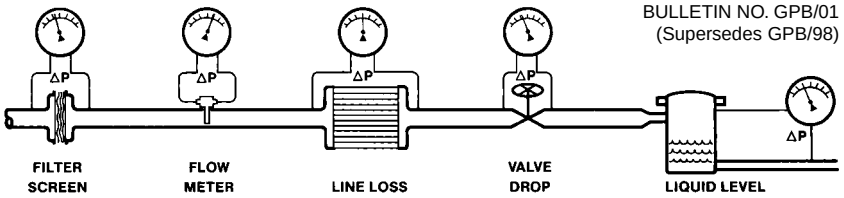
Mid-West® Instrument

BULLETIN NO. GPB/01
(Supersedes GPB/98)



GENERAL PRODUCTS BROCHURE

- Differential Pressure Gauges & Switches
- "Delta-Tube®" Averaging Pitot Tubes
- Portable Flow Measurement & Backflow Prevention Device Test Kits
- Pulsation Snubbers & Pressure Limiting Valves
- Five Year Limited Warranty

DIFFERENTIAL PRESSURE GAUGES/SWITCHES

All Mid-West Instrument Differential Pressure Gauges/Switches Are designed to One or More of the Following Standards:

ASME B1.20.1
ASME B40.1
CSA-C22.2 No. 14.25 & 30
EN-61010-1
NACE MR0175
NEMA Std. No. 250
SAE J5141
UL Std. No. 50, 508 & 1203

105/106	109
	
Precision Indicators & Controllers of Differential Pressure, Flow, Liquid Level, Balancing, Leak Detection, Etc.	

Specifications:

Differential Pressure Range	0-10" H_2O to 0-400" H_2O (or Equivalent) Uni-Directional or Bi-Directional	0-15 P.S.I.D. to 0-6000 P.S.I.D. (or Equivalent) Uni-Directional or Bi-Directional
Accuracy	± 1% F.S. Standard, ± 1/2% F.S. Optional	
Dial Size	6" (Standard), 4-1/2" (Optional)	
Working Pressure	1500, 3000, 6000 P.S.I.G	
Materials of Construction - Body	Aluminum, Brass, Carbon Steel, 316 Stainless Steel	
Materials of Construction - Internals	Copper Alloy or Stainless Steel	
Switch Options (Power, VAC/VDC, Current) Where Applicable	Solid State Control. One or two 10 AMP. SPDT Outputs Visible Set Pointers. Adjustable from 5 to 95% F.S.	
Electrical Enclosures	Weather-proof or Explosion-proof	

Special Features:

Over-range Protection	Full to Maximum Working Pressure	
Anti-Parallax Dials	Furnished on Standard Range 6" Dials	
Panel Mounting	Standard, Front of Panel 6" or 4-1/2"	
Pipe Mounting Kit	Optional, 2" U-Bolt	Optional, 2" U-Bolt
Wall Mounting	Optional - Flush Panel, or Rear Bracket	
NACE Compliance	Optional	
Seismic Compliance	Optional	
Product Brochure Number	105-106	109

DIFFERENTIAL PRESSURE GAUGES/SWITCHES

120	122	130	140
			
Modestly priced, medium accuracy differential pressure gauges and switches for use on filters, strainers, pumps, liquid level & local flow indication, etc.			

0-5 P.S.I.D. to 0-110 P.S.I.D.	0-5 P.S.I.D. to 0-110 P.S.I.D	0-5" H_2O to 0-400" H_2O	0-50" H_2O to 0-100 P.S.I.D.
Available in a variety of equivalent ranges and/or flow scales (square root)			
± 3-2-3% of Full Scale	± 5% of Full Scale	± 3-2-3% of Full Scale	± 5% thru 399" H_2O ± 3-2-3% thru 400" thru 100 PSID
All Accuracies are Based on Ascending Readings (Without Maximum Follower Pointer)			
2-1/2" Round (Standard), 3-1/2" Round (Optional), 4-1/2" Round (Optional)		4-1/2" Round (Standard) 3-1/2" Round (Optional)	2-1/2" Round (Standard) 3-1/2" Round (Optional) 4-1/2" Round (Optional)
6000 P.S.I.G. (5000 P.S.I.G. Aluminum Bronze and Monel)	5000 P.S.I.G.	Plastic - 300 P.S.I.G. Metal - 500 P.S.I.G.	Alum. & 316 S.S. - 3000 P.S.I.G. Brass - 1500 P.S.I.G.
Aluminum or 316 Stainless Steel, Aluminum Bronze or Monel	Aluminum	Plastic, Aluminum, Brass 316 S.S. or Hastelloy C	Aluminum, Brass, or 316 Stainless Steel
316 Stainless Steel (Standard) Monel (Aluminum Bronze and Monel bodies)		316 S.S. or Hastelloy C & Elastomer Diaphragm	316 Stainless Steel & Elastomer Diaphragm
SPST 60W, 240 VAC/VDC, 3 Amps SPDT 3W, 125 VAC/VDC, 0.25 Amps	SPST 60 W, 240 VAC/VDC, 3 Amps SPDT 3W, 125 VAC/VDC 0.25 Amps	SPDT 3W, 125 VAC/VDC, 0.25 Amps (Metal Bodies Only)	SPST 25W, 230 VAC/VDC, 0.5 Amps SPDT 3W, 125 VAC/VDC, 0.25 Amps
Weather-resistant, NEMA 4X or NEMA 7	NONE	Weather-resistant NEMA 4X or Nema 7 (Metal Bodies Only)	Weather-resistant NEMA 4X (Plastic or Metal Enclosure) or Nema 7

Full to Maximum Working Pressure			
Not Available			
Standard, Front or Rear of Panel			
Optional - 2" U-Bolt			
Optional - Rear Mount			
Optional			
Contact Factory			
120	122	130	140

5 YEAR

PRODUCT WARRANTY

MANUFACTURER HEREBY REPRESENTS AND WARRANTS THAT ALL PRODUCTS SOLD SHALL BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIAL FOR SUCH PRODUCTS. MANUFACTURER DOES NOT MAKE ANY OTHER WARRANTIES AND EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, OF ANY KIND OR NATURE, UNDER ANY APPLICABLE LAW, INCLUDING, WITHOUT LIMITATION, THE UNIFORM COMMERCIAL CODE, AS ADOPTED IN THE STATE OF MICHIGAN. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, MANUFACTURER EXPRESSLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY, AND ANY WARRANTY OF SUITABILITY OR FITNESS FOR ANY PARTICULAR OR INTENDED PURPOSE OR USE. THE SOLE AND EXCLUSIVE REMEDY SHALL BE LIMITED TO REPLACEMENT OR REPAIR OF ANY PRODUCT WHICH HAS A DEFECT IN WORKMANSHIP OR MATERIAL. IN NO EVENT SHALL MANUFACTURER BE LIABLE TO ANY REPRESENTATIVE, DISTRIBUTOR, CUSTOMER, ULTIMATE USER OR ANY OTHER PERSON OR ENTITY FOR ANY DAMAGES, COSTS, EXPENSES OR LIABILITIES OF ANY KIND OR NATURE, INCLUDING, WITHOUT LIMITATION, DIRECT DAMAGES, INDIRECT DAMAGES, CONSEQUENTIAL DAMAGES, LABOR COST, AND ANY EXPENSES INCURRED BY ANY DISTRIBUTOR, CUSTOMER, ULTIMATE USER OR ANY OTHER PERSON OR ENTITY RELATING TO THE INSTALLATION, USE, REPAIR OR REPLACEMENT OF ANY PRODUCT. THIS PRODUCT WARRANTY AND DISCLAIMER SHALL APPLY TO ALL SALES OF PRODUCTS.

* PRINTED CIRCUIT BOARDS, SWITCHES, AND OTHER ELECTRICAL COMPONENTS CARRY THE ABOVE PRODUCT WARRANTY FOR A PERIOD OF ONE YEAR FROM THE DATE OF SHIPMENT.

Mid-West
Instrument

Delta tube®

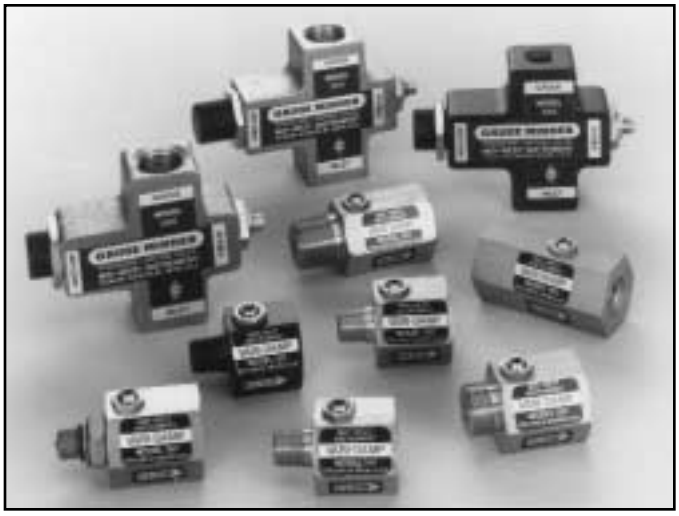
THE SHAPE OF TOMORROW IS HERE TODAY IN THE NEW "TEAR-DROP" SHAPED AVERAGING PITOT TUBES IN BOTH 1/2" AND 1" FLOW ELEMENTS.

- **"Tear-Drop" Shaped Flow Elements Compare Favorably To "Other" Shapes Offered In The Field.**
- **Flow Elements Feature An Anti-Blowout Ring For Safe Field Operation.**
- **Offered With Both 1/4" FNPT and 1/2" FNPT Instrument Connections.**
- **Accuracy up to +/- 1.0% Of Actual Flow, Repeat Accuracy +/- 0.1%.**
- **Suitable For Use In The Measurement Of Liquids, Gases, Or Steam.**
- **Designed For Use With Differential Pressure Gauges, Transmitters, Totalizers, And Chart Recorders.**

FLOW MEASUREMENT AND BACKFLOW PREVENTION DEVICE TEST KITS

A broad variety available for use in balancing HVAC systems, flow measurement, checking pump performance, etc. Kits available to test all backflow preventers to any procedure.

PULSATION DAMPENERS & PRESSURE LIMITING VALVES



"Vari-Damp® pulsation dampeners with external adjustment provide protection against pulsation & surges. "Gauge Minders® provide positive shutoff against over-pressures & automatically reopen within 10% below shutoff pressure. Set pressures to 5000 P.S.I.G.

VISA MasterCard AMERICAN EXPRESS

REPRESENTED BY:

Mid-West®
Instrument

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Website: www.midwestinstrument.com

Printed in U.S.A.

Bulletin No. BFTK2003A
October 2003

Mid-West® Instrument

The Ultimate Backflow Test Kits

Accessories

Regional Factory Authorized Calibration/Service Centers

For an updated list of factory authorized service centers, please visit our website at www.midwestinstrument.com

A Test Kit for Every Preference

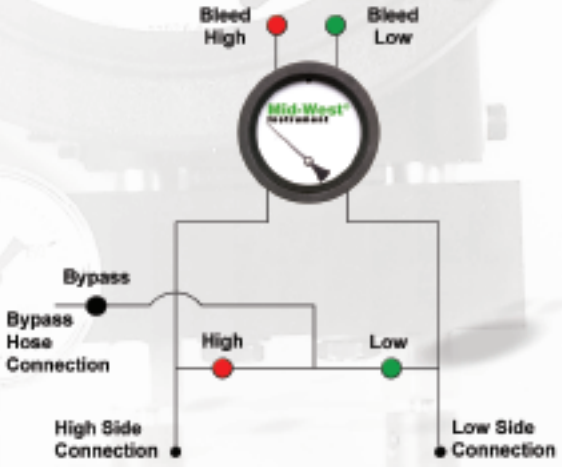
For the past 30 years Mid-West Instrument has been producing Quality Backflow Test Kits. Our Model 830 has been the benchmark of the industry for decades. Constant input from field testers led to refinements such as inline filters, laminated test procedures, removable lids, soft seated needle valves & line pressure gauges.

Further input testing and updated technology led to the portable Model 844. The culmination of all this development has resulted in Mid-West's newest product offering, the Model 845.

This new model features all the benefits you've come to expect from our kits and is available in 5-valve, 3-valve and 2-valve configurations. The Model 845 also comes with a new spacious carrying case with external fitting/tool compartments. **The addition of the Model 845 to our product lineup truly allows Mid-West to offer 'A Test Kit for Every Preference'!**

Our new line of Backflow Test Kits

MODEL
845-5
5 valve



Gauge Weight: 3.6lbs/1.6kg

Mid-West® Instrument

Toll Free: 1-800-648-5778

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Fax: 586-254-6509
Email: sales@midwestinstrument.com
www.midwestinstrument.com

Helping To Protect The World's Drinking Water

MODEL 845-3

3 valve

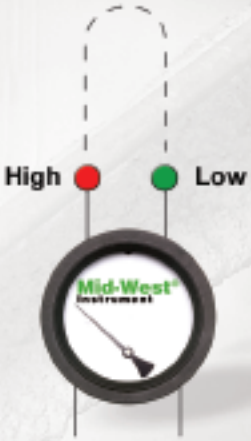
Gauge Weight: 3.3lbs/1.5kg

- Portable/removable from case.
- Improved case with storage compartments for fittings and tools.
- Room for additional accessories.
- Specially designed for testing backflow prevention assemblies with over 30 years of input from YOU the tester.

MODEL 845-2

2 valve

Gauge Weight: 2.9lbs/1.3kg



Durable Carrying Case Included

All Test Kits

Soft Seated Needle Valves With Replaceable

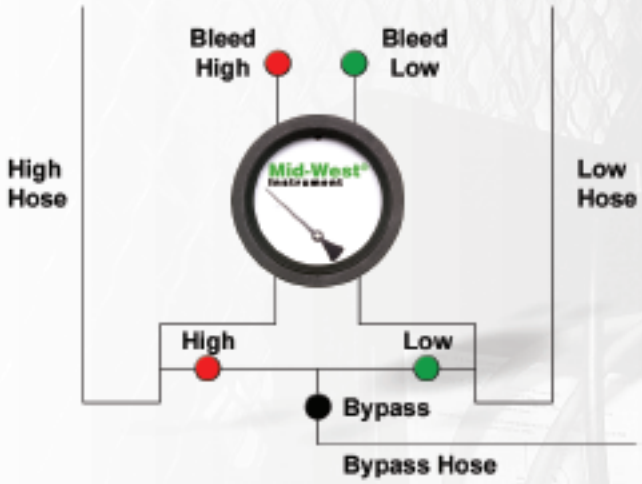
Laminated Test Procedures • Line Pressure Gauge • Adapter

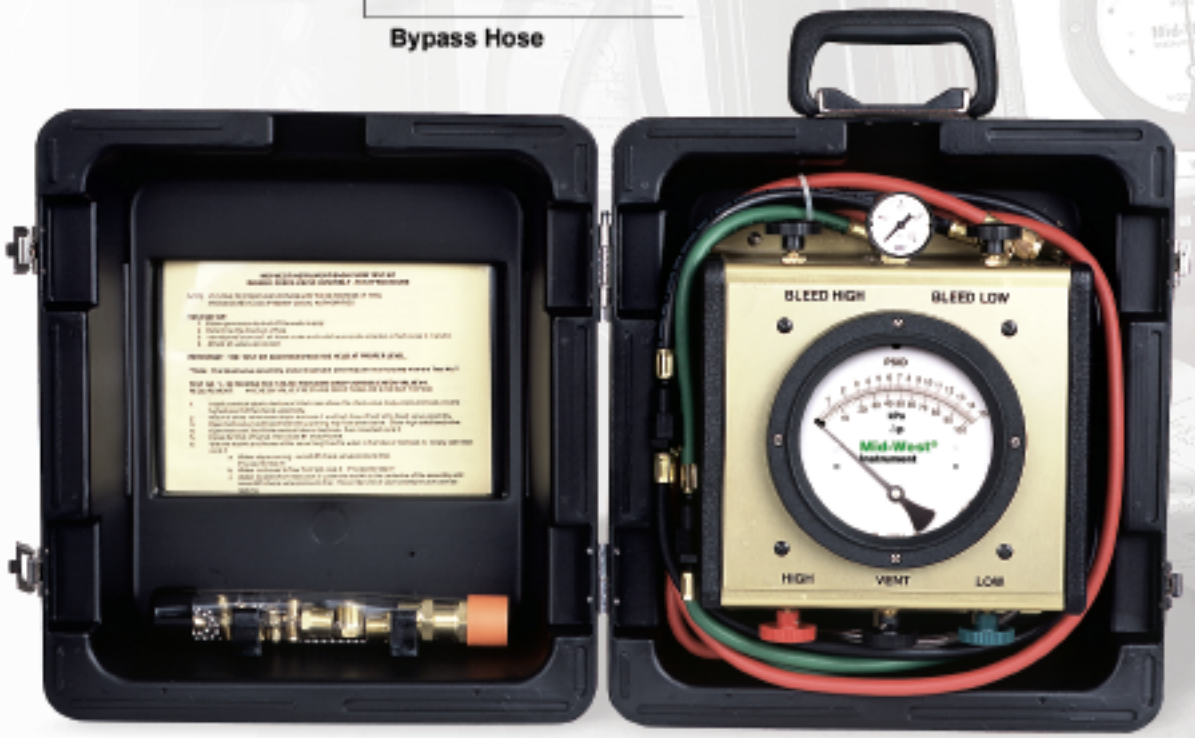
Capable of performing all known test procedures including those recomm

MODEL 830

The industry standard for over 30 years

- Industry Standard for 3 decades
- Durable Molded Carrying Case with Removable Lid
- High quality Hinges & Buckles





Kit Weight 14lbs./6.3kg

Have:

Seats • Durable Carrying Case

Fittings • In Line Hose Filters - Field Serviceable

hended by ASSE, AWWA, CSA, FCCC & HR-USC and NEWWA

Standard Specifications

Gauge Type	Diaphragm Differential Pressure
Gauge Dial Size & Range	4½" 0-15 P.S.I.D./100 kPa DP Gauge with a 1½" Line Pressure Gauge
Differential Pressure Accuracy	±0.2 P.S.I.D. (Descending)
Working Pressure	200 P.S.I.G.
Body Material	Glass Reinforced Engineering Thermoplastic
Wetted Internals	EP Elastomers, Brass and 316 S.S. Metal Parts (Nylon Tubing on 830)
Valves	Soft-Seated Needle with replaceable seats
Hoses & End Fittings	Nitrile jacket and liner, Schrader ¼" brass coupler, inline field serviceable filters
Carrying Case	Durable Molded Plastic
Hose Length	Three each / 5' long (color coded).
Bleed Tube	One each / 4' long clear (845-5 and 830 only).
Filters	Test kit is protected with 90 micron filters to minimize plugging with scale, sand, etc. Elements can be cleaned or replaced.
Adapter Fittings	Three sets of brass fittings provided for hookup to all standard size test cocks.
Temperature Limitations	Maximum 150°F/65°C. **FREEZING TEMPERATURES MUST BE AVOIDED!**

"The World Leader in Backflow Test Kits"

Mid-West Instrument's **5 Year Product Warranty** is the best in the industry

5 YEAR WARRANTY

Mid-West®
Instrument

6500 Dobry Dr., Sterling Heights, MI 48314
Toll Free: 1-800-648-5778 • Fax: 586-254-6509
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Bulletin No. DiaphragmDP04
November 2004

Mid-West® Instrument

Your Quality Choice For Diaphragm Type Differential Pressure Gauges & Switches

Differential Pressure Gauges & Switches for Every Need

Mid-West Instrument has been serving a variety of industries (power, chemical, petro chemical, HVAC, water, filtration) for over 45 years. Over 150,000 diaphragm type units have been produced bearing the Mid-West name or private branded for our OEM customers!

Mid-West's forte is flexibility and quick response. Standard configuration can be customized and modified to suit a customer's need for easy installation or retrofit.

Differential pressure is sensed by the movement of an elastomer diaphragm against a precision calibrated range spring. The change in position of the diaphragm in response to the change in Differential Pressure moves an internal magnet. This magnet, in turn, causes a rotary magnet external to the gauge body to rotate. This rotary magnet has a pointer attached which indicates the differential pressure on the dial.

Diaphragm type Differential Pressure gauges are available with one or two hermetically sealed reed switches. The switches are adjustable (see table for the adjustment range) within a defined percentage of the full scale range of the gauge and are available in SPDT and SPST, normally open configurations for various load/power ratings. The switches can be set to activate or deactivate on rising or falling pressure. Switches are "CE" marked per the EU low voltage directive.

All Mid-West diaphragm-type differential pressure gauges can be configured for use in hazardous locations. All hazardous location switches are both CSA and UL listed. The CSA & UL listings are for the entire assembly and not just the enclosure. See our website at **www.midwestinstrument.com** or contact us at 1-800-648-5778 for specific information and ratings on all available models.

Mid-West® Instrument

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Email: sales@midwestinstrument.com
www.midwestinstrument.com

A World Leader in Differential Pressure Gauges & Switches

MODEL 130

Lowest Range Gauge

- 4-1/2" Dial
- ASME B40.100 Accuracy, Grade B (±3-2-3% FS Ascending 0-5" H_2O through 0-15 PSID)
- Wide Material Selection (Aluminum, Brass, Hastelloy C, Glass Reinforced Engineered Plastic & 316/316L Stainless Steel)
- Wide Range of Elastomers
- Wide Selection of Switching Options CE

MODEL 140

High Range Gauge

- Ranges from 0-25 PSID through 0-100 PSID
- ASME B40.100 Accuracy, Grade B (±3-2-3% FS Ascending 0-25 PSID through 0-100 PSID)
- Available with Aluminum, Brass or 316/316L Stainless Steel Bodies
- Wide Range of Elastomers
- Wide Selection of Switching Options CE

Common To All Diap

Simple Rugged Compact Design • Full Overrange Protection to Maxi
No Pressure Under The Lens • 2½" and 4½" Plastic Dial Assemb
Shatter Resistant Lens • Fully Gasketed Gauge Face Weather/Rust

MODEL 141

Standard Range Gauge

- Ranges from 0-50" H_2O through 0-25 PSID
- ASME B40.100 Accuracy, Grade B (±3-2-3% FS Ascending 0-15 PSID through 0-25 PSID)
- ASME B40.100 Accuracy, Grade D (±5% FS Ascending 0-50" H_2O through 0-400" H_2O)
- Available with Aluminum, Brass or 316/316L Stainless Steel Bodies
- Wide Range of Elastomers
- Wide Selection of Switching Options CE

MODEL 142

Low Range Gauge

- Ranges from 0-20" H_2O through 0-25 PSID
- ASME B40.100 Accuracy, Grade B (±3-2-3% FS Ascending 0-20" H_2O through 0-25 PSID)
- Available with Aluminum, Brass or 316/316L Stainless Steel Bodies
- Wide Range of Elastomers
- Wide Selection of Switching Options CE

PHRAGM GAUGES:

mum Working Pressure • Private Label Products - Custom Dials

plies • 3½" and 4½" Anodized Aluminum Dial Assemblies

Resistant Construction Standard (Conforms to NEMA-4X/IP65)

Diaphragm Gauge Specifications

	130	140	141	142
Differential Pressure Range	0-5" H_2O (0-12.4 mbar) to 0-400" H_2O (0-1 bar)	0-25 PSID (0-1.7 bar) thru 0-100 PSID (0-7 bar)	0-50" H_2O (0-125 mbar) thru 0-25 PSID (0-1.7 bar)	0-20" H_2O (0-50 mbar) thru 0-25 PSID (0-1.7 bar)
Accuracy	±3-2-3% of Full Scale	±3-2-3% of Full Scale Ascending (Except ±5% for model 141 from 0-50" H_2O through 0-399" H_2O Ascending)		
Dial Size	4-1/2"	2-1/2", 3-1/2", 4-1/2"		
Safe Working Pressure	300 PSI w/G.R. Engineered Plastic 500 PSI w/all other Body Materials	0-3000 PSI For Aluminum and Stainless Steel Bodies 0-1500 PSI for Brass Bodies		
Proof Pressure	Two Times Safe Working Pressure			
Materials of Construction Body	G.R. Engineered Plastic, Aluminum, Brass, 316/316L Stainless Steel	Aluminum, Brass, 316/316L Stainless Steel		
Materials of Construction Internals	316/316L Stainless, Teflon, Acetal			
Switch Options	Option A	Option A or B		
Electrical Enclosures	Weather-resistant NEMA 4X/IP65 or NEMA 7			

Switching Information

Standard Hermetically Sealed Reed Switch Ratings (Resistive Load)

Type	SPDT	SPST (Normally Open)
Option	A	B (Not Available on the Model 130)
Power*	3 W	25 W
Max. Current	0.25 Amps	0.5 Amps
Max. Voltage	125 VAC/VDC	240 VAC/VDC
Setting (F.S.)**	10% - 90% for 140/141; 15% - 95% for 142	10% - 90% for 140/141; 15% - 95% for 142
Hysterisis (Max/Nom)	10% / 5% Full Scale	15% / 8% Full Scale
Repeatability	1% F.S.	1% F.S.
Leads (Model 130 Only) Model 140, 141, 142 Has a terminal strip.	Three 26 Gauge 24" Long Color Coded per switch	Seven Position Terminal Strip Interface

*Product of switching voltage and current shall not exceed the power rating of the device. **Except where otherwise noted.

Reed Switch Power Relay For High Loads

For loads above the switch rating, Mid-West Power Relay 1000TR, or an equivalent relay should be used. It may be used to control loads to 10 amps. The 1000TR is mounted on a standard 4" square junction box cover.

Standards: All diaphragm differential pressure gauges/switches either conform to and/or are designed to the requirements of the following standards:

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

Totally Integrated Design, Manufacturing & Testing Facility

Mid-West Instrument in Sterling Heights, MI has an experienced staff of engineers and technicians in many disciplines. The latest technology is used for integrating the design, engineering, testing, manufacturing and assembly of Mid-West's line of precision instruments.

Customer Oriented Staff: Mid-West's staff of experienced engineers and technical personnel work with our customers to solve their most challenging custom gauge requirements.

Engineering & Custom Design: The latest CAD system software is used to develop original as well as custom gauges for Mid-West's customers.

Quality System Certification: Mid-West's quality system is 3rd party certified by QMI in accordance with CSA B51-03 Category F. The result of this quality assurance program is a five (5) Year Product Warranty ... the best in the industry!

Assembly & Testing: Mid-West utilizes a wide range of custom fixtures to meet its diverse range of standard and custom gauge assembly requirements.

Manufacturing: State-of-the-art manufacturing systems are used to reach the precision tolerances of Mid-West's full line of gauge products.

"A World Leader in Differential Pressure Gauges & Switches"

Mid-West® Instrument

6500 Dobry Dr., Sterling Heights, MI 48314
Toll Free: 1-800-648-5778 • Fax: 586-254-6509
www.midwestinstrument.com

Mid-West Instrument's **5 Year Product Warranty** is the best in the industry

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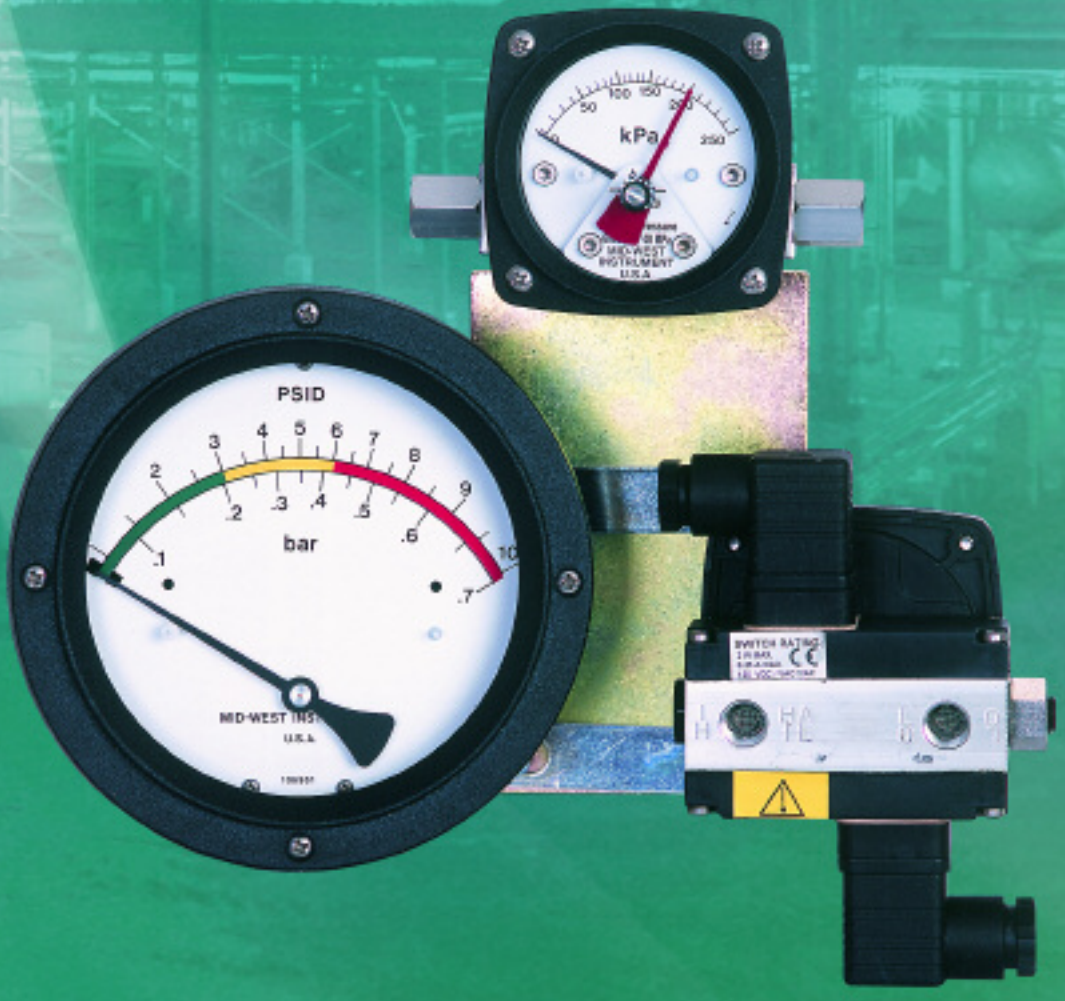
Bulletin No. PistonDP04
June 2004

Mid-West® Instrument

Your Quality Choice For Piston Type Differential Pressure Gauges & Switches



Differential Pressure Gauges & Switches for Every Need

Mid-West Instrument has been serving a variety of industries (power, chemical, petro-chemical, HVAC, water, filtration) for over 45 years. Over 500,000 piston type units have been produced bearing the Mid-West name or private branded for our OEM customers!

Mid-West's forte is flexibility and quick response. Standard configurations can be customized and modified to suit a customer's need for easy installation or retrofit.

Differential pressure is sensed by the movement of a precisely ground floating piston/magnet in a precision bore against a calibrated spring. Any variation in pressure on either side of the piston/magnet will cause the magnet to move proportionally to the change in differential pressure. A rotary pointer magnet located close to the internal magnet but outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure on the dial.

Piston-Type Differential Pressure gauges are available with one or two hermetically sealed reed switches. The switches are adjustable (see table for the adjustment range) within a defined percentage of the full scale range of the gauge and are available in SPDT and SPST, normally open or normally closed configurations for various load/power ratings. The switches can be set to activate or deactivate on rising or falling pressure. Switches are "CE" marked per the EU low voltage directive.

The model 120 can be configured for use in hazardous locations. All hazardous location switches are both CSA and UL listed. The CSA & UL listings are for the entire assembly and not just the enclosure. See our website at www.midwestinstrument.com or contact us at 1-800-648-5778 for specific information and ratings on all available models.

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A World Leader in Differential Pressure Gauges & Switches

Piston Gauge Specifications

	120	122	123
Differential Pressure Range	0-5 P.S.I.D. to 0-110 P.S.I.D.	0-5 P.S.I.D. to 0-110 P.S.I.D.	0-150 P.S.I.D. to 0-400 P.S.I.D.
	Available in a variety of equivalent ranges		
Accuracy	± 3-2-3% of Full Scale	± 5% of Full Scale	±3-2-3% of Full Scale
	All Accuracies are Based on Ascending Readings (Without Maximum Follower Pointer)		
Dial Size	2 1/2" Round (Standard), 3 1/2" Round (Optional), 4 1/2" Round (Optional)		
Working Pressure	6000 P.S.I.G. (400 BAR) Aluminum and 316/316L SS 5000 P.S.I.G. (340 BAR) Aluminum-Bronze and Monel	5000 P.S.I.G. (340 BAR)	5000 P.S.I.G. (340 BAR)
Proof Pressure	12,000 PSI (120A, 120S) 10,000 PSI (120M and 120N)	10,000 PSI	10,000 PSI
Materials of Construction Body	Aluminum, 316/316L Stainless Steel, Aluminum-Bronze and Monel	Aluminum	Aluminum, 316/316L Stainless Steel, Aluminum-Bronze and Monel
Materials of Construction Internals	316 Stainless Steel (Standard) Monel (Aluminum-Bronze and Monel bodies)		
Switch Options	SPDT 3W, 125 VA/VDC, 0.25 Amps SPST 60 W, 240 VAC/VDC, 3 Amps		
Electrical Enclosures	Weather-resistant NEMA 4X/IP65 or NEMA 7	None	Weather-resistant NEMA 4X/IP65 or NEMA 7

Switching Information

Standard Hermetically Sealed Reed Switch Ratings (Resistive Load)

Type	SPDT	SPST NO	SPDT
Option	A	E	H
Power*	3 W	60 W	60 W
Max. Current	0.25 Amps	3.0 Amps	1.0 Amps
Max. Voltage	125 VAC/VDC	240 VAC/240 VDC	240 VAC/VDC
Setting (F.S.)**	10% to 90%	25% to 100%	25% to 100%
Hysterisis (Max/Nom)	10% / 5% Full Scale (F.S.)	15% / 8% Full Scale (F.S.)	25% / 13% Full Scale (F.S.)
Repeatability	1% F.S.	1% F.S.	1% F.S.
Leads	(3) 22 Awg, 24"	(2) 22 Awg, 24"	(3) 22 Awg, 24"

*Product of switching voltage and current shall not exceed the power rating of the device. **Except where otherwise noted.

Reed Switch Power Relay For High Loads

For loads above the switch rating, Mid-West Power Relay 1000TR, or an equivalent relay should be used. It may be used to control loads to 10 amps. The 1000TR is mounted on a standard 4" square junction box cover.

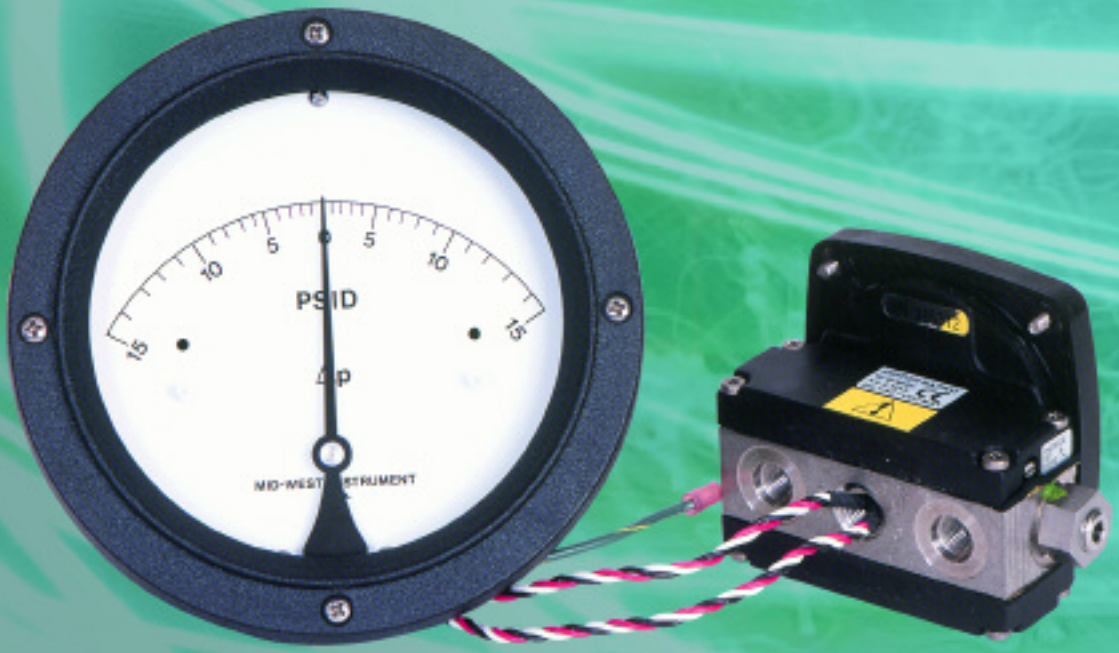
Standards: All Model 120 Series differential pressure gauges/switches either conform to and/or are designed to the requirements of the following standards:

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

MODEL 120

Standard Range Gauge

- ASME B40.100 Accuracy Grade B (±3-2-3% Ascending)
- Ranges from 0-5 PSID to 0-110 PSID (0-0.35 bar to 0-7 bar)
- Wide Material Selection (Aluminum, Brass, 316/316L SS, Aluminum-Bronze and Monel)
- Center Zero (Bi-Directional) Available
- Wide Selection of Switching Options

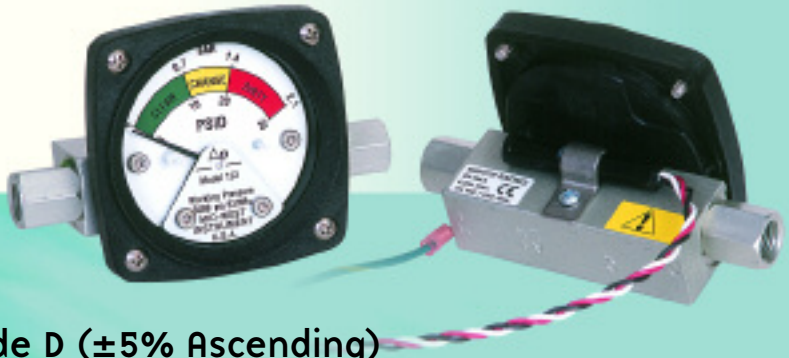


Common To All Pi

Simple Rugged Compact Design • Full Overrange Protection to Maxi
No Pressure Under The Lens • 2½" and 4½" Plastic Dial Assemb
Shatter Resistant Lens • Fully Gasketed Gauge Face Weather/Rust

MODEL 122

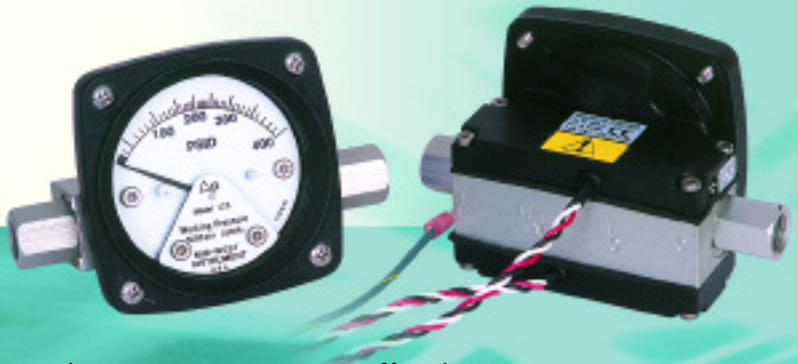
Standard Range Indicator



- ASME B40.100 Accuracy Grade D (±5% Ascending)
- Ranges from 0-5 PSID to 0-110 PSID (0-0.35 bar to 0-7 bar)
- Aluminum Construction
- Switch Options Available

MODEL 123

High Range Gauge



- ASME B40.100 Accuracy Grade B (±3-2-3% Ascending)
- Ranges from 0-150 PSID to 0-400 PSID (0-10 bar to 0-27 bar)
- Aluminum or 316/316L SS End Connected Construction
- Switch Options Available

ston Gauges:

num Working Pressure • Private Label Products - Custom Dials

plies • 3½" and 4½" Anodized Aluminum Dial Assemblies

Resistant Construction Standard (Conforms to NEMA-4X/IP65)

Totally Integrated Design, Manufacturing & Testing Facility

Mid-West Instrument in Sterling Heights, MI has an experienced staff of engineers and technicians in many disciplines. The latest technology is used for integrating the design, engineering, testing, manufacturing and assembly of Mid-West's line of precision instruments.

Customer Oriented Staff: Mid-West's staff of experienced engineers and technical personnel work with our customers to solve their most challenging custom gauge requirements.

Engineering & Custom Design: The latest CAD system software is used to develop original as well as custom gauges for Mid-West's customers.

Quality System Certification: Mid-West's quality system is 3rd party certified by QMI in accordance with CSA B51-03 Category F. The result of this quality assurance program is a five (5) Year Product Warranty ... the best in the industry!

Assembly & Testing: Mid-West utilizes a wide range of custom fixtures to meet its diverse range of standard and custom gauge assembly requirements.

Manufacturing: State-of-the-art manufacturing systems are used to reach the precision tolerances of Mid-West's full line of gauge products.

"A World Leader in Differential Pressure Gauges & Switches"

Mid-West Instrument's **5 Year Product Warranty** is the best in the industry

Mid-West® Instrument

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Toll Free: 1-800-648-5778 • Fax: 586-254-6509
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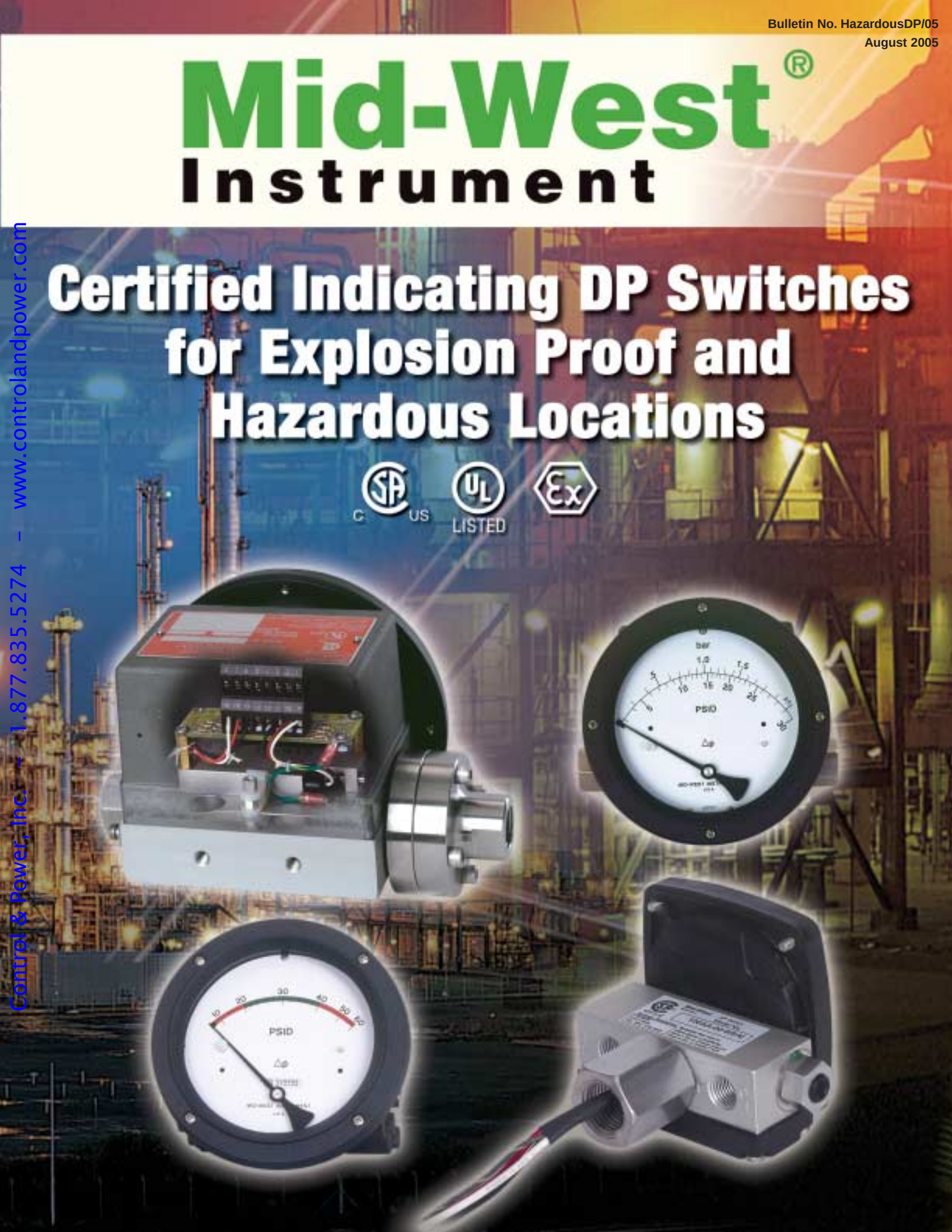
Bulletin No. HazardousDP/05
August 2005

Mid-West® Instrument

Certified Indicating DP Switches for Explosion Proof and Hazardous Locations



Differential Pressure Gauges and Switches for All Your Hazardous Location Requirements

Mid-West Instrument has been designing and manufacturing indicating differential pressure switches for use in hazardous locations for over 30 years. We are proud to add ATEX certification to our broad line of CSA and UL certified products. ATEX, CSA and/or UL certifications apply to the entire assembly as mandated by the Hazardous Location Standards.

Differential pressure is sensed either by the movement of an elastomer diaphragm or a precision ground piston in a precision controlled bore. The change in position of these sensing elements in response to a change in differential pressure moves an internal magnet. The movement of this magnet causes the closure (or opening) of the contacts of a hermetically sealed reed switch.

Instruments for use in hazardous locations are available with one or two hermetically sealed reed switches. The switches are adjustable (see table for the adjustment range) within a defined percentage of the full scale range of the gauge and are available in SPDT and SPST, configurations for various load/power ratings. The switches can be set to activate or deactivate on rising or falling pressure. Switches, including Division II classsified switches, are “CE” marked per the EU low voltage directive.

All hazardous location switches are both CSA and UL listed. Some units are ATEX certified. All of these listings are for the entire assembly, not just the enclosure. See our website at **www.midwestinstrument.com** or contact Mid-West Instrument at 1-800-648-5778 for specific information and ratings on all available models.

Mid-West® Instrument

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Fax: 586-254-6509
Email: sales@midwestinstrument.com
www.midwestinstrument.com

A World Leader in Indicating DP Switches for Explosion-Proof and Hazardous Locations

Division II Classified Designs

MODEL 120

Piston Type Gauge

- CSA and UL Listed with SPST or SPDT Switches for use in Class I, Division II, Groups A, B, C & D; Class II Division II Groups F & G
- Switches available with load ratings up to 60 watts
- CE marked in accordance with the EU Low Voltage Directive
- Pressure containing elements in Aluminum, 316/316L SS, Brass, Monel & Aluminum-Bronze
- Rugged Piston Type Gauge
- SWP 5000 PSI
- Differential pressure ranges from 0-5 PSID (0-0.35 bar) to 0-110 PSID (0-7.0 bar)
- 2 1/2", 3 1/2" and 4 1/2" dials available
- Accuracy ± 2% (ASME B40.100 Grade B) Full Scale Asending
- 1/2" FNPT conduit entry

MODELS 140, 141, 142

Diaphragm Type Gauges

- CSA and UL Listed with SPST or SPDT Switches for use in Class I, Division II, Groups A, B, C & D; Class II Division II Groups F & G
- Diaphragm design provides positive high to low isolation
- Switches available with load ratings up to 25 watts
- CE marked in accordance with the EU Low Voltage Directive
- Pressure containing elements in Aluminum, 316/316L SS, Brass
- SWP 3000 PSI (Aluminum, 316/316L SS) 1500 PSI (Brass) For Models 140, 141
- SWP 1500 PSI (Aluminum, 316/316L SS), 750 PSI (Brass) For Model 142
- Differential pressure ranges from 0-20" H_2O (0-50 mbar) to 0-100 PSID (0-7.0 bar)
- 2 1/2", 3 1/2" and 4 1/2" dials available
- Accuracy ± 2% (ASME B40.100 Grade B) Full Scale Asending
- 1/2" FNPT conduit entry

Control & Power, Inc. – 1.877.835.5274 – www.controlandpower.com

Common To All Units For Use In Explosi

ATEX, CSA and UL Listed • Simple Rugged Compact Design •
• Private Label Products - Custom Dials
• Fully Gasketed Gauge Face Weather/Rust Resistant

Explosion-Proof/Flame-Proof Designs

MODEL 220

Piston Type For Group B *(Hydrogen Service)*

- ATEX Ex d IIB + H_2; Ex II 2GD IP65
- CSA and UL listed for Class I, Division I, Groups B, C & D and Class II, Division I Groups E, F & G; Class I, Division II, Groups A, B, C & D, Class II, Division II, Groups F & G.
- Division II unit is NEMA 4X rated
- SWP up to 4000 PSI
- Compact rugged piston design
- Up to 10 AMP 120/240 VAC switching with DPDT relay output
- Hermetically sealed switch outputs up to 3 AMPS in SPST configuration and 1 AMP in SPDT configuration
- ½" FNPT conduit cable interface with internal terminal strip
- Differential pressure ranges from 0-5 PSID (0-0.35 bar) to 0-100 PSID (0-7.0 bar)
- Accuracy ± 2% (ASME B40.100 Grade B) Full Scale Asending

MODEL 240

Diaphragm Design For Group B *(Hydrogen Service)*

- ATEX Ex d IIB + H_2; Ex II 2GD IP65
- CSA and UL Listed for Class I, Division I, Groups B, C & D and Class II, Division I Groups E, F & G; Class I, Division II, Groups A, B, C & D, Class II, Division II, Groups F & G.
- Division II unit is NEMA 4X rated
- SWP to 1500 PSI
- Compact rugged diaphragm design
- Up to 10 AMP 120/240 VAC switching with DPDT relay output
- Hermetically sealed switch outputs up to 3 AMPS in SPST configuration and 1 AMP in SPDT configuration
- ½" FNPT conduit cable interface with internal terminal strip
- Diaphragm design provides positive high to low isolation
- Differential pressure ranges from 0-20" H_2O (0-50 mbar) to 0-100 PSID (0-7.0 bar)
- Accuracy ± 2% (ASME B40.100 Grade B) Full Scale Asending

Control & Power, Inc. – 1.877.835.5274 – www.controlandpower.com

on-Proof and Hazardous Locations

Full Overrange Protection to Maximum Working Pressure

- **Shatter Resistant Lens**

Construction Standard (Conforms to NEMA-4X/IP65)

Specification for Gauges/Switches for Hazardous Locations

	120	140	141	142	220	240
Differential Pressure Range	0-5 PSID (0-0.35 bar) to 0-100 PSID (0-7.0 bar)	0-25 PSID (0-1.7 bar) thru 0-100 PSID (0-7.0 bar)	0-50" H_2O (0-125 mbar) thru 0-25 PSID (0-1.7 bar)	0-20" H_2O (0-50 mbar) thru 0-25 PSID (0-1.7 bar)	0-5 PSID to (0-0.35 bar) to 0-100 PSID (0-7.0 bar)	0-20" H_2O to (0-50 mbar) to 0-100 PSID (0-7.0 bar)
Accuracy	Accuracy ± 2% (ASME B40.100 Grade B) Full Scale Asending					
Dial Size	2 1/2", 3 1/2", 4 1/2"				4 1/2"	
Safe Working Pressure PSI	Up To 5000 PSI (340 bar)	Up To 3000 PSI (200 bar)		Up To 1500 PSI (100 bar)	Up To 3000 PSI (200 bar)	Up To 1500 PSI (100 bar)
Proof Pressure	2 times SWP					
Materials of Construction (Pressure Containing Elements)	Aluminum, 316/316LSS					
Internals	316/316LSS, Teflon, Acetal, Ceramic					
Switch Option	A,E,F,G,H	A, B	A, B	A, B	A,E,F,G,H,R	A, E, H, R
Electrical Enclosure	Engineered Plastic	Aluminum with 1/2" NPT Access				

Switching Information

TYPE	SPDT	SPST	N.O. SPST	N.C. SPST	SPST(1)	SPDT	
OPTION	**A**	**B**	**E**	**F**	**G**	**H**	**R**
Power* (Watts)	3	25	60	60	60	60	—
Max Current (AMPS)	.25	.5	3	3	3	1.0	10A.
Max. Voltage AC/DC	125	240	240	240	240	240	240/30
Setting % F.S. min/max	15/90	10/90	25/95	25/95	25/95	25/100	15/90
Repeatability % F.S.	1	1	1	1	1	1	1
Available on	All	140 141 142	120 220 240	120 220	120 220	120 220 240	220 240

* The product of voltage and current shall not exceed the power rating of the device.

(1) Two switch option – one switch normally open, one switch normally closed

STANDARDS: All explosion-proof differential pressure gauges/switches either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1
ASME B40.100
CSA-C22.2 No. 14, 25, 30 and 213
EN60079-0, EN60079-1, EN50281-1-1, EN13463-1, EN61010-1 and EN60529
NACE MR0175
NEMA Std. No. 250
SAE J514
UL Std. No. 50, 508, 698, 1203 and 1604

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Assembly & Testing: Mid-West utilizes a wide range of custom fixtures to meet its diverse range of standard and custom gauge assembly requirements.

Manufacturing: State-of-the-art manufacturing systems are used to reach the precision tolerances of Mid-West's full line of gauge products.

"A World Leader in Certified Indicating DP Switches for Explosion-Proof and Hazardous Locations"

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Mid-West Instrument's **5 Year Product Warranty** is the best in the industry

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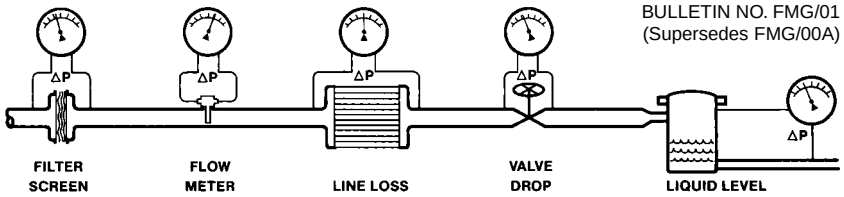
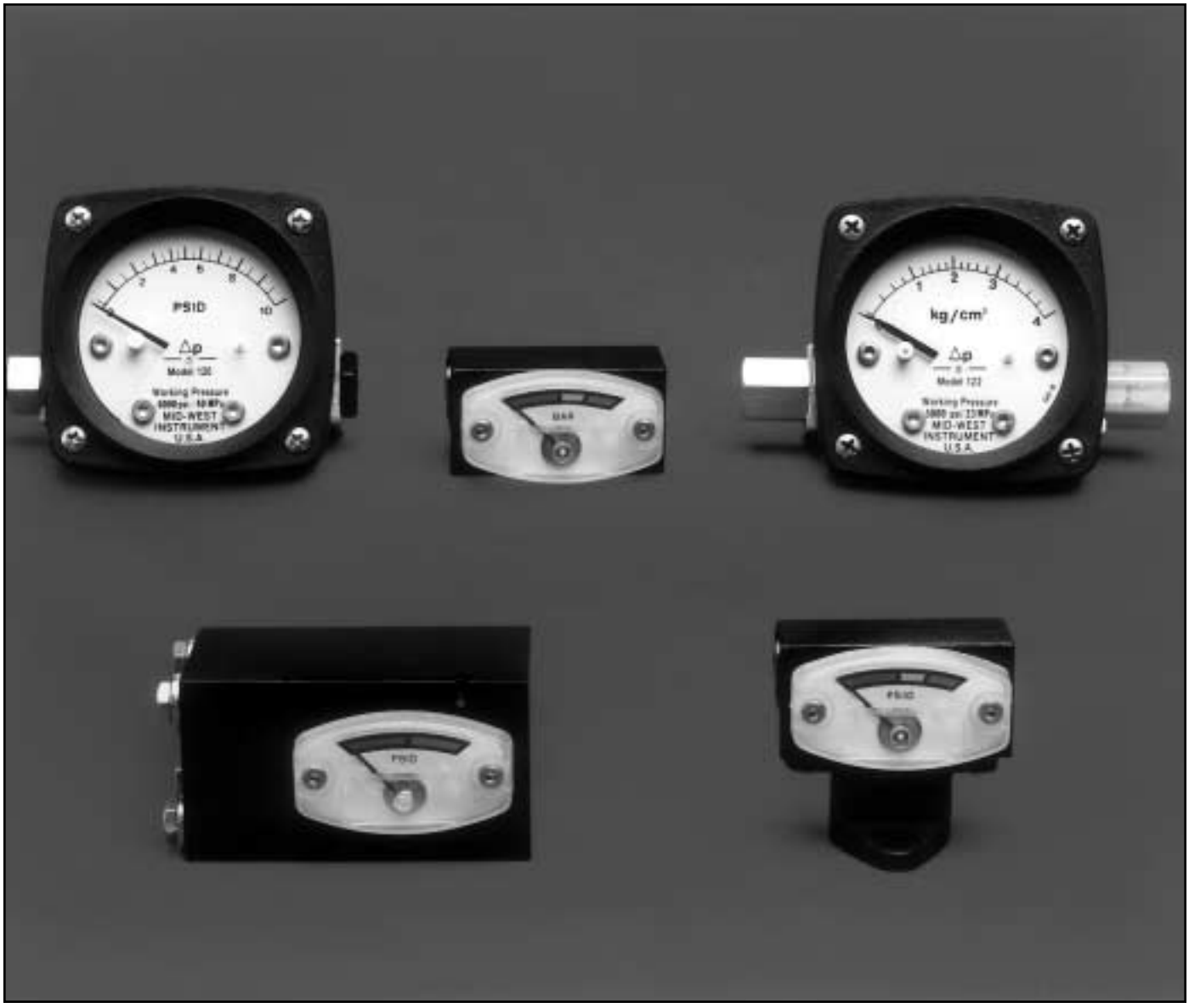
BULLETIN NO. FMG/01
(Supersedes FMG/00A)



"FILTER-MINDER®" Differential Pressure Gauges

(Five Year Limited Warranty)



- Low cost reliable differential pressure gauges for use in measuring pressure drop across filters, strainers, separators.
- Most cost effective and more accurate than using two pressure gauges in monitoring filter performance. All gauges can be private branded.
- Aluminum or 316 stainless steel housing with 316 stainless steel internals with a variety of connections/mountings optionally available.

120

122

126

140/141

146

SPECIFICATIONS

MODEL NUMBER	120	122	126	127	140/141	146
DIFFERENTIAL PRESSURE RANGE	0-5 PSID THRU 0-100 PSID		0-5 PSID TO 0-30 PSID	0-30 PSID TO 0-100 PSID	0-50" H_2O THRU 0-100 PSID	0-50" H_2O THRU 0-100 PSID
ACCURACY	± 3-2-3% F.S.	± 5% F.S.	± 5% F.S.	± 5% F.S	(0-50" to 0-400" H_2O) +/-5% F.S. (0-15 thru 0-100 PSID)± 3-2-3% F.S.	± 5% F.S.
DIAL SIZE	(1) 2-1/2" ROUND (STD.) (1) 3-1/2" ROUND (OPT.) (1) 4-1/2" ROUND (OPT.)	(1) 2-1/2" ROUND (STD) (1) 3-1/2" ROUND (OPT.) (1) 4-1/2" ROUND (OPT.)	(1) 1-1/4" x 2-1/4" OVAL (STD.) (2) 1-1/4" x 2-1/4" OVAL (OPT.)	(1) 1-1/4" x 2-1/4" OVAL (STD.) (2) 1-1/4" x 2-1/4" OVAL (OPT)	(1) 2-1/2" ROUND (STD.) (1) 3-1/2" ROUND (OPT.) (1) 4-1/2" ROUND (OPT.)	(1) 1-1/4" x 2-1/4" OVAL (STD.) (2) 1-1/4" x 2-1/4" OVAL (OPT.)
WORKING PRESSURE	6,000 PSIG	5,000 PSIG	3,000 PSIG	3,000 PSIG	3000 PSIG-ALUM. 316 S.S. 1,500 PSIG-BRASS	1,000 PSIG
OPERATING TEMPERATURE	-40° F (-40° C) TO + 200° F (+93° C)					
BODY MATERIALS	ALUMINUM (STD.) 316 S.S. (OPT.)	ALUMINUM	ALUMINUM (STD.) 316 S.S. (OPT.)	ALUMINUM (STD.) 316 S.S. (OPT.)	ALUMINUM (STD.), BRASS, 316 S.S. (OPT.)	ALUMINUM
INTERNAL MATERIALS	316 S.S.	316 S.S.	316 S.S.	316 S.S.	316 S.S. & ELASTOMER DIAPHRAGM	316 S.S. & ELASTOMER DIAPHRAGM
ELASTOMERS	BUNA N (STD.) VITON®, NEOPRENE, ETHYLENE-PROPYLENE				BUNA N (STD.) VITON®, NEOPRENE ETHYLENE-PROPYLENE (OPT.)	
SWITCH OPTIONS (PWR, VAC/VDC, Current)	SPST, 60W, 240/240, 3.0 SPDT, 60W, 240/240, 1.0 SPDT, 3W, 125/125, 0.25	SPST, 60W, 240/240, 3.0 SPDT, 60W, 240/240, 1.0 SPDT, 3W, 125/125, 0.25	SPST, 60W, 240/240, 3.0 SPDT, 3W, 125/125, 0.25	SPST, 60W, 240/240, 3.0 SPDT, 3W, 125/125, 0.25	SPST, 25W, 240/300, 0.5 SPDT, 3W, 125/125, 0.25	SPST, 60W, 240/240, 3.0 SPDT, 3W, 125/125, 0.25
SWITCH MOUNTING	ADUSTABLE ENCLOSURE	CLAMP ON, STICK ON FLATPACK	CLAMP ON, STICK ON FLATPACK OR TUBE WITH SET SCREW	CLAMP ON, STICK ON FLATPACK OR TUBE WITH SET SCREW	ADJUSTABLE ENCLOSURE	CLAMP ON, STICK ON FLATPACK OR TUBE WITH SET SCREW
MOUNTING & CONNECTIONS	1/4" FNPT BACK CONN. (STD.) 1/4" FNPT END CONN. (OPT.)	1/4" FNPT END CONN. (STD.) 1/4" FNPT BACK CONN. (OPT.)	1/8" FNPT BOTTON CONN. (STD.) 1/8" FNPT END CONN. (OPT.)	1/8 " FNPT BOTTOM CONN. (STD.) 1/8" FNPT END CONN.	1/4" FNPT BACK CONN. (STD.) 1/4" FNPT TOP CONN. (OPT.) 1/4" FNPT BOTTOM CONN. (OPT.)	1/8" FNPT BOTTOM (STD.) END CONN.
GAUGE DESIGN	MAGNETICALLY-COUPLED PISTON-TYPE				MAGNETICALLY-COUPLED DIAPHRAGM-TYPE	
BASE DIMENSIONS	3.3" x 1.97" x 4.25"	3.3" x 1.97" x 4.93"	1.25" H x 1.62" W x 2.78" L	1.25" H X 1.62" W X 2.48" L	3.3" x 2.75" x 5.41"	1.7" H x 2.5" W x 2.9" L
BASE WEIGHT (ALUMINUM)	1.0#	1.0#	0.5#	0.6#	2.75#	2.5#
STANDARDS*	ASME B40.1, B1.20.1 CSA-C22.2 No. 14.25.30 EN-6010-1 NACE MR0175 NEMA Std. No. 250 SAE J514 UL Std. No. 50,508,1203			ASME B1.20.1 SAE J514		

*Mid-West Instrument products conform to and/or are designed to the requirements of the standards shown above.

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Mid-West®
Instrument

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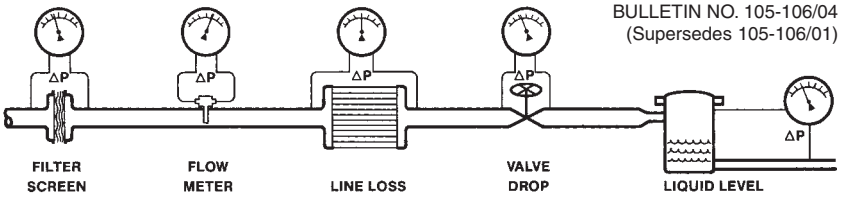
BULLETIN NO. 105-106/04
(Supersedes 105-106/01)



Model 105/106
Differential Pressure Gauge

LOW RANGE: 0-10" H_2O to 0-400" H_2O (25 mbar to 1 bar)

The Model 105/106 diaphragm/bellows design provides a simple, compact, accurate, direct-acting, low range differential pressure indicator.

- Working pressures of 500, 1500, 3000, or 6000 psig (400 bar) are available in the same housing size. The gauges are cost efficient, light weight and easy to install.
- Aluminum, Brass, Carbon Steel, or 316 Stainless Steel housings with a choice of Copper-Alloy or Stainless Steel diaphragm/bellows and a wide variety of elastomers. The materials of construction can easily be matched to the application.
- Mechanical over-range protection high to low and low to high. The Models 105/106 gauges require no additional “fill” liquid in their over-range system, eliminating the possibility of system contamination. The gauge is easier and less expensive to service/repair than competitive units.
- Uni-directional or bi-directional dials are readily available. Offers the ability to read positive or positive/negative differential pressure with one gauge.
- Gauges are optionally available with one or two switches. Offers the ability to have alarm or control.
- The Models 105/106 come with a five year limited warranty on gauge workmanship and materials, with a one year warranty on switch options. Provides a quality product with the long term security of a product warranty.

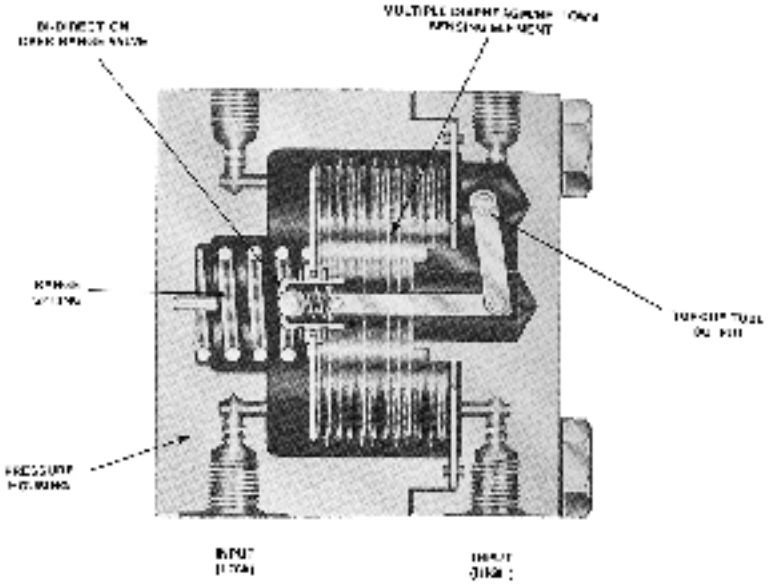
MODEL 105/106 CHARACTERISTICS

The major components of the Model 105/106 are a two-piece body, a multiple diaphragm/bellows sensing element and over-pressure assembly, a torque tube assembly, a range spring and the gauge front assembly.

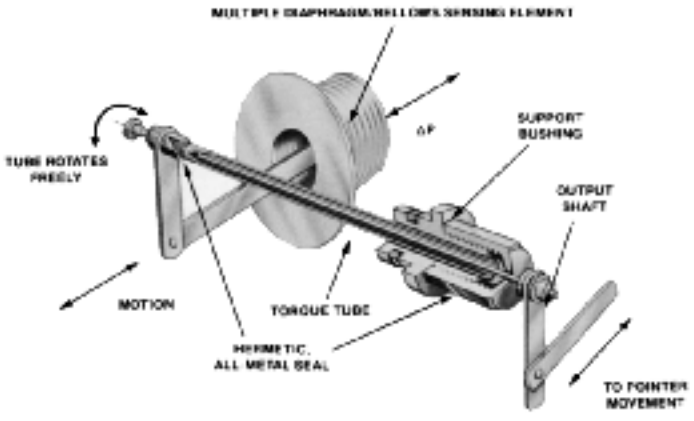
The body halves provide the pressure containment function. They also clamp the sensing element and over-pressure assembly between the halves, isolating the high side and low side pressures of the system. The high side body half also provides a mount for the torque tube assembly and the gauge front assembly.

The sensing element is exposed to the differential pressure and deflects in response to the differential pressure. This 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 it's maximum rating. The opening of the valve in either direction equalizes the pressure and protects the unit.

A range spring is provided to adust the spring rate of the system to suit the various differential pressure ranges of the instrument.



TYPICAL CROSS SECTION



TORQUE TUBE ASSEMBLY

The torque tube assembly consists of a rigid shaft and torque tube. The torque tube is welded to a bushing which is fixed to the high side pressure body half. The other end of the tube is welded to the shaft. The shaft is connected to the sensing element by a linkage. As the sensing element deflects, it causes the torque tube to twist. The torque tube provides a frictionless transmission of an output which is proportional to the differential pressure.

The torque tube shaft extends into the gauge front assembly and is connected to a low-friction, jeweled movement which provides output to the pointer.

"LOCKED LOGIC" SOLID STATE ALARM-CONTROL FOR ALL 105, 106 GAUGES (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.

STANDARD MODEL SPECIFICATIONS

105-CE-00-OO

1500 P.S.I.G./Working Pressure Aluminum Body & Copper Alloy Internals; 6" Uni-Directional Dial ±1% Full Scale Accuracy; Buna N Seals, 1/4" FNPT Connections (Dual-Top & Bottom). Weather resistant engineering plastic case & shatter resistant acrylic lens.

PART NUMBERING SYSTEM

□□□ - □□ - □□ - □□□□ - □□□

① **BASIC MODEL NUMBER**
105 0-10 Thru 0-80" H_2O (Or equivalent)
106 Over 0-80 To 0-400" H_2O

② **WORKING PRESSURE, MATERIAL**
C. 1500 P.S.I.G./ Alum. Body & Copper Alloy Internals
D. 3000 P.S.I.G./ Alum. Body & Copper Alloy Internals
E. 6000 P.S.I.G./ Alum. Body & Copper Alloy Internals
F. 1500 P.S.I.G./Alum. Body & S.S. Internals
G. 3000 P.S.I.G./Alum. Body & S.S. Internals
H. 6000 P.S.I.G./Alum. Body & S.S. Internals
J. 1500 P.S.I.G./Carbon Steel Body & Copper Alloy Internals
K. 3000 P.S.I.G./Carbon Steel Body & Copper Alloy Internals
L. 6000 P.S.I.G./Carbon Steel Body & Copper Alloy Internals
M. 1500 P.S.I.G./Carbon Steel Body & S.S. Internals
N. 3000 P.S.I.G./Carbon Steel Body & S.S. Internals
P. 6000 P.S.I.G./Carbon Steel Body & S.S. Internals
Q. 1500 P.S.I.G./316 S.S. Body & S.S. Internals
R. 3000 P.S.I.G./316 S.S. Body & S.S. Internals
T. 6000 P.S.I.G./316 S.S. Body & S.S. Internals
U. 1500 P.S.I.G./Brass Body & Copper Alloy Internals
V. 500 P.S.I.G./Brass Body & Copper Alloy Internals
X. 1500 P.S.I.G./Brass Body & S.S. Internals

③ **DIAL TYPE ACCURACY**
E. ±1% F.S., Uni-Directional (STD)
F. ±1% T.S., Bi-Directional
G. ±1/2% F.S., Uni-Directional (30" W.C. DP & Above)
Z. Special

④ **SEALS**
0. Buna N (Standard)
1. Viton®
2. Neoprene
5. Ethylene Propylene
6. Perfluoroelastomer
9. Special

*Viton® is a Registered Trademark of DuPont Dow Elastomers

⑤ **CONNECTIONS**
0. 1/4" FNPT (Dual, Top & Bottom) (STD)
1. 1/4" Carbon Steel Compression Tube Fittings
2. 1/4" 316 S.S. Compression Tube Fittings
3. 1/2" FNPT Brass Adaptors
4. 1/2" FNPT 316 S.S. Adaptors
9. Special

⑥ **OPTIONS**
O. None (STD)
F. Field Mount Kit (Std. W/Exp. Proof Enclosure)
S. Shatterproof Lens
T. Oxygen Cleaning
U. S.S. Tag w/S.S. wire
V. S.S. Tag w/S.S. screws
W. Wall Mounting Bracket
Y. 4-1/2" Dial
Z. Special

⑦ **ELECTRICAL CONFIGURATIONS**
(See Bulletin LLC Latest for details)
O. None (Standard)
A. (1) Control switch in Weatherproof Enclosure
B. (2) Control switches in Weatherproof Enclosure
C. (1) Control switch, Class 1, Groups B, C and D Explosion-proof Enclosure*
D. (2) Control switches in Class 1, Groups B, C and D Explosion-proof Enclosure*
Z. Special
*Pipe Mounting Kit Standard

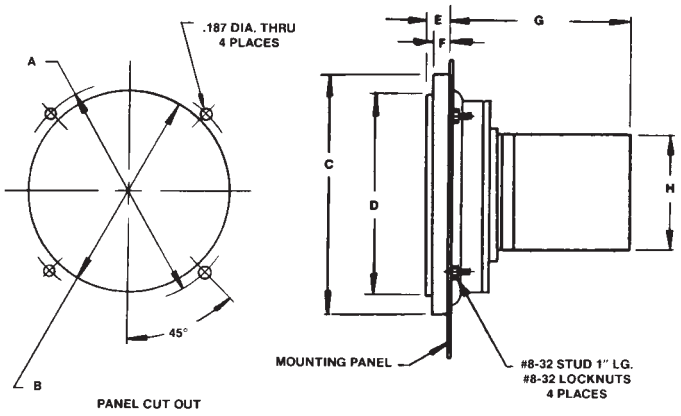
(⑦ and ⑧ up to three options)

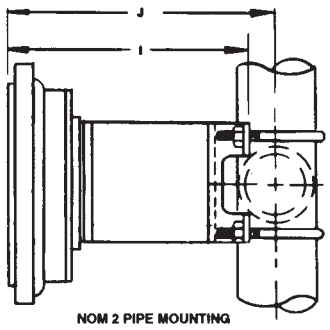
⑧ **ELECTRICAL SPECIFICATIONS**
INPUT OPTIONS
A. 8 to 28 VDC
B. 115 VAC, 50/60 Hz
C. 220/240 VAC, 50/60 Hz
D. 115 VDC
E. Standby Battery Pack, 9 VDC, 115 VAC, 50/60 Hz
F. Standby Battery Pack, 9VDC, 220/240 VAC, 50/60 Hz
Z. Special (Uncoded Options)

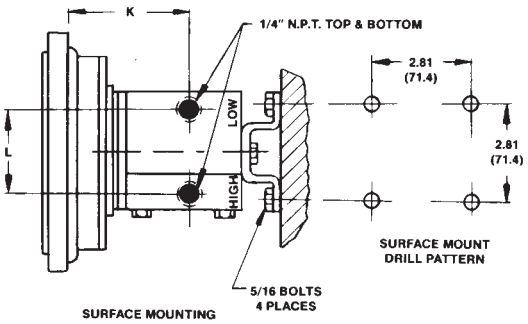
OUTPUT OPTIONS (Resistive Load - 10 Amp. @ 28VDC, 115/230 VAC (50/60 Hz))
(1/2" NPT, 24" Flying Leads Standard Interface)
(3/4" NPT, 24" Flying Leads for double set point)
A. SPDT Relay(s)
C. DPDT Relay(s) (available for 2 set points)
D. Adjustable Deadband, 1 SPDT Output
E. Adjustable Deadband, 1 DPDT Output
Z. Special (Uncoded Options)
NOTE: NOT ALL OPTIONS AVAILABLE IN COMBINATION WITH OTHER OPTIONS

NOTE: The use of diaphragm seals is not recommended for model 105/106 series gauge. Attempts to install such seals on these gauges will void the warranty.

MOUNTING INFORMATION & DIMENSIONAL DATA







MODEL	A	B	C	D	E	F	G	H	I	J	K	L
105-4½"	5.63 (143.0)	5.29 (134.3)	6.21 (157.7)	5.25 (133.3)	.85 (21.4)	.70 (17.6)	4.88 (123.9)	3.75 (95.2)	6.90 (177.2)	7.62 (193.7)	3.00 (76.2)	2.43 (62.0)
105-6"	7.00 (177.8)	6.50 (165.1)	8.18 (208.0)	6.94 (176.2)	.91 (23.1)	.76 (19.3)	4.88 (123.9)	3.75 (95.2)	7.02 (178.5)	7.74 (196.7)	3.00 (76.2)	2.43 (62.0)
106-4½"	5.63 (143.0)	5.29 (134.3)	6.21 (157.7)	5.25 (133.3)	.85 (21.4)	.70 (17.6)	4.40 (111.7)	3.00 (76.2)	6.42 (163.2)	7.14 (181.5)	3.00 (76.2)	2.43 (62.0)
106-6"	7.00 (177.8)	6.50 (165.1)	8.18 (208.0)	6.94 (176.2)	.91 (23.1)	.76 (19.3)	4.40 (111.7)	3.00 (76.2)	6.54 (166.3)	7.26 (184.5)	3.00 (76.2)	2.43 (62.0)

NOTES: 1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.

NOTES: 1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.

Manufacturer reserves the right to change specifications without prior notice.

PROOF PRESSURE: Two times working pressure or 10,000 PSI whichever is lower at ambient temperature.

TEMPERATURE LIMITS: -40°F(-40°C) to +200°F(+93°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: All Model 105/106 Series gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1
ASME B40.1
CSA-C22.2 No. 14.25 and 30
NACE MR0175
NEMA Std. No. 250
SAE J5141
UL Std. No. 50, 508 and 1203

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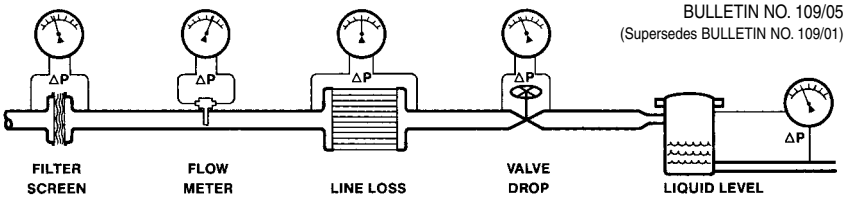
Mid-West® Instrument

BULLETIN NO. 109/05
(Supersedes BULLETIN NO. 109/01)



Model 109
Differential Pressure Gauge
(Five Year Limited Warranty)

The Model 109 encapsulated bourdon tube design provides a simple, compact, and accurate differential pressure indicator.

- Range 0-15 psid (0-1.0 bar) to 0-6000 psid (0-400 bar).
- Accuracy of ±1% or ±1/2% full scale.
- Over-range protection to maximum working pressure.
- Working pressure 1500-6000 P.S.I.G. (100-400 bar).
- Aluminum, brass, or carbon steel housing with copper alloy or stainless steel internals; or all 316 stainless steel housing with stainless steel internals.
- Uni-directional or bi-directional (center zero) dials available.
- Anti-parallax mirrored band standard on 6” dial.

"LOCKED LOGIC" ALARM CONTROLS
Model 109 gauges are optionally available with one or two switches for alarm and control.

- All solid-state optical switching. No error-producing mechanical linkage.
- Visible set pointers adjustable from 5-95% of full scale.
- Weatherproof or explosion proof enclosures. Standard input 8 to 28 VDC, standard output 10 amps. S.P.D.T.
(See bulletin LLC Latest for details).

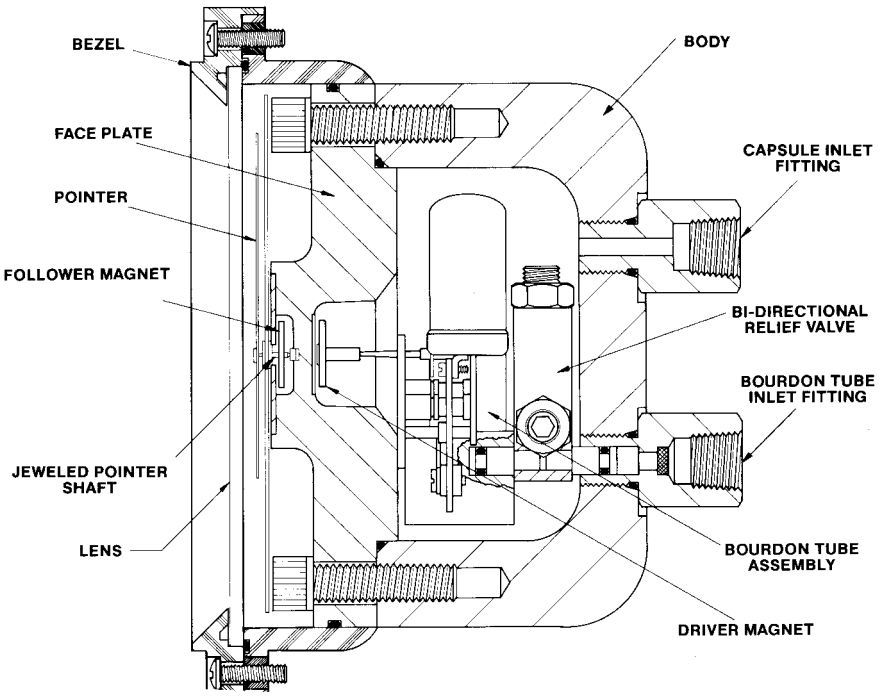
MODEL 109 CHARACTERISTICS

The Model 109 is 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. The model 109 indicates the difference between the pressure applied inside the Bourdon Tube and the pressure inside the chamber.

The pressure chamber for the assembly is small, close fitting and rugged. The volume displacement of the Bourdon Tube through the pressure range is near to zero (0.02 c.c.). The speed of response of the indicator to changes in differential pressure is instantaneous, even on low volume pressure systems. The low volume displacement is an important advantage for differential pressure leak detection, and when isolation diaphragms are required.

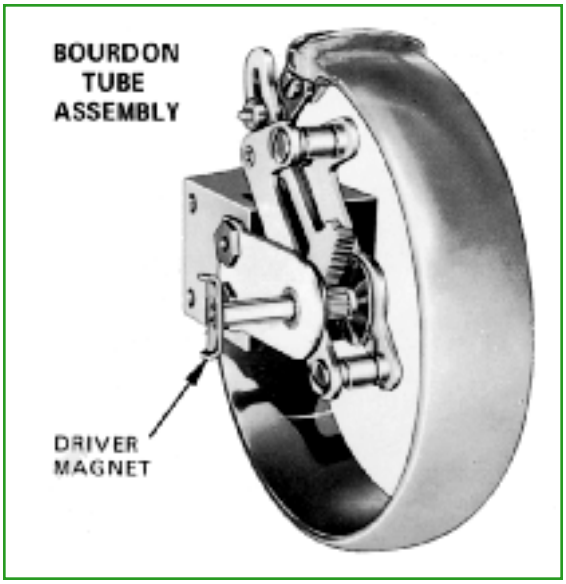
The Bourdon Tube Assembly is protected against over-range in either direction to the rated working pressure by a bi-directional relief valve.

The output shaft of the gauge assembly is magnetically coupled through the solid wall of the pressure chamber to a sensitive jeweled pointer shaft in the dial housing outside the chamber. The magnetic coupling transmits the exact motion of the assembly to the pointer to give an accurate dial reading of the differential pressure.



DETAILS OF CONSTRUCTION

The Bourdon Tube is mounted on a connection block and to an open gear and sector gauge movement. A ceramic coupling magnet is carried on the output shaft of the movement. A bi-directional relief valve is installed between the Bourdon Tube assembly and the high pressure inlet port.



The gauge assembly is a bolted sealed pressure chamber with a solid face plate and a heavy walled capsule. The assembly is rated at 1500, 3000 or 6000 P.S.I.G. working pressure. Pressure connections are located on the back of the capsule.

The indicating mechanism of the model 109 (the pointer, handstaff, and dial) is in a corrosion resistant engineering plastic case bolted and sealed to the face plate of the pressure chamber. The pointer is carried on a shaft with jeweled bearings. The dial, silkscreened on mirrored band aluminum, is designed so it may be rotated underneath the pointer, should rezeroing be necessary.

The shatter resistant acrylic lens is permanently attached to the bezel which snaps on to the gauge case and is sealed by a resilient seal. It is mounted to the dial chamber by four screws.

"LOCKED LOGIC" SOLID STATE ALARM-CONTROL FOR ALL 109 GAUGES (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. (See Bulletin LLC Latest for details).

Visible set pointers are provided, adjustable to within 5% of full scale of each other, and from 5 to 95% of full scale. Internal adjustment is standard.

STANDARD MODEL SPECIFICATIONS

109-CE-00-OO*

1500 P.S.I.G. Working Pressure Aluminum Body & Copper Alloy Internals; 6" Uni-Directional Dial ±1% Full Scale Accuracy; Buna N Seals, 1/4" FNPT Connections (Carbon Steel), Weather Resistant Engineering Plastic Case & Shatter Resistant Acrylic Lens.

PART NUMBERING SYSTEM

X X X - X X - X X - X X X X - X X X

① **BASIC MODEL NUMBER**

② **MATERIAL**
- C. 1500 P.S.I.G./ Alum. Body & Copper Alloy Int'ls
- D. 3000 P.S.I.G./ Alum. Body & Copper Alloy Int'ls
- E. 6000 P.S.I.G./ Alum. Body & Copper Alloy Int'ls
- F. 1500 P.S.I.G./Alum. Body & S.S. Int'ls
- G. 3000 P.S.I.G./Alum. Body & S.S. Int'ls
- H. 6000 P.S.I.G./Alum. Body & S.S. Int'ls
- J. 1500 P.S.I.G./Carbon Steel Body & Copper Alloy Int'ls
- K. 3000 P.S.I.G./Carbon Steel Body & Copper Alloy Int'ls
- L. 6000 P.S.I.G./Carbon Steel Body & Copper Alloy Int'ls
- M. 1500 P.S.I.G./Carbon Steel Body & S.S. Int'ls
- N. 3000 P.S.I.G./Carbon Steel Body & S.S. Int'ls
- P. 6000 P.S.I.G./Carbon Steel Body & S.S. Int'ls
- Q. 1500 P.S.I.G./316 S.S. Body & S.S. Int'ls
- R. 3000 P.S.I.G./316 S.S. Body & S.S. Int'ls
- T. 6000 P.S.I.G./316 S.S. Body & S.S. Int'ls
- U. 1500 P.S.I.G./Brass Body & Copper Alloy Int'ls
- V. 500 P.S.I.G./Brass Body & Copper Alloy Int'ls
- X. 1500 P.S.I.G./Brass Body & S.S. Int'ls
- Y. 500 P.S.I.G./Brass Body & S.S. Int'ls

③ **DIAL SIZE**
- E. ±1% F.S., Uni-Directional **(STD)**
- F. ±1% F.S., Bi-Directional (±3% Above 1500-0-1500 PSID)
- G. ±1/2% F.S., Uni-Directional (Not available above 1000 PSID)
- Z. Special

④ **SEALS**
- 0. Buna N **(Standard)**
- 1. Viton®**
- 2. Neoprene
- 5. Ethylene Propylene
- 6. Perfluoroelastomer
- 9. Special

⑤ **CONNECTIONS**
- 0. 1/4" FNPT Conn's. (C.S.) **(STD)**
- 1. 1/4" S.S. Compression Tube Fittings
- 2. 1/4" FNPT Adapters (Brass)
- 3. 1/4" FNPT Adapters (316 S.S.) **(STD on 316 S.S. Body)**
- 4. 1/2" FNPT Adapters (Brass)
- 5. 1/2" FNPT Adapters (316 S.S.)
- 9. Special

⑥ **OPTIONS**
- O. None (STD)
- B. Drain & Bleed Conn's. (1/8" FNPT), Brass
- C. Drain & Bleed Conn's. (1/8" FNPT), 316 S.S.
- F. Field Mount Kit (Std. W/Exp. Proof Enclosure)
- L. Liquid Filled Front
- M. Follower Pointer (Not Available with Liquid Fill)
- S. Shatterproof Lens
- T. Oxygen Cleaning
- U. S.S. Tag w/S.S. wire
- V. S.S. Tag w/S.S. screws
- W. Wall Mounting Bracket
- Y. 4-1/2" Dial
- Z. Special

NOTE: NOT ALL OPTIONS AVAILABLE IN COMBINATION WITH OTHER OPTIONS

⑦ **ELECTRICAL CONFIGURATIONS**
- O. None **(Standard)**
- A. (1) Switch, Weatherproof Enclosure
- B. (2) Switches, Weatherproof Enclosure
- C. (1) Switch, Class 1, Group B, C, D Exp. Proof Enclosure
- D. (2) Switches, Class 1 Group B, C, D Exp. Proof Enclosure
- Z. Special

⑧ **ELECTRICAL SPECIFICATIONS**

INPUT OPTIONS
- A. 8 to 28 VDC
- B. 115 VAC, 50/60 Hz
- C. 220/240 VAC, 50/60 Hz
- D. 115 VDC
- E. Standby Battery Pack, 9 VDC, 115 VAC, 50/60 Hz
- F. Standby Battery Pack, 9VDC, 220/240 VAC, 50/60 Hz
- Z. Special (Uncoded Options)

OUTPUT OPTIONS (Resistive Load - 10 Amp. @ 28VDC, 115/230 VAC (50/60 Hz))
(1/2" NPT, 24" Flying Leads Standard Interface)
- A. SPDT Relay(s)
- C. DPDT Relay(s) (available for 2 set points) (3/4" FNPT, 24" Flying Leads for double set point)
- D. Adjustable Deadband, 1 SPDT Output
- E. Adjustable Deadband, 1 DPDT Output
- Z. Special (Uncoded Options)

*Use of diaphragm seals is not recommended on the Model 109 Gauge and such field installations will automatically void any warranty consideration.

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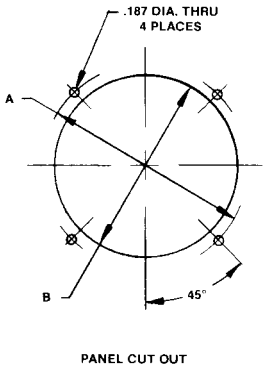
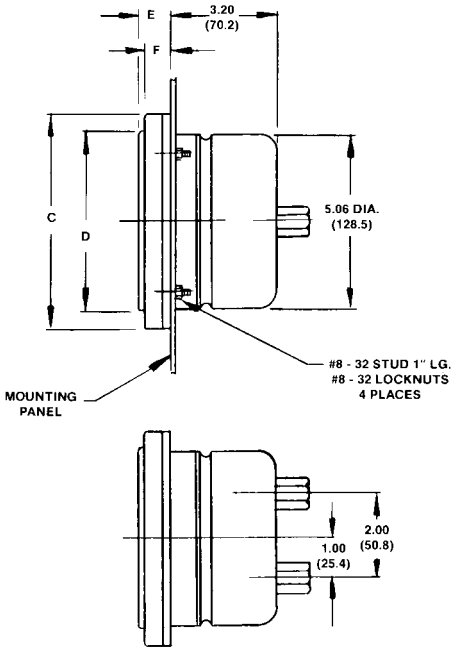
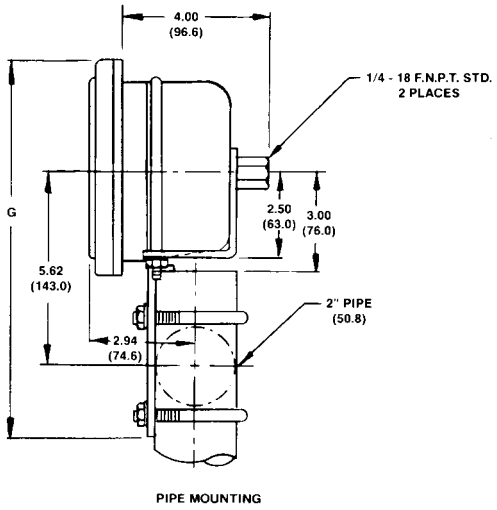
MOUNTING INFORMATION & DIMENSIONAL DATA



PANEL CUT OUT





PIPE MOUNTING

MODEL	A	B	C	D	E	F	G
109-4½"	5.63 (143.0)	5.29 (134.3)	6.21 (157.7)	5.25 (133.3)	.85 (21.4)	.70 (17.6)	11.03 (280.2)
109-6"	7.00 (177.8)	6.50 (165.1)	8.18 (208.0)	6.94 (176.2)	.91 (23.1)	.76 (19.3)	12.02 (305.5)

NOTES:
1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.

Manufacturer reserves the right to change specifications without prior notice.

PROOF PRESSURE: Two times working pressure or 10,000 PSI whichever is lower at ambient temperature.

TEMPERATURE LIMITS: -40°F(-40°C) to +200°F(+93°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: All Model 109 Series gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1
ASME B40.100
CSA-C22.2 No. 14.25 and 30
NACE MR0175
NEMA Std. No. 250
SAE J5141
UL Std. No. 50, 508 and 1203

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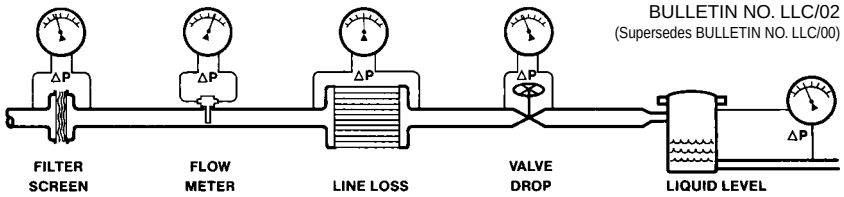


BULLETIN NO. LLC/02
(Supersedes BULLETIN NO. LLC/00)

ALARM CONTROLS
For Model 105/106/109 Gauges

Mid-West Instrument's "Locked Logic" solid state optical alarm controls feature friction free optical sensing for precise alarm set points without affecting the gauges indicating accuracy.

The "Locked Logic" system is all solid state and is available with one or two set pointers and weatherproof or explosion-proof housings.

Alternate configurations such as adjustable deadband, bi-directional dial, and DPDT outputs are also available.

Additional features include:

- Large Dial - 12"(300mm) Scale Length
- One or two visible set pointers
- Optional Power Inputs
  - 8-28 VDC
  - 110-170 VDC
  - 120 VAC
  - 240 VAC
- Standard Electrical Output (Resistive Load)
  - 10 AMP @ 30 VDC
  - 10 AMP @ 115/230 VAC-50/60 Hz
- Optional wide adjustable Deadband (From 5 to 95% of Full Scale)

Weatherproof enclosure

Explosion-proof enclosure

Accuracy plus Reliability

The Mid-West “Locked Logic” control system utilizes miniaturized solid state components that have proved their reliability and ruggedness in a variety of industrial process applications. These components have been combined in a new generation of indicating controls.

This concept provides units that are competitively priced and give superior performance as the result of a design that offers —

- **Freedom from friction — no contacts, no springs, no sliding wearing wipers**
- **Freedom from moving parts — all solid state, no wear, no shift, no misalignment**
- **Freedom from mechanical contacts — no burn-out, no erosion, no chatter, no erratic signals**
- **Freedom from auxiliary encumbrances — no vanes, no levers, no cams**
- **Freedom from error — no friction, reaction nor interaction with gauge measurement**
- **Explosion-proof option available:**
  — Division I, Class I, Groups B, C, & D;
  Class II Groups E, F & G

Design & Operation

The “Locked Logic” design utilizes two reflective optical sensors per set pointer to detect a mirrored target on the gauge indicating pointer as it passes a desired set point. Two sensors per set pointer provide hysterisis for oscillation prevention. The sensors are positioned so that upon increasing differential pressure, the right sensor determines the “Upper Trigger Point” (U.T.P.) and upon decreasing differential pressure (assuming Δp above U.T.P.), the left sensor determines the “Lower Trigger Point” (L.T.P.). The algebraic difference between the U.T.P. and L.T.P. determines the set pointer hysterisis (fixed nominally at 2%).

Figure 1 illustrates the two sensors on the control set pointer, the mirrored target on the indicating pointer, and the logic sequence, as the gauge indicating pointer moves across the control set point. For this example, “on” is defined as the output relay energized and “off” as the output relay de-energized.

With the gauge pointer below the set point S, (i.e. position A) the output is “off”. The output will remain “off” until differential pressure increases and the gauge pointer passes position “S”, which is determined by the U.T.P. sensor. As the gauge pointer moves further upscale (i.e. position D), the output will remain “on”. For the reverse direction, the output will remain “on” until the gauge pointer passes position “B”, which is determined by the L.T.P. sensor.

The “Locked Logic” design is also available with two set pointers configured for adjustable deadband functionality. For this option, the left set pointer determines the L.T.P. and the right set pointer determines the U.T.P. The deadband can be adjusted from 5 to 95% of the range span, with both set pointers controlling one S.P.D.T. or D.P.D.T. relay output. LED indications for this option are on the left set pointer only. Green shall indicate when the output is “off” and red shall indicate when the output is “on”. Applications for this option include; level control, differential pressure filter backwash, and by-pass flow control.

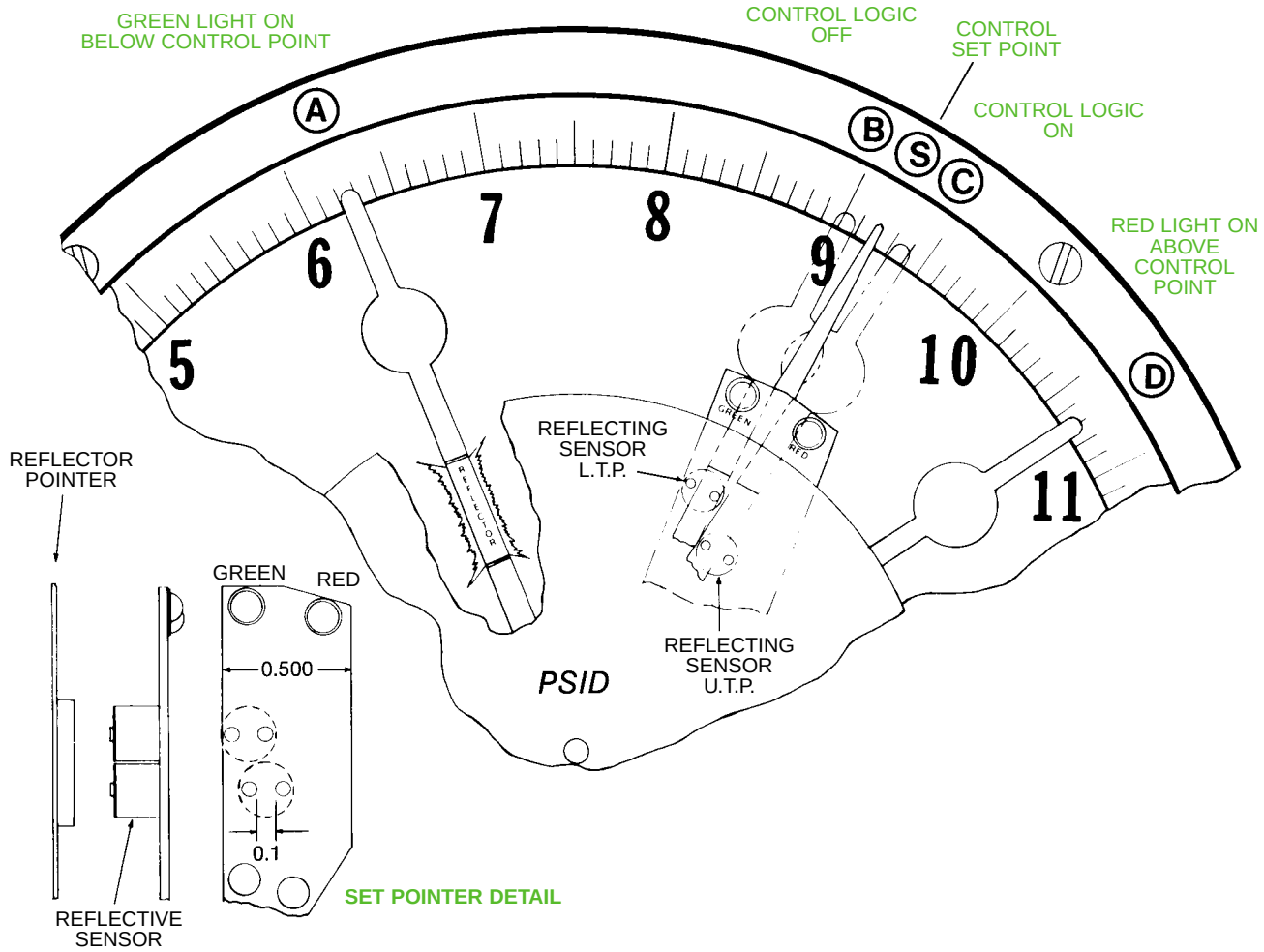
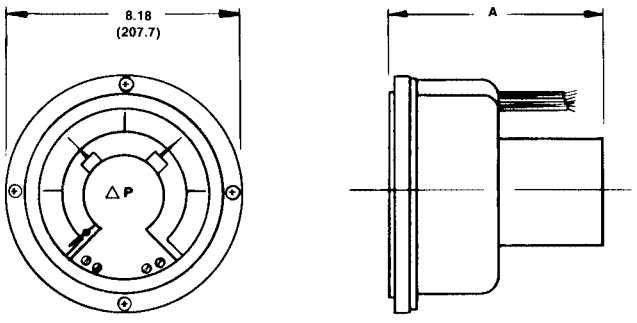


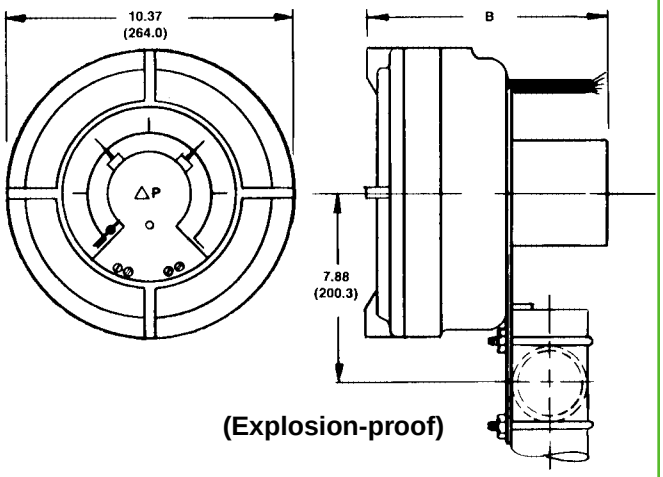
FIGURE 1 — Locked Logic control arrangement

MOUNTING INFORMATION & DIMENSIONAL DATA



(Weatherproof)

MODEL	A	B
105	7.73 (196.3)	8.86 (225.0)
106	7.25 (184.1)	8.38 (212.8)
109	6.50 (165.1)	7.63 (193.8)



(Explosion-proof)

Weight:	**Aluminum**	**Brass**
Weatherproof	12 lbs.	19 lbs.
Weatherproof (110-170 Vdc)	17 lbs.	24 lbs.
Explosion-proof	23 lbs.	30 lbs.

NOTES: 1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.

SPECIFICATIONS

Input Voltage:	Standard Range: Optional:	8 to 28 VDC 110 to 170 VDC 85 to 165 VAC 153 to 345 VAC	Select one of four input ranges.
	Reverse Polarity:	8 to 28 VDC	Input Polarity Protected Not Applicable for AC units
	Power Loss:	< 2 seconds	Loss of input power less than 2 seconds unit will remember last state of output(s).
	Logic Reset:	> 4 seconds	To reset logic, power must be off for greater than 4 seconds before re-application of input power.
Input Current:	DC Inputs: AC Inputs:	400 ma. maximum 100 ma. maximum	Steady State Values
Set Pointers:	Quantity: Adjust: Set 1 to Set 2 Diff.:	1 or 2 5% to 95% of Full Scale 5% of Full Scale (Nominal) 2 set point units only	
Output(s):	Contact(s): Contact Rating:	1 or 2 SPDT or DPDT 10 Amps Maximum 10 Amps Maximum	 @≤30 VDC @115/240 VAC
Temperature:	Operating:	-40˚F to +160˚F / -40˚C to +70˚C	
Environment:	Standard: Optional:	Weatherproof Housing Explosion-proof Housing	NEMA 4 Class I, Groups B, C & D Class II, Groups E, F, & G
Electrical Interface:	Standard:	2Ft., 18 Awg., 600V, 105˚C color coded wire leads	1/2” FNPT for 1 or 2 SPDT Outputs and 1 DPDT Output. 3/4” FNPT for 2 DPDT Outputs.
	Optional	Flexible metal conduit Weatherproof flexible metal conduit Extra lengths of either of above	
	Drawings:	101384 107882 108047 108158 108479 108736	8-28 VDC Input, SPDT Output 120/240 VAC Input, SPDT Output AC Input, 1 DPDT Output AC Input, 2 DPDT Output DC Input, 1 DPDT Output DC Input, 2 DPDT Output
Materials of Construction:	Weatherproof:	Cast Aluminum with “engineering plastic” bezel	
	Explosion-proof:	Cast Aluminum	

Manufacturer reserves the right to change specifications without prior notice.

Mid-West® Instrument

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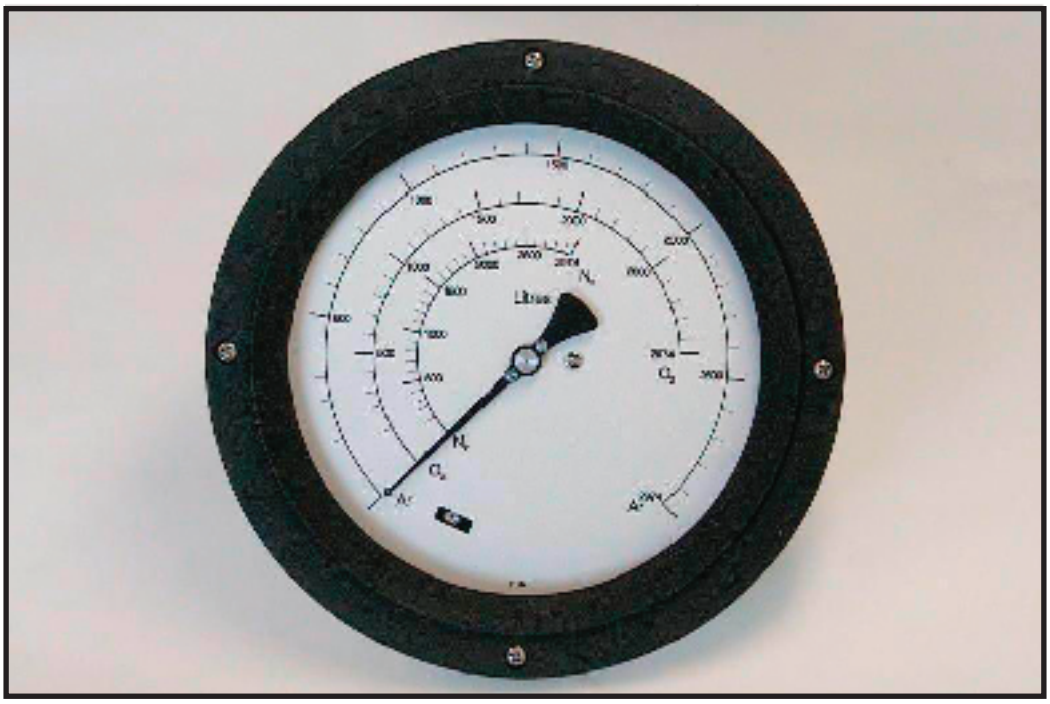
Mid-West®
Instrument

Bulletin No. 115/116/06
September 2006

MODEL 115/116

Your Quality Choice For Level Gauges or Switches For Cryogenic/Liquified Gas Applications



Model 115

Differential Pressure Range
0-10" H_2O to 0-50" H_2O
(25mbar to 125 mbar)

Model 116

Differential Pressure Range
0-50" H_2O to 0-400" H_2O
(125mbar to 1 bar)

BENEFITS:

- "Engineered Plastic" gauge front and optional stainless steel body bolts provide superior corrosion resistance in "over-the-road" trailers, outdoor or salt air environments

- Dry gauge design with no internal liquid fill
  - Eliminates costly clean up from liquid fill leaking and fouling the tank and system
  - No gauge damage/accuracy loss caused by liquid fill expansion/contraction when exposed to temperature shocks in cryogenic applications

- Up to a 30 lb. (14 kg) weight savings on liquid He ranges
  - Allows more products to be transported in mobile trailers
  - Easier and less labor to panel mount

- Adaptable to a wide variety of mounting configurations

- Ability to create custom dials for horizontal and vertical tanks

PRODUCT FEATURES:

- Bi-Directional Relief Valve
- Micro adjust pointer
- Snap acting micro switch for alarm (optional)
- In house Oxygen Cleaning (optional)
- Private labeling (optional)
- White ink on back dial or black ink on white dial

GAUGE SPECIFICATIONS

	115	116
Accuracy	± 1% of Full Scale	
ΔP Range	0-10" H_2O to 0-50" H_2O (25 mbar to 125 mbar)	0-60" H_2O to 0-400" H_2O (125 mbar to 1 bar)
Safe Working Pressure	1500 PSIG	500 PSIG (Standard) 1000 PSIG (Optional)
Body Material	Anodized Aluminum, Brass, 316/316L	Brass
Internals	316 S.S. Welded Multiple Diaphragm	316 S.S. Convoluted Bellows
Port	Dual Top and Bottom, ¼ FNPT connections with optional snubbers	
Seals	Viton® Standard, other elastomers available	
Dial	6" black dial with white lettering (white dial with black lettering optional)	
Warranty	One Year	

PROOF PRESSURE: Two times working pressure at ambient temperature

TEMPERATURE LIMITS: -40°F (-40°C) to 200°F (93°C)

STANDARDS:

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

MICRO-SWITCH SPECIFICATION

ELECTRICAL

Input Voltage:	None required		
Set Pointers:	Quantity: Adjust:	1 3% to 100% of Full Scale	With visual set point set on decreasing pressure
Output(s):	Contact(s) Contact Rating:	1 SPDT 4 Amps Maximum 3 Amps Maximum 5 Amps	 @ 30 VDC @ 240 VAC @120 VAC
Temperature:	Operating:	-20°F to +185°F	
Environment:	Standard:	Weather-proof Housing	NEMA 4
Electrical: **Interface**	Standard:	18", 18 Awg., 600 V, 105C color coded wire leads	½" FNPT
Gauge Accuracy:	2%	Including effects of the switch	
Switch Repeatability:	2%	Maximum	

Gauge Specifications: See Page 3

Manufacturer reserves the right to change specifications without prior notice

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Mid-West Instrument is proud to introduce our new

Model 115/116

Tank Level gauges for Cryogenic and liquefied gas Applications

These gauges are direct drop in replacements for the most popular level gauges on the market available with all of the common mounting configurations without having to re-tube the gauge to retrofit on your tank. These gauges fit right up to your stationary or mobile tanks just like the competition.

The Model 115/116 comes in a variety of ranges from 0-10" H2O to 0-415" H2O (0-25 mbar to 0-1 bar). Our 1000 psig working pressure is optimum for CO2 applications.

Our unique "dry" bellows design uses an internal bi-directional relief valve which protects the gauge from over pressurizing causing the bellows to rupture and fail. Ask yourself "why do I have to have these gauges repaired so often"?

Our low range Model 115 is ideal for liquid Helium and Hydrogen applications offering a 30 lb weight savings over the competition and allowing the trailer to carry more product.
Our standard gauges can be delivered in two weeks with customer approved 02 cleaning. Special applications and custom dial faces (dual scale, tri-scale or custom logo scale) can be delivered in as little as 4 weeks.

Give us a call at 800-648-5778 or visit us at www.midwestinstrument.com and find out how we can make your job easier when it comes to liquid level gauges.

Model 115/116 "Cryogenic"

Model 115 - ΔP Range 0-10" H2O (0-25 mbar) to 0-50" H2O (0-125 mbar)
Model 116 - ΔP Range 0-50" H2O (0-125 mbar) to 0-415" H2O (0-1bar)

Functions and Application

Precision Differential Pressure Gauge & Switch for
Pressurized Cryogenic/Liquefied Gas Tank Level monitoring.
Capable of operating at low differential pressures for up to
1500 PSI of line pressure.

Common Applications:

- Pressurized Tank Level Monitoring
- Stationary Tanks- Horizontal or Vertical
- Tanker Transport
- Cryogenic/Liquefied Gas Applications

Product Features:

- Drop in replacement for Barton and Prime Measurements
- Over-Range Protection, High over Low and Low over High
- Micro adjust pointer
- Tamper Proof, All adjustments require removal of bezel for access.
- Snap acting micro switch for alarm (optional)
- In house Oxygen Cleaning (optional)
- Private labeling (optional)
- Black ink on white dial or Whit ink on black dial

Product Features / Benefits:

- "Engineered Plastic" gauge front and optional stainless steel body bolts provide superior corrosion resistance in "over-the-road trailers, outdoor or salt air environments
- Dry gauge design with no internal liquid fill
- Eliminates costly clean up from liquid fill leaking and fouling the tank and system
- No gauge damage/accuracy loss caused by liquid fill expansion/contraction when exposed to temperature shocks in cryogenic applications
- Up to a 30 lb. (14 kg) weight savings on Helium and Hydrogen
- Allows more products to be transported in mobile trailers
- Easier and less labor to panel mount
- Adaptable to a wide variety of mounting configurations
- Ability to create custom dials for horizontal and vertical tanks
- **Warranty: One Year**

Specifications:

- Accuracy: +/- 1% of Full Scale
- **Model 115** - DP Range: 0-10" H2O to 0-50" H2O (25 mbar to 125 mbar)
- Safe Working Pressure: 1500 PSIG
- **Model 116** - DP Range: 0-50" H2O to 0-415" H2O (25 mbar to 125 mbar)
- Safe Working Pressure: 500 PSIG (Standard) 1000 PSIG (optional)
- **Model 115** - Internals: 316 S.S. Welded Multiple Diaphragm
- **Model 116** - Internals: 316 S.S. Convoluted Bellows
- Body Material: Brass
- Port: Dual Top and Bottom, " FNPT connections with optional snubbers
- Vilton ® Standard, other elastomers available
- 6" Black Dial with White Lettering (White Dial with Black Lettering)

Switch Options

- 1 Switch
- SPDT Outputs
- 4 Amp @ 30 VDC
- 3 Amp @ 240 VAC
- 5 Amp @ 120 VAC
- Adjustable from 3% to 100% F.S.
- Operating Temperature -20deg F to +185 deg F

- Electrical Enclosures Weather-proof NEMA 4

Static Pressure:

- 500 PSIG and 1000 PSIG Static Pressure

Temperature Limits:

- -40 deg F (-40 deg C) to 200 deg F (93 deg C)

Standards:

Model 115/116 Series Gauges either conform to and/or are designed to the requirements of the following standards;

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

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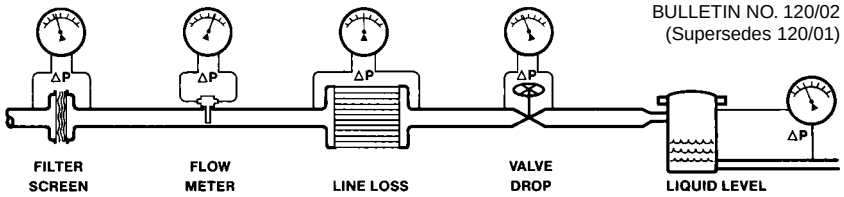


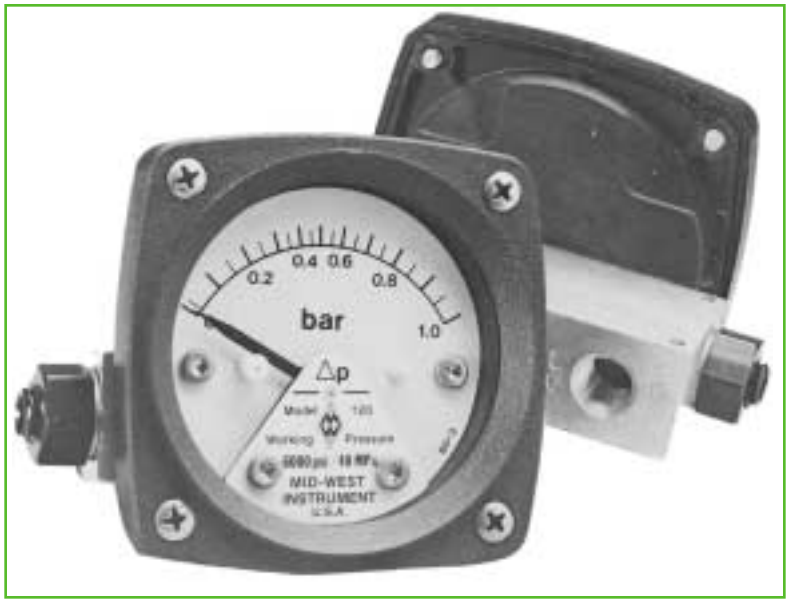
BULLETIN NO. 120/02
(Supersedes 120/01)

Model 120 Series "Filter Minder"®
Piston-Type Differential Pressure Gauge

MEDIUM RANGE: 0-5 P.S.I.D. to 0-110 P.S.I.D. (0.35 to 7.0 bar)

A low cost differential pressure gauge for use in measuring the pressure drop across filters, strainers, separators, valves, pumps, chillers, etc., and for local flow indication and control.

- Simple, rugged, compact design.
- Working pressure 6000 P.S.I.G. (400 bar) models 120-A and 120-S.
- Working pressure 5000 P.S.I.G. (340 bar) models 120-M and 120-N.
- Over-range protection to max. pressure.
- Aluminum or 316 stainless steel housing with 316 stainless steel internals.
- Monel or Aluminum Bronze housing with monel internals.
- Weather-resistant construction standard.
- Accuracy ±3-2-3% full scale (ascending).
- Shatter resistant lens.
- More cost effective and more accurate than using two pressure gauges in monitoring differential pressure.
- 2-1/2" and 4-1/2" plastic dial assemblies.



2-1/2" Plastic Dial Assy.

- 3-1/2" and 4-1/2" annodized aluminum dial assemblies.
- Uni-directional or bi-directional.
- Five Year Limited Warranty

4-1/2" Plastic Dial Assy

Differential pressure is sensed by the movement of a floating piston magnet against a calibrated spring. The gauge pointer, outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure.

Available with magnetically actuated hermetically sealed CSA listed reed switches to provide high and low limit alarm or control.

An optional maximum indication follower pointer provides automatic indication of maximum differential occuring during a time period or system cycle.

Reversed pressure ports are optionally available to facilitate installation and readability depending on which side of a filter, etc., the instrument must be installed.

2-1/2" Plastic Dial Assy. w/Max. Follower Pointer

Why use a dp gauge like this, instead of one or two pressure gauges to monitor a filter? Let's take a typical filter application – 1000 P.S.I.G. system pressure and 25 P.S.I.G. maximum dp. Two 1% accuracy pressure gauges (0-2000 P.S.I.G.) could have a combined error of ±40 P.S.I.G. (more than the maximum allowable dp!) A 0-50 P.S.I.D. Model 120 would have an error of ±1 P.S.I. at a reading of 25 P.S.I.D., **40 times the accuracy of more costly pressure gauges!**

NOTE: Due to precision sizing of piston and body bore, leakage across the piston will not exceed 15 SCFH air at 100 P.S.I.D. at ambient conditions.

Cutaway View w/1/4" FNPT Back Connections

Standard Enclosures for two (2) Switches w/1/4" FNPT Conduit Connection. Nema 4X/IP65

Model 120 "Filter Minder"®
Differential Pressure Gauge with Control Switching

The Model 120 "Filter Minder"® gauge is available with one or two hermetically sealed reed switches. The switches are adjustable (see table for adjustment range) within a defined percentage of the full scale range of the gauge and are available in SPDT and SPST, normally open or normally closed configurations for various load power ratings. The switches can be set to activate or deactivate on rising or falling pressure.

All hazardous location switches are CSA & UL Listed. The CSA & UL listings are for the entire design and not just the enclosure. All standard and weatherproof units are CE marked for conformance with the Low Voltage Directive to harmonized standard EN 61010-1.

The standard reed switch is enclosed in a weather-resistant plastic housing. Adjustment of the switch setting is made with an external screw adjustment.

The switch functionality will be different for gauges with bi-directional operation for positive and negative delta pressure. For example a SPDT switch with positive ΔP applied to the gauge, the red wire will be N.O. and the black will be N.C.. For negative ΔP the functionality will be reversed.

Location for a single SPDT (grommet or conduit) switch will be on the bottom of the gauge body for a normal port and on the top for a reverse port. Locations for a single SPST (grommet or conduit) N.O. or SPST N.C. switch will be on the bottom and top respectively for a normal port gauge. The locations will be reversed for a reverse port gauge. For more details request IM 120/latest.

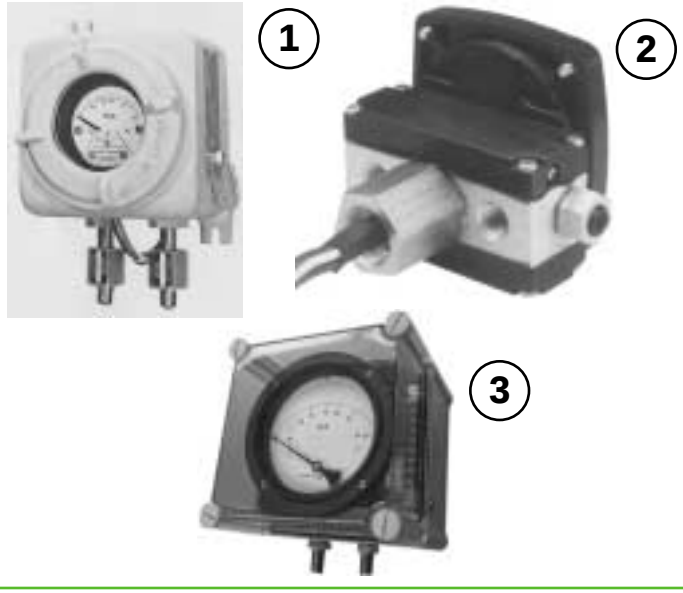
A non-indicating (no dial) differential pressure switch is also available.

Special Switch Enclosures

1. **Hazardous Locations Division 1:** CSA & UL listed design with SPST or SPDT switches in NEMA 7/9 enclosure approved for use in Class 1 Division 1, Groups C & D; Class 2, Division 1, Groups E, F, & G atomospheres.

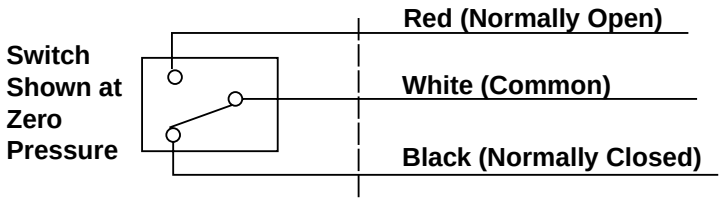
2. **Hazardous Locations Division 2:** CSA & UL listed design with SPST or SPDT switches in a general purpose enclosure approved for use in Class 1, Division 2, Groups A, B, C, & D; Class 2, Division 2, Groups F & G atmospheres.

3. **Weatherproof:** Switch(es) and gauge are enclosed in a non-corrosive, molded, plastic enclosure that are oil-tight, dust-tight, and water-tight per NEMA 4X. Design is CE marked for conformance to the Low Voltage Directive.



Reed Switch Ratings (Resistive Load)

Type	SPST	SPST	SPDT	SPDT
Option:	B,C,D***	E,F,G	H	A
*Power	50 W	60 W	60 W	3 W
Max. Current	0.5 Amps	3.0 Amps	1.0 Amps	0.25 Amps
Max. Voltage VAC/VDC	240	240	240	125
**Setting (%F.S.)	10 to 100	25 to 95	25 to 100	10 to 90
Hysterisis (Max/Nom)	10% / 2% (F.S.)	15% / 8% (F.S.)	20% / 13% (F.S.)	10% / 5% (F.S.)
Repeatability	1% F.S.	1% F.S.	1% F.S.	1% F.S.
Leads 22 Awg.	(2), 24"	(2), 24"	(3), 24"	(3), 24"



*Product of the Switching Voltage & Current shall not exceed power rating of the device.
**Except where otherwise noted.
***B, C, & D options are available, however they are not identified in Electrical Specifications. (Recommend using E, F, or G)

STANDARD MODEL SPECIFICATIONS

120-AA-00-OO

6000 P.S.I.G. Working Pressure Aluminum Body, Stainless Steel Piston, Ceramic Magnets, Buna N Seals, 2-1/2" Engineering Plastic Case with Shatter-Resistant Lens. 1/4" FNPT Back Connections. Accuracy ±3-2-3% Full Scale (Ascending).

PART NUMBERING SYSTEM

1 2 0 – □ □ – □ □ – □ □ □ □ – □ □ □

① **BASIC MODEL NUMBER**

② **MATERIAL**
- A. Aluminum Body, S.S. Piston **(Standard)**
- M. Monel Body (See 120 ABM) (5000 P.S.I.G. working pressure)
- N. Aluminum Bronze Body (See 120 ABM) (5000 P.S.I.G. working pressure)
- S. 316 S.S. Body & S.S. Piston **(Standard)**
- Z. SPECIAL (Uncoded Options)

③ **DIAL TYPE**
- A. 2-1/2" Round Uni-Directional Engrd. Plastic Housing Assy. **(Standard)**
- B. 2-1/2" Round Bi-Directional Engrd. Plastic Housing Assy.
- C. 4-1/2" Round Uni-Directional Engrd. Plastic Housing Assy.
- D. 4-1/2" Round Bi-Directional Engrd. Plastic Housing Assy.
- E. 3-1/2" Round Uni-Directional Anod. Aluminum Housing Assy.
- F. 3-1/2" Round Bi-Directional Anod. Aluminum Housing Assy.
- G. 4-1/2" Round Uni-Directional Anod. Aluminum Housing Assy.
- H. 4-1/2" Round Bi-Directional Anod. Aluminum Housing Assy.
- T. Non-Indicating Differential Pressure Switch Only (Select Appropriate Electrical Option)
- Z. Special (Uncoded Options)

④ **SEALS**
- 0. Buna N **(Standard)**
- 1. Viton®
- 2. Neoprene
- 4. Teflon®
- 5. Ethylene Propylene
- 6. Perfluoroelastomer
- 9. Special (Uncoded Options)

*Viton® is a Registered Trademark of DuPont Dow Elastomers.
**Teflon® is a Registered Trademark of DuPont.

⑤ **CONNECTIONS**
(NOTE: Models 120M and 120N available only with end connections)
- 0. 1/4" FNPT Back Connections **(Standard)**
- 2. 1/4" FNPT End Connections
- 6. 7/16" - 20 Str. Thd. O-Ring Port (Back Connections)
- 7. 1/2" FNPT Stainless Steel Adaptors
- 8. 1/2" FNPT Monel Adaptors
- 9. Special (Uncoded Options)

⑥ **OPTIONS (Up to four options)**
- O. None **(Standard)**
- A. Reversed High/Low Process Connections
- B. DIN2353 12-S (12mm) Steel Tube Fittings (2)
- C. Mounting Holes in Gauge Body for Field Mounting of Electrical Configurations Options A & B
- D. Mounting Holes in Gauge Body for Field Mounting of Electrical Configurations Options L & M
- F. Pipe Mounting Kit (Carbon Steel) (Not available w/C or D Electrical Switch Options)
- L. Liquid Fill **(Not available w/follower pointer) (Not available with 3-1/2" dial)**
- M. Maximum Indicator Follower Pointer
- T. Oxygen Cleaning
- U. S.S. Tag Mounted w/S.S. Wire
- V. S.S. Tag Mounted w/S.S. Screws
- W. Wall Mounting Kit
- X. Individual Gauge Packaging
- Z. Special (Uncoded Options)

⑦ **ELECTRICAL CONFIGURATIONS**
(NOTE: All options CE marked, except E, F, J & K)
- O. None
- A. One (1) Switch in STD. Enclosure with Grommet Wire Seal
- B. Two (2) Switches in STD. Enclosures with Grommet Wire Seal
- C. One (1) Switch in STD. Enclosure with 1/4" FNPT Electrical Connection NEMA 4X
- D. Two (2) Switches in STD. Enclosures with 1/4" FNPT Electrical Connection NEMA 4X
- E. One (1) Switch in General Purpose Enclosure, **C.S.A. & U.L.** Listed, Division II Locations [1] [3]
- F. Two (2) Switches in General Purpose Enclosure, **C.S.A. & U.L.** Listed, Division II Locations [1] [3]
- G. One (1) Switch & Gauge in NEMA 4X Plastic Enclosure (Not Available With End Connections)
- H. Two (2) Switches & Gauge in NEMA 4X Plastic Enclosure (Not Available With End Connections)
- J. One (1) Switch in Explosion Proof Enclosure with Glass Window Cover and **C.S.A. & U.L.** Listing [2]
- K. Two (2) Switches in Explosion Proof Enclosure with Glass Window Cover and **C.S.A. & U.L.** Listing [2]
- L. One (1) Switch in STD. Enclosure with Plug-In Connector (DIN 43650/IP65-PG11)
- M. Two (2) Switches in STD. Enclosure with Plug-In Connector (DIN 43650/IP65-PG11)
- Z. Special (Uncoded Options)

[1] Complete Assembly Rated Class I, Div. II, Groups A, B, C, & D; Class II, Div. II, Groups F and G.
[2] Complete Assembly Rated Class I, Div. I, Groups C & D; Class II, Div. I, Groups E, F, & G.
[3] 5000 PSIG Working Pressure.

⑧ **ELECTRICAL SPECIFICATIONS (For Resistive Loads)**
- A. S.P.D.T., 3W, 0.25 Amp., 125 VAC/VDC (Standard) (Switch adjustable range of 10-90%)
- E. S.P.S.T., 60W, 3.0 Amp., 240 VAC/VDC (Normally Open) (Switch adjustable range of 25-95%)
- F. S.P.S.T., 60W, 3.0 Amp., 240 VAC/VDC (Normally Closed) (Switch adjustable range of 25-95%)
- G. S.P.S.T., 60W, 3.0 Amp., 240 VAC/VDC One (1) Normally Open, One (1) Normally Closed [4]
- H. S.P.D.T., 60W, 1.0 Amp., 240 VAC/VDC (Switch adjustable range of 25-100%)
- Z. Special (Uncoded Options)

[4] Available with Electrical Configurations B, D, F, H, K and M only.

⑦ – ⑧ (Up to three options)

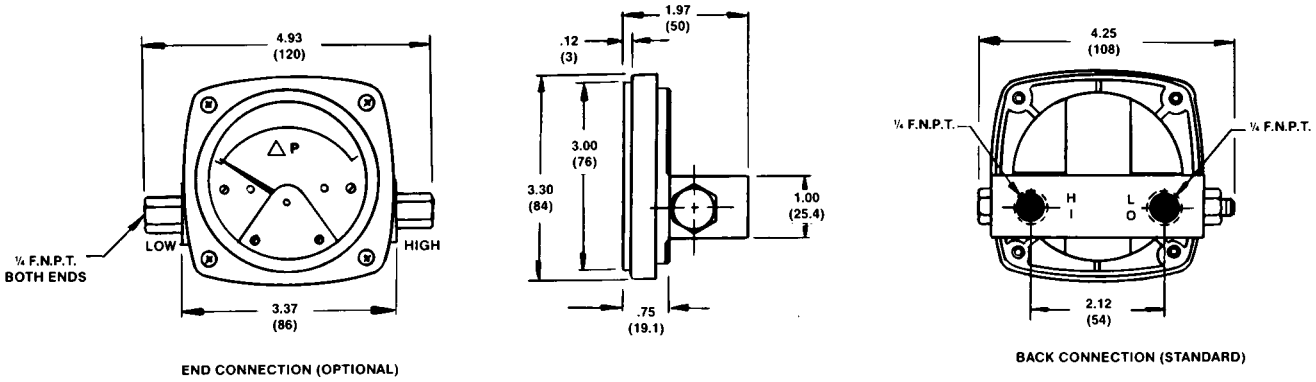
NOTE: NOT ALL OPTIONS AVAILABLE IN COMBINATION WITH OTHER OPTIONS.

NOTE: FACTORY PRESET SWITCHES AT NO CHARGE (SPECIFY SETTING)

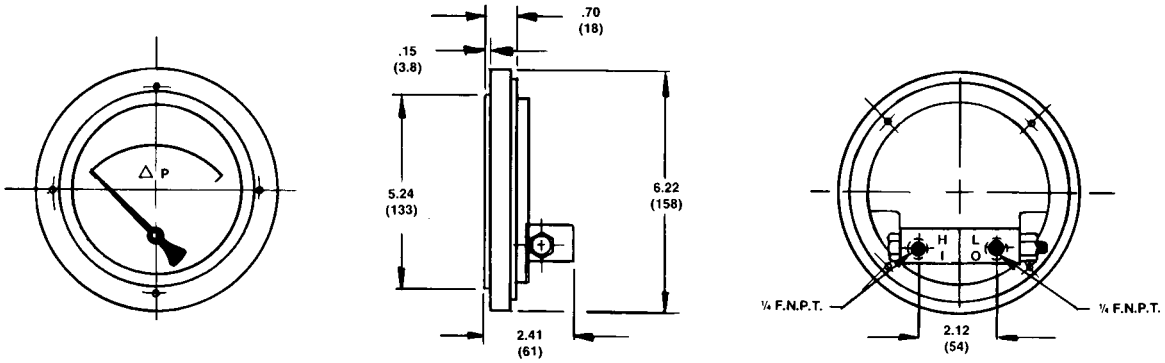
NOTE: THE USE OF DIAPHRAGM SEALS IS NOT RECOMMENDED FOR MODEL 120 SERIES GAUGE. ATTEMPTS TO INSTALL SUCH SEALS ON THIS GAUGE WILL VOID THE WARRANTY.

MOUNTING INFORMATION & DIMENSIONAL DATA

MODEL 120: 2-1/2" INCH PLASTIC DIAL ASSY.



MODEL 120: 4-1/2" INCH PLASTIC DIAL ASSY.



NOTES:
1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.
3. Mounting dimensions for 3-1/2" & 4-1/2" alum. Dial assys. – Contact Factory

Manufacturer reserves the right to change specifications without prior notice.

PROOF PRESSURE: 12,000 PSI for models 120-A and 120-S.
10,000 PSI for models 120-M and 120-N.

TEMPERATURE LIMITS: -40°F(-40°C) to +200°F(+93°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: All Model 120 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards:

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

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REPRESENTED BY:

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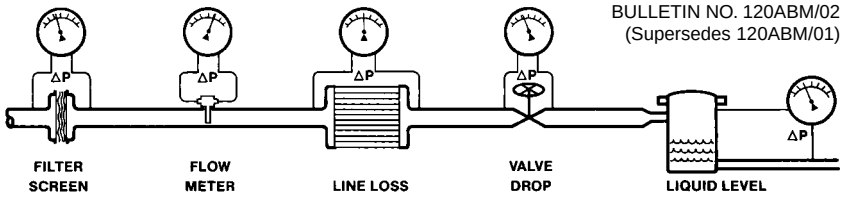
BULLETIN NO. 120ABM/02
(Supersedes 120ABM/01)



Model 120 Series "Filter Minder"® Piston-Type Differential Pressure Gauge

FOR SEA WATER APPLICATIONS

- Body materials: Aluminum-Bronze or Monel. Monel Spring and Internals.
- Standard Ranges:
  0-10, 0-15, 0-20, 0-25 and 0-30 PSID.
  (For other ranges contact factory)
- Accuracy ±5% full scale ascending.
- Working pressure 5000 P.S.I.G. (340 bar).
- Over-range protection to rated working pressure.
- Weather-resistant construction standard.
- 2-1/2", 3-1/2" or 4-1/2" round dial.
- Shatter-resistant lens.

2-1/2" Dial

Differential pressure is sensed by the movement of a floating piston magnet against a calibrated spring. The gauge pointer, outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure.

One or two hermetically sealed S.P.S.T. or S.P.D.T. reed switches are optionally available to provide high and/or low alarm or control. They may be adjusted within the set point range identified in the switch rating table. A non-indicating differential switch version is also available. (Only a single switch is available on Monel bodies)

Reversed pressure ports are optionally available to facilitate installation.

Standard Hermetically Sealed Reed Switch Ratings (Resistive Load) CE

Type	SPST NO	SPST NO	SPDT	SPDT
Option	B***	E	H	A
*Power	50W	60 W	60W	3W
Max. Current	0.5 Amps	3.0 Amps	1.0 Amps	0.25 Amps
Max. Voltage	240 VAC/240VDC	240 VAC/240 VDC	240 VAC/VDC	125 VAC/VDC
**Setting (F.S.)	10% to 100%	25% to 100%	25% to 100%	10% to 100%
Hysteresis (Max/Nom)	10% / 2% Full Scale (F.S.)	15% / 8% Full Scale (F.S.)	20% / 13% Full Scale (F.S.)	10% / 5% Full Scale (F.S.)
Repeatability	1% F.S.	1% F.S.	1% F.S.	1% F.S.
Leads	(2) 22 Awg, 24"	(2) 22 Awg, 24"	(3) 22 Awg, 24"	(3) 22 Awg. 24"

*Product of switching voltage and current shall not exceed the power rating of the device.
**Except where otherwise noted.
*** B option is available, however is not identified in Electrical Specifications. (Recommend using E)

Reed Switch Power Relay For High Loads

For loads above the switch rating, Mid-West Power Relay 1000TR, or an equivalent relay should be used. It may be used to control loads to 10 amps. The 1000TR is mounted on a standard 4" square junction box cover.

PART NUMBERING SYSTEM

1 2 0 – ☐☐ – ☐☐ – ☐☐ – ☐☐☐☐ – ☐☐☐

① **BASIC MODEL NUMBER**

② **MATERIAL**
- M. Monel
- N. Aluminum-Bronze

③ **DIAL TYPE**
- A. 2-1/2" Round Uni-Directional Engrd. Plastic Housing Assy. **(Standard)**
- B. 2-1/2" Round Bi-Directional Engrd. Plastic Housing Assy.
- C. 4-1/2" Round Uni-Directional Engrd. Plastic Housing Assy.
- D. 4-1/2" Round Bi-Directional Engrd. Plastic Housing Assy.
- E. 3-1/2" Round Uni-Directional Anod. Aluminum Housing Assy.
- F. 3-1/2" Round Bi-Directional Anod. Aluminum Housing Assy.
- G. 4-1/2" Round Uni-Directional Anod. Aluminum Housing Assy.
- H. 4-1/2" Round Bi-Directional Anod. Aluminum Housing Assy.
- T. Non-Indicating Differential Pressure Switch Only (Select Appropriate Electrical Option)
- Z. Special (Uncoded Options)

④ **SEALS**
- 0. Buna N **(Standard)**
- 1. Viton®
- 2. Neoprene
- 4. Teflon®
- 5. Ethylene Propylene
- 6. Perfluoroelastomer
- 9. Special (Uncoded Options)

*Viton® is a Registered Trademark of DuPont Dow Elastomers.
**Teflon® is a Registered Trademark of DuPont.

⑤ **CONNECTIONS**
- 2. 1/4" FNPT End Connections
- 9. Special (Uncoded Options)

⑥ **OPTIONS (Up to four options)**
- O. None **(Standard)**
- A. Reversed High/Low Process Connections
- C. Mounting Holes in Gauge Body for Field Mounting of Electrical Configurations Options A & B
- D. Mounting Holes in Gauge Body for Field Mounting of Electrical Configurations Options L & M
- F. Pipe Mounting Kit (Carbon Steel) **(CONTACT FACTORY)**
- L. Liquid Fill **(Not available w/follower pointer) (not available with 3-1/2" dial)**
- M. Maximum Indicator Follower Pointer
- T. Oxygen Cleaning
- U. S.S. Tag Mounted w/S.S. Wire
- V. S.S. Tag Mounted w/S.S. Screws
- W. Wall Mounting Kit
- X. Individual Gauge Packaging
- Z. Special (Uncoded Options)

NOTE: NOT ALL OPTIONS AVAILABLE IN COMBINATION WITH OTHER OPTIONS.

⑦ **ELECTRICAL CONFIGURATIONS**
(NOTE: All options CE marked, except E, F, J & K)
- O. None
- A. One (1) Switch in STD. Enclosure with Grommet Wire Seal
- B. Two (2) Switches in STD. Enclosures with Grommet Wire Seal
- C. One (1) Switch in STD. Enclosure with 1/4" FNPT Conduit Connection NEMA 4X
- D. Two (2) Switches in STD. Enclosures with 1/4" FNPT Conduit Connection NEMA 4X
- E. One (1) Switch in General Purpose Enclosure, CSA & U.L. Listed, Division II Locations (1) (2)
- F. Two (2) Switches in General Purpose Enclosure, CSA & U.L. Listed, Division II Locations (1) (2)
- L. One (1) Switch in STD. Enclosure with Plug-In Connector (DIN 43650/IP65-PG11)
- M. Two (2) Switches in STD. Enclosure with Plug-In Connector (DIN 43650/IP65-PG11)
- Z. Special (Uncoded Options)

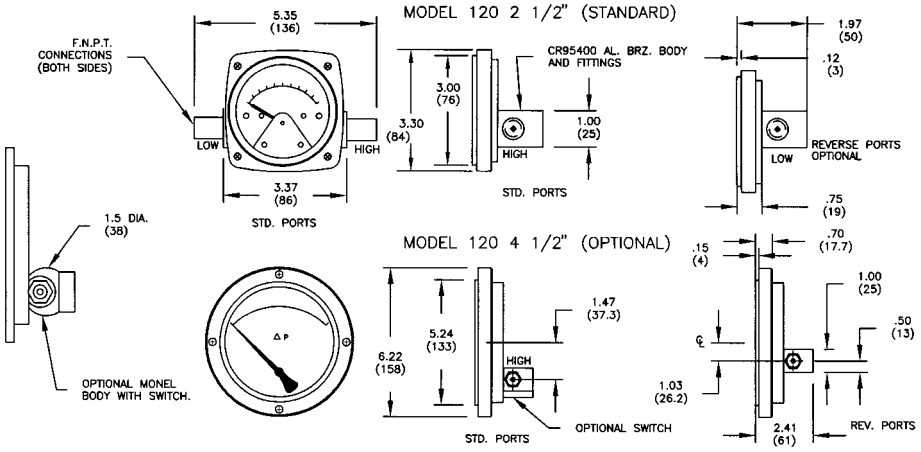
1. Complete Assembly Rated Class I, Div. II, Groups A, B, C, & D; Class II, Div. II, Groups F and G.
2. 5000 PSIG Working Pressure.

⑧ **ELECTRICAL SPECIFICATIONS (For Resistive Loads)**
- A. S.P.D.T., 3W, 0.25 Amp., 125 VAC/VDC (Standard) (Switch adjustable range of 10-90%)
- E. S.P.S.T., 60W, 3.0 Amp., 240 VAC/VDC (Normally Open) (Switch adjustable range of 25-95%)
- F. S.P.S.T., 60W, 3.0 Amp., 240 VAC/VDC (Normally Closed) (Switch adjustable range of 25-95%)
- G. S.P.S.T., 60W, 3.0 Amp., 240 VAC/VDC One (1) Normally Open, One (1) Normally Closed (Aluminum-Bronze only) (Available with Electrical Configurations B,D, F & M only) (Switch adjustable range of 25-95%)
- H. S.P.D.T., 60W, 1.0 Amp., 240 VAC/VDC (Switch adjustable range of 25-100%)
- Z. Special (Uncoded Options)

NOTE: FACTORY PRESET SWITCHES AT NO CHARGE (SPECIFY SETTING)
NOTE: THE USE OF DIAPHRAGM SEALS IS NOT RECOMMENDED FOR MODEL 120 SERIES GAUGE. ATTEMPTS TO INSTALL SUCH SEALS ON THIS GAUGE WILL VOID THE WARRANTY.

– (Up to three options) – ⑧ ⑦

MOUNTING INFORMATION & DIMENSIONAL DATA



NOTES:
1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.

Manufacturer reserves the right to change specifications without prior notice.

PROOF PRESSURE: Two times working pressure or 10,000 PSI whichever is lower at ambient temperature.

TEMPERATURE LIMITS: -40°F (-40°C) to +200°F (+93°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.

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Mid-West® Instrument

Bulletin No. 121/06

August 2006

Model 121 Series "Filter Minder"

Piston Type Differential Pressure Indicating Switch or Transmitter

2 ½" Dial – Front View

4 ½" Dial – Back View

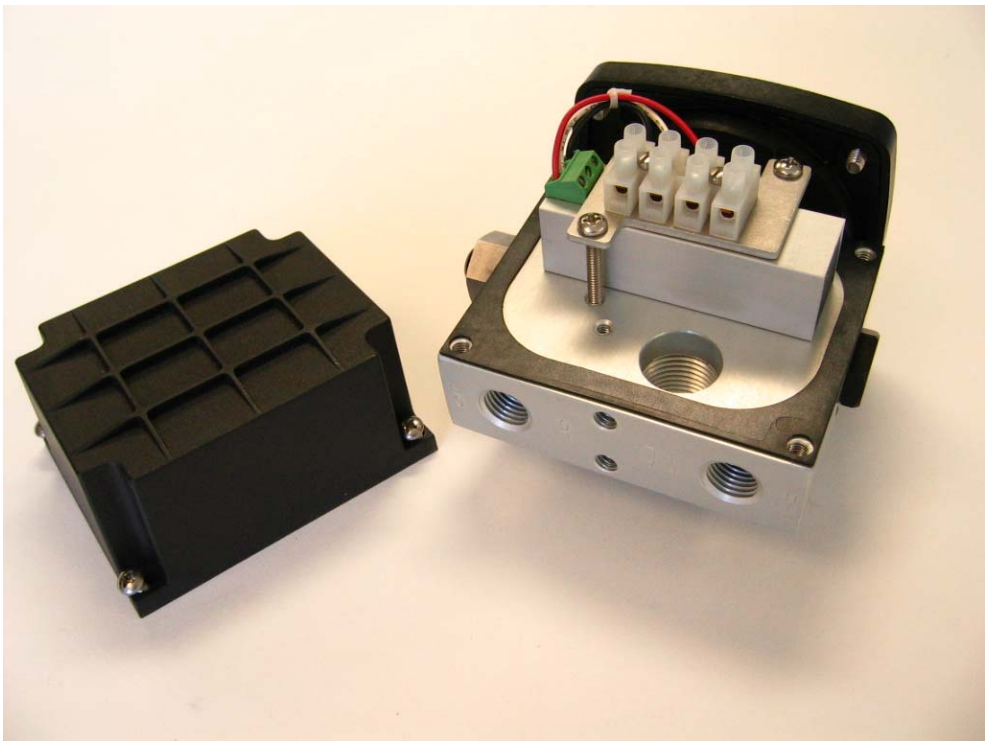
Typical Switch Arrangement

Medium Range: 0-5 P.S.I.D. to 0-110 P.S.I.D. (0.35 to 7.0 bar)

A low cost differential pressure indicating switch or transmitter for use in measuring the pressure drop across filters, strainers, separators, valves, pumps, chillers etc., and for local flow indication and control.

- NPT conduit connection with heavy duty switch/transmitter cover and terminal strip
- Choice of one or two magnetically actuated hermetically sealed reed switches to provide high and low limit alarm or control or 4-20mA transmitter.
- Simple, rugged, compact design.
- Working pressure 6000 P.S.I.G. (400 bar) Models 121-A and 121-S.
- Over-range protection to maximum pressure.
- Aluminum or 316 stainless steel gauge body with 316 stainless steel internals.
- Weather resistant construction standard
- Gauge accuracy ± 2% full scale (ascending)*. Transmitter accuracy ± 2% full scale (from 20% to 100% of scale,ascending)
- Shatter resistant lens.
- 2 " and 4 " plastic dial assemblies.
- Five Year Limited Warranty. (One Year Limited Warranty on Transmitter)

*ASME B40.100 Grade B



Typical Transmitter Arrangement- 2 ½" Dial Back View

Model 121 Indicating Switch(es) or 4-20mA Transmitter SPECIFICATIONS

TRANSMITTER

Features: Microprocessor based, external zero interface
8-28 Vdc loop powered, 2 wire interface

Electrical

Accuracy	±2% (from 20% to 100% of scale, ascending)
Supply Voltage	8-28 Vdc
Output	4-20mA
Max Loop Resistance	1000 Ohms

Interface

4 position terminal strip for 16-22 Awg wire, (Pin 1 – return, Pin 2 = zero, Pin 3 = 8-28 Vdc, Pin 4 – chassis (1/2" NPT conduit connection)

Environmental Rating Weatherproof (NEMA 4X, IP65)

SWITCHES

Features: One or two hermetically sealed reed switches

Electrical

Switch rating and adjustability

0-3W, .25 Amp
125 VAC (15-95% F.S.)
60W, 3.0 Amp
240 VAC (20-95% F.S.)

Interface

7 position terminal strip for 16-22 Awg wire
1/2 " NPT conduit connection

Environmental Rating Weatherproof (NEMA 4X, IP65)

Standard Model Specifications 121-AA-00-O(AA)

6000 P.S.I.G. Working Pressure Aluminum Body, Stainless Steel Piston, Ceramic Magnets, Buna N Seals, 2 ” Engineering Plastic Case with shatter-resistant Lens. ” FNPT Back Connections. Accuracy ± Full Scale (Ascending)

1 2 1 — □ □ — □ □ — □ □ □ □ — □ □ □

1. BASIC MODEL NUMBER

2. MATERIAL

A. Aluminum Body, SS Piston (Standard)
S. 316 SS Body, SS Piston
Z. Special

3. DIAL SIZE

A. 2-1/2" Round Uni-Directional Plastic Housing (Std)
C. 4-1/2” Round Uni-Directional Plastic Housing
E. 3-1/2" Round Anod.. Aluminum Housing Assy
G. 4-1/2" Round Anod.. Aluminum Housing Assy
T. Non Indicating
Z. Special (Uncoded Options)

4. SEALS & DIAPHRAGM

0. Buna N **(Standard)**
1. *Viton®
2. Neoprene
4. **Teflon®
5. Ethylene Propylene
6. Perfluoroelastomer
9. Special (Uncoded Options)

* Viton® is a Registered Trademark of DuPont Dow Elastomers
** Teflon® is a Registered Trademark of DuPont

5. CONNECTIONS

0. 1/4" FNPT Back Connections **(Standard)**
2. 1/4" FNPT End Connections
6. 7/16”-20 Straight Thread O-Ring Port (Back Connections)
7. ” FNPT Stainless Steel Adaptors
9. Special (Uncoded option)

6. OPTIONS (Up to four options)

O. None
B. DIN2353 12-S (12mm) Steel Tube Fittings (2)
F. Pipe Mounting Kit (carbon steel)
G. Pipe Mounting Kit (stainless steel)
L. Liquid Fill (Not available w/follower pointer)
M. Maximum Indicator Follower Pointer
T. Oxygen Cleaning
U. S.S. Tag with S.S. Wire
W. Wall Mounting Kit
X. Individual gauge packaging
Z. Special

NOTE: NOT ALL OPTIONS AVAILABLE IN COMBINATION WITH OTHER OPTIONS.

7. ELECTRICAL CONFIGURATIONS

(Switch Adjustable Range 20-95% except where stated below)

A. One (1) switch NEMA 4X/IP65 Enclosure with terminal strip
B. Two (2) switch NEMA 4X/IP65 Enclosure with terminal strip
T. 4-20 ma Transmitter in NEMA 4X/IP65 plastic Enclosure with terminal strip & ” NPT Conduit Connection.

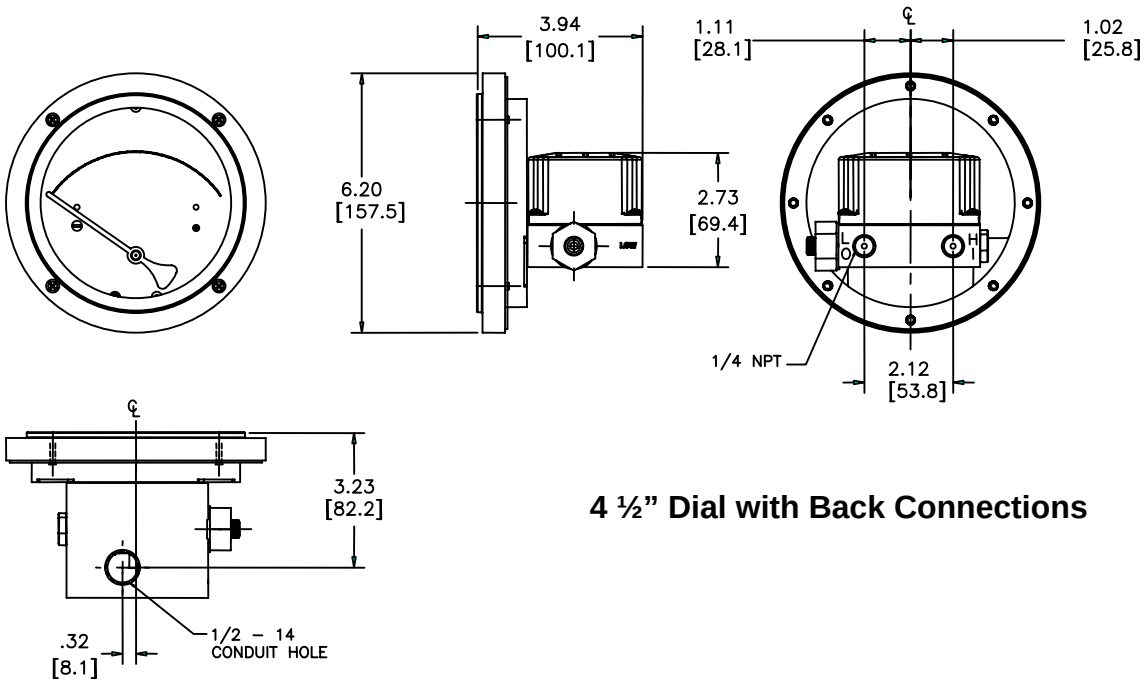
8. ELECTRICAL SPECIFICATIONS

A. S.P.D.T., 3 Watts, 0.25 Amp, 125 VAC/VDC (Switch adjustable range of 15% - 95%)
E. S.P.S.T., Normally Open, 60 Watts, 3.0 Amp, 240 VAC/ VDC (Switch adjustable range of 20-95%)
F. S.P.S.T., Normally Closed, 60 Watts, 3.0 Amp, 240 VAC/ VDC (Switch adjustable range of 20-95%)
G. S.P.S.T., 1 Normally Open, 1 Normally Closed, 60 Watts, 3.0 Amp, 240 VAC/ VDC (Switch adjustable range of 20-95%)
T. 4-20 ma Transmitter (Loop Powered 8-28 VDC Input)

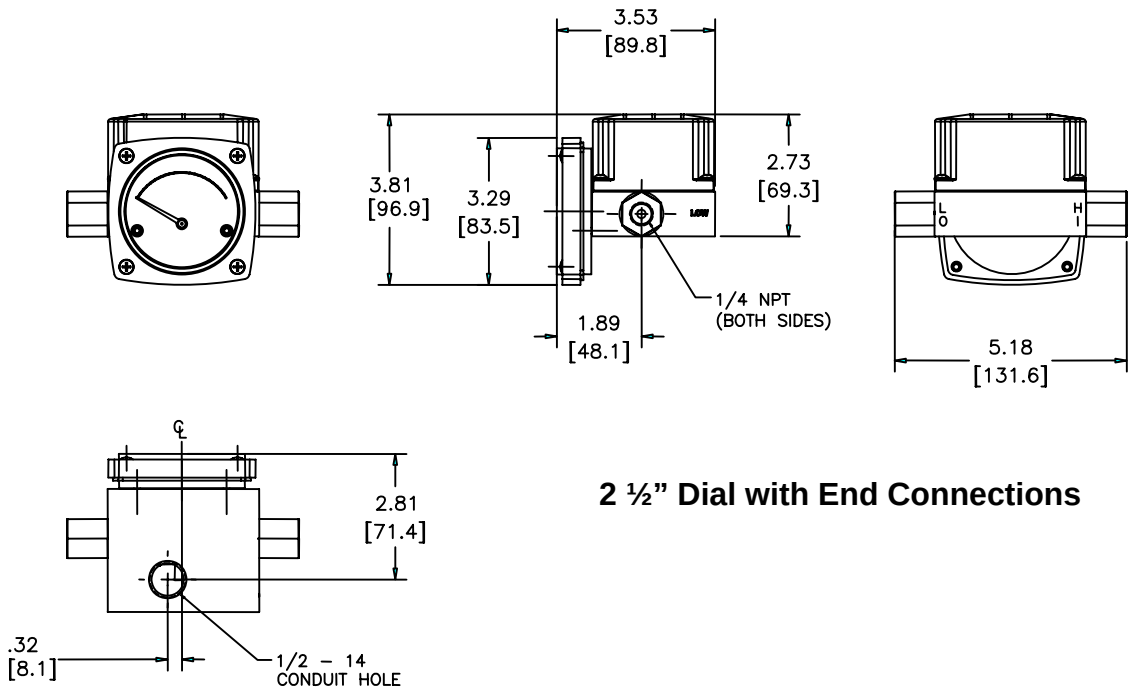
For Applications requiring Diaphragm isolation see Bulletins:

- Bulletin No. 140-141/01
- Bulletin No. 142/05
- Bulletin No. 140/142**T**/06

142 – 2 ½” Dial Transmitter – Back View



4 ½" Dial with Back Connections



2 ½" Dial with End Connections

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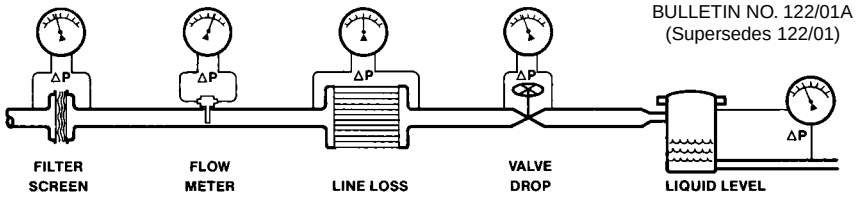


BULLETIN NO. 122/01A
(Supersedes 122/01)

Model 122 "FILTER-MINDER®" Piston-Type Differential Pressure Gauge

(Five Year Limited Warranty)

- Range: 0-5 PSID thru 0-100 PSID (0.3 bar to 7.0 bar).
- Accuracy ±5% full scale ascending.
- Working pressure 5000 P.S.I.G. (340 bar).
- Over-range protection to rated working pressure.
- Aluminum housing with 316 stainless steel internals.
- Weather-resistant construction standard.
- 2-1/2", 3-1/2" or 4-1/2" round dial.
- Shatter-resistant lens.

2-1/2" Dial

Differential pressure is sensed by the movement of a floating piston magnet against a calibrated spring. The gauge pointer, outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure.

One or two hermetically sealed S.P.S.T. or S.P.D.T. reed switches are optionally available to provide high and/or low alarm or control. They may be adjusted within the set point range identified in the switch rating table. A non-indicating differential switch version of the Model 122 is also available.

Reversed pressure ports are optionally available to facilitate installation.

STANDARDS: All Model 122 Series gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1	NACE MR0175
ASME B40.1	NEMA Std. No. 250
SAE J514I	UL Std No. 50
EN-61010-1	

Standard Hermetically Sealed Reed Switch Ratings (Resistive Load) CE

Type	SPST NO	SPST NO	SPDT	SPDT***
Option	B***	E	H	A
*Power	50W	60 W	60W	3W
Max. Current	0.5 Amps	3.0 Amps	1.0 Amps	0.25 Amps
Max. Voltage	240 VAC/240VDC	240 VAC/240 VDC	240 VAC/VDC	125 VAC/VDC
**Setting (F.S.)	10% to 100%	25% to 100%	25% to 100%	10% to 100%
Hysterisis (Max/Nom)	10% / 2% Full Scale (F.S.)	15% / 8% Full Scale (F.S.)	20% / 13% Full Scale (F.S.)	10% / 5% Full Scale (F.S.)
Repeatability	1% F.S.	1% F.S.	1% F.S.	1% F.S.
Leads	(2) 22 Awg, 24"	(2) 22 Awg, 24"	(3) 22 Awg, 24"	(3) 22 Awg. 25"

*Product of switching voltage and current shall not exceed the power rating of the device.
**Except where otherwise noted.
*** B option is available, however is not identified in Electrical Specifications. (Recommend using E)

Reed Switch Power Relay For High Loads

For loads above the switch rating, Mid-West Power Relay 1000TR, or an equivalent relay should be used. It may be used to control loads to 10 amps. The 1000TR is mounted on a standard 4" square junction box cover.

PART NUMBERING SYSTEM

□□□ – □□ – □□ – □□ – □□□□ – □□□

① **BASIC MODEL NUMBER**

② **MATERIAL**
A. Aluminum (Standard)
Z. Special (Uncoded Options)

③ **DIAL SIZE**
A. 2-1/2" Round Engrd. Plastic Dial Assy.
C. 4-1/2" Round Engrd. Plastic Dial Assy.
E. 3-1/2" Round Anod. Alum. Dial Assy.
G. 4-1/2" Round Anod. Alum. Dial Assy.
T. Non-Indicating Differential Pressure Switch Only (Select Appropriate Electrical Options)
Z. Special (Uncoded Options)

④ **SEALS**
0. Buna N (Standard)
1. Viton®*
2. Neoprene
4. Teflon®**
5. Ethylene Propylene
9. Special (Uncoded Options)
*Viton® is a Registered Trademark of DuPont Dow Elastomers.
** Teflon® is a Registered Trademark of Dupont.

⑤ **CONNECTIONS**
0. 1/4" FNPT End Connections (Standard)
1. 1/4" FNPT Back Connections

NOTE: The use of diaphragm seals is not recommended for the model 122 series gauges. Attempts to install such seals will void the warranty.

⑥ **OPTIONS (Up to four options)**
0. None
A. Reversed High/Low Process Connections
L. Liquid Fill (Not Available w / 3-1/2" Dial)
T. Oxygen Cleaning
U. S.S. Tag w/ S.S. Wire
V. S.S. Tag w/ S.S. Screws
W. Wall mounting kit
Z. Special (Uncoded Options)
NOTE: NOT ALL OPTIONS AVAILABLE IN COMBINATION WITH OTHER OPTIONS.

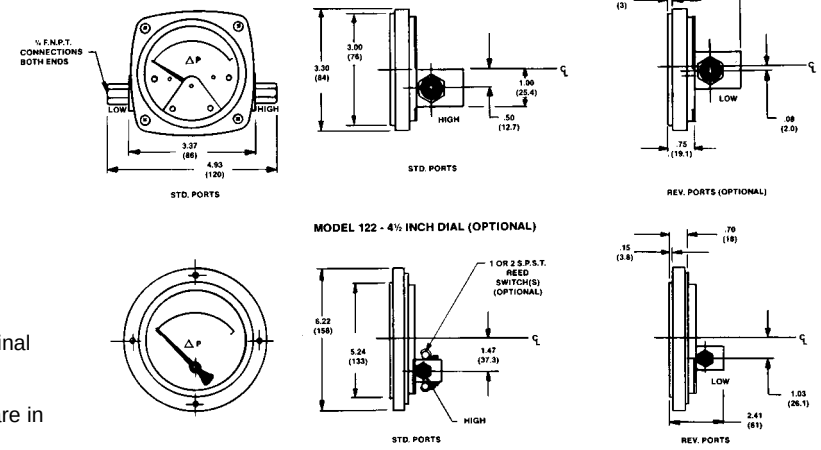
⑦ **ELECTRICAL CONFIGURATIONS**
(NOTE: All options CE marked)
0. None
M. One (1)-Reed Switch **(Clamp-On)**
N. Two (2) Reed Switches **(Clamp-On)**
R. One (1) Reed Switch, Flat Pack, Preset Only, **Non-Adjustable (10-100% of Range) (A option only)**
S. Two (2) Reed Switches, Flat Pack, Preset Only, **Non-Adjustable (10-100% of Range) (A option only)**
Z. Special (Uncoded Options)

(Up to three options)

⑧ **ELECTRICAL SPECIFICATIONS**
(For Resistive Loads)
A. S.P.D.T., 3 Watts, 0.25 Amp, 125 VAC/VDC
E. S.P.S.T., 60 Watts, 3.0 Amp, 240 VAC/VDC (Switch adjustable to 25-100% of Range Only)
H. S.P.D.T., 60 Watts, 1.0 Amp, 240 VAC/VDC (Switch adjustable to 25-100% of Range Only)
Z. Special (Uncoded Options)

NOTE: Leakage across the piston will not exceed 15 SCFH air at 100 P.S.I.D. at ambient conditions.

MOUNTING INFORMATION & DIMENSIONAL DATA



NOTES: 1. Drawings show standard gauge nominal dimensions. (not to scale)

2. Dimensions shown in parentheses are in millimeters.

PROOF PRESSURE: Two times working pressure or 10,000 PSI whichever is lower at ambient temperature.

Manufacturer reserves the right to change specifications without prior notice.

TEMPERATURE LIMITS: -40°F (-40°C) to +200°F (+93°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.

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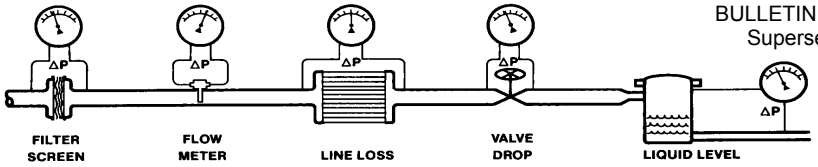


BULLETIN NO. 123/06
Supersedes 123/03

Model 123 "FILTER-MINDER"
PISTON-TYPE Differential Pressure Gauge

HIGH RANGE: 0-150 P.S.I.D. TO 0- 400 P.S.I.D. (10.3 bar To 27.6 bar)

Gauge Features

- Range: 0-150 PSID thru 0-400 PSID (10.3 bar thru 27.6 bar)
- Working pressure 5000 P.S.I.G. (340 bar).
- Over-range protection to 5000 P.S.I.G.
- Aluminum or 316 / 316L SS Gauge Body.
- Wetted 316 SS and Ceramic moving components.
- Weather-resistant construction standard.
- Accuracy ± 3-2-3 % standard.
- Optional Shatter Resistant lens
- 2 ½" and 4 ½" plastic dial assemblies.
- Optional 4 ½" Anodized Aluminum dial assembly.
- Reverse pressure ports available.
- Five Year Limited Warranty.

2 ½" Dial

4 ½" Dial

Switch Features

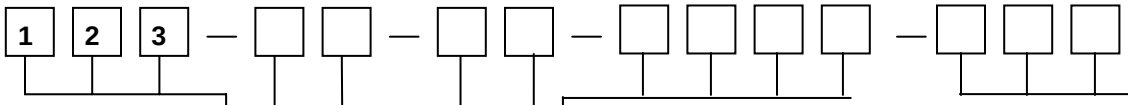
- Hermetically Sealed Switch Outputs up to 3 amps in SPST configuration and up to 1 amp in SPDT configuration.
- SPST outputs available in Normally Open or Normally Closed configurations.
- Up to two independent adjustable switch points.
- Switch Adjustable from 15% - 95% of Range *
- Up to 240 VAC/VDC voltage ratings
- CE Marked to requirements of the Low Voltage Directive
- Optional Configuration for Class I, Div 2, Group A, B, C, & D, Class II, Groups F & G Hazardous Locations. (Contact factory for UL & CSA Listing)

* dependent on selected switch option.

Operation: Differential pressure is sensed by the movement of a piston magnet against a calibrated spring. The gauge pointer, outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure. When equipped, magnetically operated reed switches, also located outside the pressure housing, actuate dependent upon the positional relationship between the reed switch and the internal magnetic piston. The reed contact(s) can be positioned to actuate within a defined percentage of the full-scale range of the gauge.

See Model 120 Bulletin for Dimensional Information

Part Numbering System



1 BASIC MODEL NUMBER

2 BODY MATERIAL

A. Aluminum
S. 316 S.S.

3 DIAL SIZE

A. 2-1/2" Round Uni-Directional Dial
C. 4-1/2" Round Uni-Directional Dial
G. 4-1/2" Round Uni-Directional Anod. Alum. Hous. Assy.
T. Non-indicating Differential Pressure Switch Only Selection Appropriate Electrical Options
Z. Special (Uncoded Options)

4 SEALS & DIAPHRAGM

0. Buna N
1. * Viton® * Viton is a registered trademark of Dupont Dow Elastomers
2. Neoprene
4. ** Teflon® ** Teflon is registered trademark of Dupont Dow
5. Ethylene Propylene
6. Perflouroelastomer
9. Special (Uncoded Options)

5 CONNECTIONS

2. 1/4" FNPT End Connections
7. ½" FNPT End Connected Stainless Steel Adapters

6 OPTIONS (Up to four options)

O. None
A. Reversed High/Low Process Connections
B. DIN2353 12-S (12mm) Steel Tube Fittings (2)
C. Mounting Holes in Gauge Body for field mounting of Electrical Configurations A & B
D. Mounting Holes in Gauge Body for field mounting of Electrical Configurations L & M
F. Pipe Mounting Kit (Carbon Steel) (Contact Factory)
L. Liquid Fill (Not available w/follower pointer Option M)
M. Maximum Indicator Follower Pointer
T. Oxygen Cleaning
U. S.S. Tag w/S.S. Wire
V. S.S. Tag w/S.S. Screws
W. Wall Mounting Kit
X. Individual Gauge Packaging
Z. Special (Uncoded Options)

7 ELECTRICAL CONFIGURATIONS
(Switch Adjustable Range 10-90% except where stated below)

O. None
A. One (1) Switch in STD Encl. with Grommet Wire Seal
B. Two (2) Switches in STD Encl. with Grommet Wire Seal
C. One (1) Switch in STD Encl. with ¼" FNPT Electrical Connection NEMA 4X.
D. Two (2 Switches in STD Encl. with ¼" FNPT Electrical Connection NEMA 4X.
E. One (1) Switch in NEMA 4X General Purpose Enclosure, Div. II Hazardous Locations.
F. Two (2) Switches in NEMA 4X General Purpose Enclosure, Div. II Hazardous Locations.
L. One (1) Switch in STD Enclosure with Plug In Connector (DIN 43650/I 65 – PG-11)
M. Two (2) Switches in STD Enclosure with Plug In Connector (DIN 43650/I 65 – PG-11)
Z. Special

8 ELECTRICAL SPECIFICATIONS

A. SPDT 3W, 0.25 Amp, 125 VAC/VDC (Switch adjustable range of 15-90%)
E. SPST 60W, 3 Amp, 240 VAC/VDC Normally Open (Switch adjustable range of 25-95%)
F. SPST 60W, 3 Amp, 240 VAC/VDC Normally Closed (Switch adjustable range of 25-95%)
G. SPST 60W, 3 Amp, 240 VAC/VDC 1Normally Open, 1 Normally Closed (Switch adjustable range of 25-95%) (Available with Electrical Configurations B, D, F, & M)
H. SPDT 60W, 1 Amp, 240 VAC/VDC (Switch adjustable range of 25-95%)
Z. Special

NOTE: Not all options are available in combination with other options.

Factory Preset of switches available at no charge (Specify Setting on the order)

The use of diaphragm seals is not recommended. Attempts to install such seals on this gauge will void

PROOF PRESSURE: 10,000 PSI working pressure

TEMPERATURE LIMITS: -40° F (-40° C) TO + 200° F (+93° 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: All Model 123 Series differential pressure gauges either to conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1
ASME B40.1
CSA-C22.2 No. 14, and 213
UL Std. No. 50, 508, and 1604
NACE MR0175
NEMA Std. No. 250
SAE J514
EN-61010-1

Mid-West®
Instrument
6500 Dobry Dr. Sterling Heights, MI 48314
Ph: (586)254-6500 FAX (586)254-6509
E-Mail: sales@midwestinstrument.com

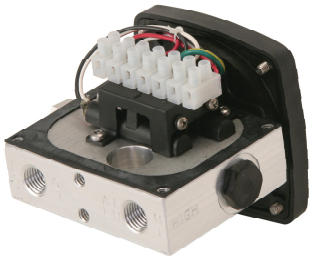
Mid-West® Instrument

Differential Pressure Gauges
Switches and Transmitters

6500 Dobry Dr., Sterling Heights, MI 48314 U.S.A. Tel: 586-254-6500 Fax: 586-254-6509
Web Site: www.midwestinstrument.com E-mail:sales@midwestinstrument.com

Another "NEW" Gauge from Mid-West

"Model 124"
High Pressure 10,000 PSI



New, Cost Effective Piston Type-Differential Pressure Gauge for High Working Pressures (10,000 PSI)

Mid-West Instrument introduces its new **Model 124** Differential Pressure Gauge. This new gauge uses the same proven sensing and output method as the ultra reliable Model 120! The Model 124 has a safe working pressure of 10,000 PSI and a proof pressure of 20,000 PSI.

The Model 124 is available with 316/316L stainless steel bodies, 316 S.S. springs and internal parts, and a wide variety of elastomers. The instrument is over-range protected in either direction up to 5000 PSID. Available differential pressure ranges are 0-5 PSID through 0-400 PSID.

Hermetically sealed S.P.S.T. or S.P.D.T. magnetically actuated reed switches are available as options to provide high and/or low alarm control. Available in 2 ½", 3 ½" or 4 ½" dials. Mid-West Instrument is one of the leading designers and manufacturers of differential pressure gauges in the US.

Model 124

Piston-Type Differential Pressure Gauge and Switch
High Working Pressure: 10,000 PSI

Competitively priced, piston type differential pressure gauges and switches for use on High Pressure Filters, Strainers, Pumps, Liquid Level, Sub Sea / Deep Well and Flow Indication etc.

Available ΔP Ranges:
0-5 PSID (0-0.35 bar) to 0-110 (0-7.0 bar)
0-150 PSID (0-10.3 bar) to 0-400 (0-27.6 bar)

Common Applications

- Sub Sea / Deep Well
- High Pressure Filter/Strainer Monitoring
- Compressed Air
- Hydraulic
- Refrigerant
- Pump Performance Testing
- Heat Exchanger Pressure Drop Monitoring

Product Features

- DP Ranges from 0-5 PSID to 0-400 PSID
- Piston Sensing Element
- Working Pressure up to 10,000 PSIG (689 bar)
- Proof Pressure 20,000 PSIG
- Over-Range Protection, High over Low and Low over High to 5,000 PSID
- Gauge Housing 316L Stainless Steel
- Wide Range of Elastomers

Product Features/Benefits

- Simple Rugged Designs
- Glass Reinforced Thermoplastic Gauge Front Is Standard
- Weather Resistant & Corrosion Resistant Gauge Front
- Shatter Resistant Lens
- **1 Year Warranty**

Specifications:

- Differential Pressure Range 0-5 PSID to 0-400 PSID (0-0.35 to 0-27.6 bar)
- Available in a Variety of Equivalent Ranges & Scales
- Accuracy ±2%*
- Operating Temp -40ºF to +200ºF (-40ºC to +93ºC)

- Dial Size 2-1/2" Round (Standard), 3-1/2" Round (Optional), 4-1/2" Round (Optional)
- Working Pressure 10,000 PSIG
- Material of Construction of Body - 316/316L Stainless Steel, adjusting Screws & end plugs
- Materials of Construction of Internals - 316 Stainless Steel
- ¼" FNPT Back Connections **(Standard)** other options available

- **Switch Options**

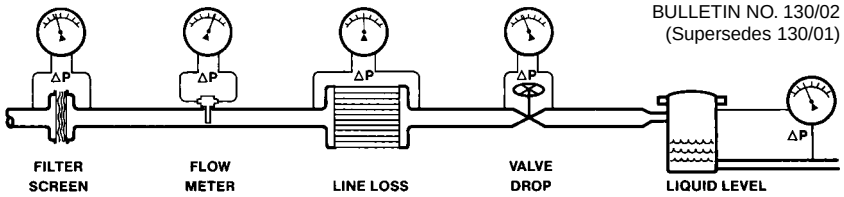
  - SPDT 3W, 125 VAC/VDC, 0.25 amps CE
  - SPDT 60W, 240 VAC/VDC, 1.0 amps CE
  - SPST 60W, 240 VAC/VDC, 3.0 amps CE

- Electrical Enclosures Weather-Resistant, NEMA 4X
- CE Marked in Accordance With Low Voltage Directive

Special Features:

- Over-range Protection Full to Maximum Working Pressure
- Panel Mounting Standard
- Pipe Mounting Kit Optional - 2" U-Bolt
- Wall Mounting Optional - Rear Mount
- NACE Compliance Optional

Mid-West®
Instrument



BULLETIN NO. 130/02
(Supersedes 130/01)

Model 130 DELTA GAUGE®
Diaphragm Type Differential Pressure Gauge

LOW RANGE: 0-5" H_20 (0 to 12.4 mbar) to 0-400" H_20 (0 to 1 bar)

The Model 130 is a rugged general purpose differential pressure gauge with a 4-1/2" round dial.

- Either linear or square root (for flow) dials.
- Working pressure of 300 P.S.I.G. (20 bar) with a polysulfone body, and 500 P.S.I.G. (34 bar) in aluminum, brass, 316 S.S., and Hastelloy C.
- Over-range protection to rated working pressure.
- **Five Year Limited Warranty**

- Magnetic coupling between the sensing element and the indicating pointer provides for complete isolation of the process fluid within the pressure capsule.
- Suitable for use on virtually all reasonably clean liquids or gases.
- Diaphragm design allows use of dissimilar fluids on high and low side of gauge.
- Can be used with vacuum or pressure applications.
- Ideal for liquid level indication for pressurized tanks.
- Wide range of elastomers.
- CE marked switches and enclosures are available.

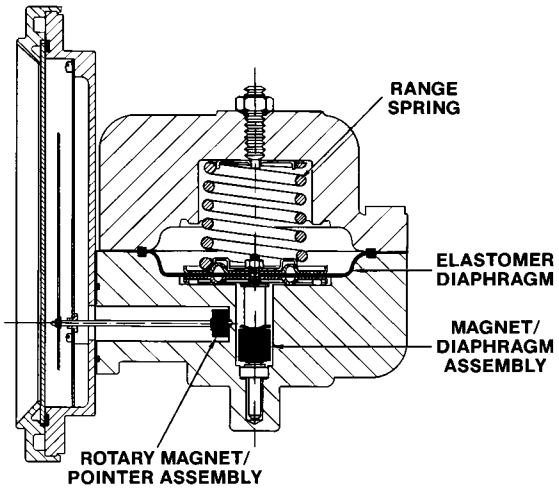
MODEL 130 DELTA GAUGE® CHARACTERISTICS

A flexible elastomer diaphragm and calibrated spring sense differential pressure. The diaphragm provides total separation of the high and low pressure liquids and gases. Totally supported at full travel in either direction, this feature assures full overrange protection to the rated working pressure of the gauge.

A magnetic coupling transmits the sensing element motion to the indicating pointer while assuring total isolation of the process fluid within the pressure capsule. This prohibits the possibility of process fluid leaking into the gauge case.

The few internal metal parts are 316 Stainless Steel, or Hastelloy C as an option.

The low range capability of the Model 130 is ideally suited for flow, liquid level and vacuum applications.



The Model 130 is available in Aluminum, Brass and 316SS bodies only with one or two hermetically sealed reed switches for low and/or high limit alarm. These CSA listed switches are single-pole, double-throw, and may be connected to open or close on rising or falling pressure.

Switching may be adjusted from 10% to 90% of the differential pressure range of the instrument.

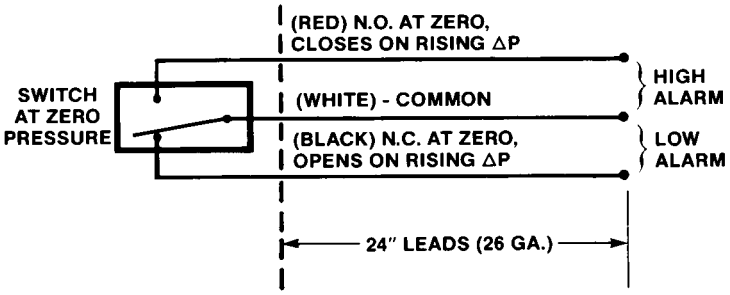
Switches are enclosed in a weather resistant housing. Switch setting is readily made with a screw adjustment.

Special Enclosures:

NEMA Type 4X Enclosure
The Model 130 with CSA listed control switching is available in non-corrosive molded plastic enclosures. These are oiltight, dustfree and watertight per NEMA Type 4X standards. Dimensions approximately 6"x6"x7". Weight approximately 5 to 11 lbs. (2.3 to 5.0 Kilos).

Explosion-proof CSA Listed
The Model 130 with CSA listed control switching is available in an explosion-proof enclosure which complies with NEC Class 1, Groups C and D; Class II Groups E, F, and G; NEMA 7 and 9 standards. These are machined cast-aluminum enclosures with 1/2" FNPT conduit connection and 24" wire leads. Dimensions approximately 8"x8"x9". Weight approximately 20 to 26 lbs. (9.0 to 11.7 Kilos).

Standard Hermetically Sealed Reed Switch for Low-energy Circuits CSA Listed



Type: S.P.D.T.
Accuracy: Repeatability of set point 1% of full scale. On-off switching differential 5% of full scale.
Settings: Adjustable from 10% to 90% of scale range.
Maximum Current: 0.25 amps
Maximum Power: 3 watts at 125 volts; AC/DC continuous
Leads: Three color-coded leads 24" long; 26 gauge.

STANDARD MODEL SPECIFICATIONS

130-PC-00-OO

300 P.S.I.G. Working Pressure, 40% Glass filled Polysulfone Capsule; Buna N Diaphragm; 316 Stainless Steel Internal Metal Parts; Ceramic Magnet and Acetal Guide Bushing; 4-1/2" Round Dial in Corrosion Resistant Engineering Plastic Case with Shatter Resistant Acrylic Lens. 1/4" Steel Compression Tube Fittings. (Metal Bodies - Dual 1/4" FNPT Top and Bottom, Single for Hastelloy only.)

DIFFERENTIAL RANGE (IN. H_2O OR EQUIVALENT & ACCURACY	
0-5 to 9.9	0-10 thru 0-400
±5% Full Scale (Ascending)	±3-2-3% Full Scale (Ascending)

PART NUMBERING SYSTEM

1 3 0 – □□ – □□ – □□ – □□□□ – □□□

① BASIC MODEL NUMBER

② MATERIAL
A. Aluminum
B. Brass
H. Hastelloy C
P. Glass-Reinforced Engineering Plastic Body
S. 316 S.S.
Z. Special (Uncoded Options)

③ DIAL SIZE
C. 4-1/2" Round Dial Engrd. Plastic Housing Assy. **(STANDARD)**
E. 3-1/2" Round Dial Anod. Aluminum Housing Assy.
G. 4-1/2" Round Dial Anod. Aluminum Housing Assy.
T. Non-Indicating Differential Pressure Switch Only (Select Appropriate Electrical Options)
Z. Special (Uncoded Options)

④ SEALS & DIAPHRAGM MATERIAL
0. Buna N **(STANDARD)**
1. *Viton®
2. Silicone
5. Ethylene Propylene (0-5" H_2O thru 0-100" H_2O max)
9. Special (Uncoded Options)

*Viton® is a Registered Trademark of DuPont Dow Elastomers.

⑤ CONNECTIONS
0. 1/4" C.S. Comp. Tube Ftgs. (2) Model P or 1/4" FNPT (4) for Models A, B & S **(STANDARD)**
1. 1/4" 316 S.S. Comp. Tube Ftgs. (2)
2. 1/4" FNPT Brass Adapters (2) (Model P Only)
3. 1/4" FNPT 316 S.S. Adapters (2) (Model P Only)
4. 1/2" FNPT 316 S.S. Adapters (2) (All Models, Except P)
9. Special (Uncoded Options)

NOTE: The use of diaphragm seals is not recommended for the model 130 series gauges. Attempts to install such seals will void the warranty.

NOTE: Not all options available in combination with other options.

⑥ OPTIONS (Up to four options)
O. None **(STANDARD)**
B. Drain & Bleed Plugs, 316 Stainless Steel (2) (Model 130 P only)
D. Drain & Bleed, for Model 130 P in Nema 4X Enclosure
E. Drain & Bleed, for all other Model 130's in Nema 4X Enclosure
F. Pipe Mounting Kit
H. Hastelloy C Internal Wetted Metal Parts and Fittings
M. Maximum Indicator Follower Pointer
T. Oxygen Cleaning
U. S.S. Tag Mounted w/S.S. Wire
V. S.S.Tag Mounted w/S.S.Screws
W. Wall Mounting Kit
Z. Special (Uncoded Options)

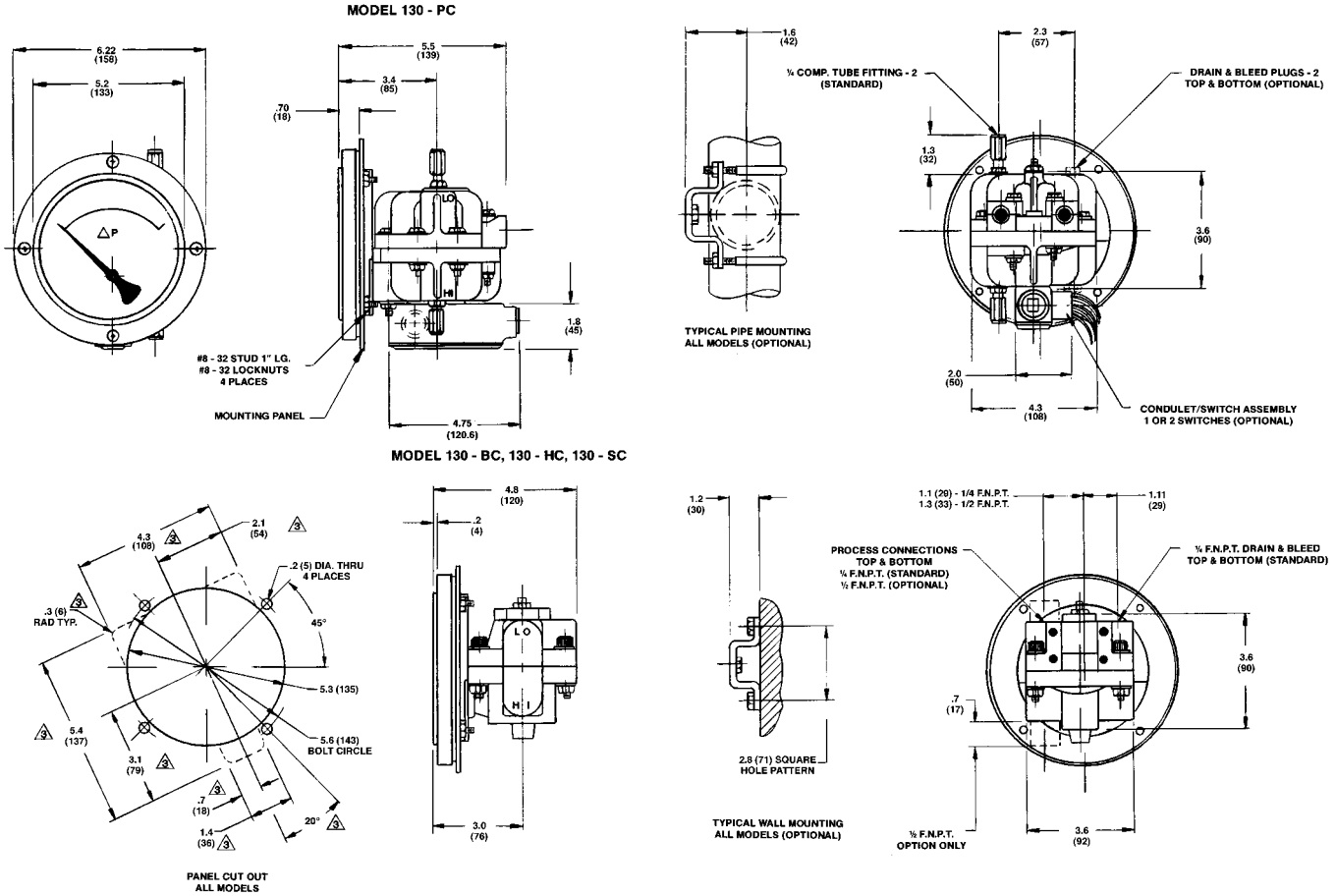
⑦ ELECTRICAL CONFIGURATIONS (SWITCH ADJUSTABLE RANGE 10-90%)
(NOTE: Switch option not available for 130-PC Models)
(NOTE: All options CE marked, except N & P)
O. None **(STANDARD)**
H. (1) Reed Switch with Condulet Enclosure
I. (2) Reed Switches with Condulet Enclosure
J. (1) Reed Switch with Condulet Enclosure and Plug-In Connector (DIN 43650-PG 11)
K. (2) Reed Switches with Condulet Enclosure and Plug-In Connector (DIN 43650-PG11)
L. (1) Switch in NEMA-4X Plastic Enclosure
M. (2) Switches in NEMA-4X Plastic Enclosure
N. One (1) Switch in Explosion Proof Enclosure with Glass Window Cover and C.S.A. Listing (1)
P. Two (2) Switches in Explosion Proof Enclosure with Glass Window Cover and C.S.A. Listing (1)
Z. Special (Uncoded Options)

(1) Complete Assembly Rated Class I, Division I, Groups C & D; Class II, Division I, Groups E, F & G.

⑧ ELECTRICAL SPECIFICATIONS (For Resistive Loads)
A. SPDT, 3 Watts, 0.25 Amp, 125 VAC/VDC (Switch adjustable range 10-90%)
Z. Special (Uncoded Options)

– (Up to three options) ⑧ ⑦

MOUNTING INFORMATION & DIMENSIONAL DATA



NOTES:
1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.
3. Add to panel cut out for condulet/switch assembly option.
4. Contact Factory for 3-1/2" & 4-1/2" anod. alum. dial assy. mounting dimensions.

Manufacturer reserves the right to change specifications without prior notice.

Temperature limitations: -40°F(-40°C) to +200°F(+93°C). **Proof pressure**: two times rated working pressure.

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

STANDARDS: All Model 130 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards:

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

Mid-West® Instrument

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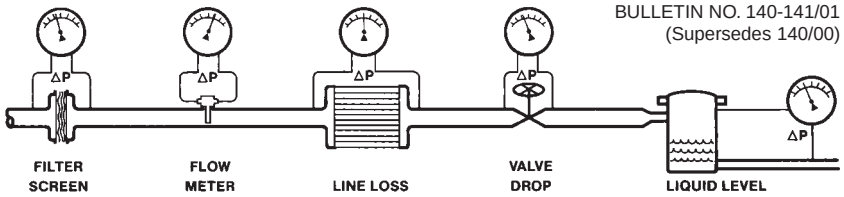
REPRESENTED BY:

Printed in U.S.A.

BULLETIN NO. 140-141/01
(Supersedes 140/00)

Mid-West Instrument



Model 140/141 Series DELTA METER® Diaphragm Type Differential Pressure Gauge

(Five Year Limited Warranty)

The Model 140 provides outstanding capabilities not previously available in a modestly priced differential pressure gauge/switch. It is ideally suited for use on dissimilar fluids, wet gas or fluids with a high concentration of solids, etc. A few of its unique features are:

- Total separation of high and low pressures by a convoluted elastomer diaphragm.
- Sensor magnetically coupled to the indicating pointer and optional switches.
- Sensor housing available in aluminum, brass, or 316 stainless steel.
- Ranges from 0-50" H_2O thru 0-100 PSID (160mbar thru 7 bar)
- Working pressures to 3000 P.S.I.G. (200 bar) depending on housing material.
- Available with square root dials for flow measurement.
- 2-1/2" or 4-1/2" Plastic Dial Assemblies
- 3-1/2" or 4-1/2" Anodized Aluminum Dial Assemblies
- Overrange protection to full rated working pressures.
- Hermetically sealed reed switches (1 or 2) available in either NEMA 4X or NEMA 7 (CSA Listed) enclosures with external set point adjustment access.
- Panel or pipe mounting capabilities.
- Weatherproof engineering plastic or anodized aluminum dial assembly with shatter-resistant lens.
- Accuracy ±3-2-3% Full Scale (0-15 P.S.I.D. thru 100 P.S.I.D.) ascending. (ASME B40.1 Grade B)

  ±5% Full Scale 0-50" H_2O to 0-400" H_2O ascending. (ASME B40.1 Grade D)

2-1/2" Plastic Dial Assy.

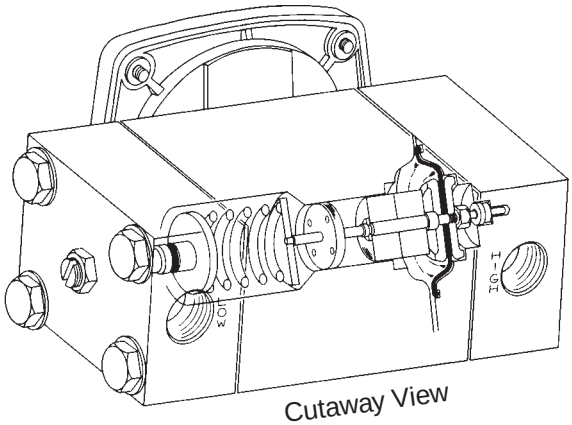
1/4" FNPT Back Connections

MODEL 140/141 DELTA METER® CHARACTERISTICS

Differential pressure is sensed by a flexible elastomer diaphragm and a calibrated range spring. The diaphragm assures total separation between the high and low pressure signals. It is totally supported at full travel in either direction. The Model 140 is protected against overrange to its rated working pressure.

A magnetic coupling transmits the sensing element motion to the indicating pointer. This prohibits the possibility of process fluid leaking into the gauge case, while assuring total isolation of the process fluid within the pressure capsule.

The gauge case, either 2-1/2", 3-1/2" or 4-1/2" dial size, is constructed of a rugged corrosion resistant “engineering plastic” or aluminum with a shatter resistant acrylic lens. The bezel screws and all internal “wetted” metal parts are of stainless steel.



Cutaway View

4-1/2" Plastic Case w/Max. Follower Pointer


NEMA 4X
Weather Proof


CSA Listed
Explosion Proof

MODEL 140 “DELTA METER” WITH CONTROL SWITCHING

The Model 140 “Delta Meter” is available with either one or two hermetically sealed reed switches for either high alarm, low alarm, or both. The switches are Single Pole Double Throw (SPDT) or Single Pole Single Throw (SPST) with set points adjustable from 10% to 90% of the differential range of the instrument. Switches can be set to activate/deactivate on rising or falling pressure.

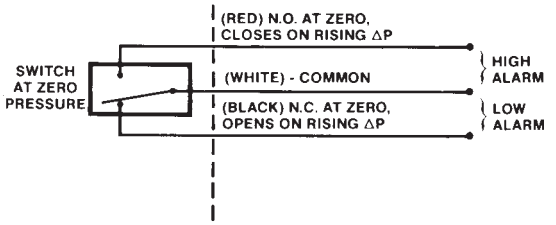
The standard switch enclosure is non-corrosive molded plastic that is oil tight, dust tight, and water tight per NEMA 4X. External access to the switch adjustment is provided.

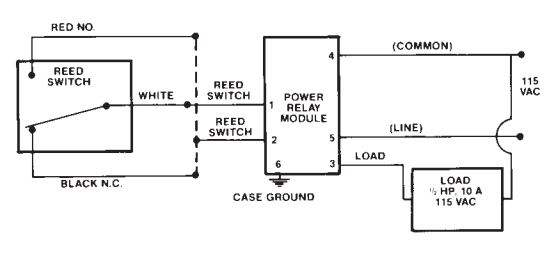
CSA Listed Explosion Proof enclosures with SPDT or SPST switches rated Class I, Groups C & D, Class II, Groups E, F, & G are available. Switch leads are 24", 18 Awg, and are color coded where applicable.

Standard Hermetically Sealed Reed Switch Ratings (Resistive Load)

Type	SPST	SPDT
*Power	25W	3W
Max. Current	0.5 Amps	0.25 Amps
Max. Voltage	230 VAC/230VDC	125 VAC/VDC
Setting (FS)**	10% to 90%	10% to 90%
Hysterisis (Max/Nom)	15% / 8% Full Scale (F.S.)	10% / 5% Full Scale (F.S.)
Repeatability	1% F.S.	1% F.S.

*Product of the switching voltage and current shall not exceed the power rating of the device
**Except where otherwise stated





Reed Switch Power Relay for High Power Loads

Mid-West Power Relay 1000TR or equivalent should be used for loads above the switch rating. The 1000TR can control loads up to 10 amps. The 1000TR is available in various input power, output power, and enclosure configurations. Contact Mid-West for technical assistance.

STANDARD MODEL SPECIFICATIONS

Model 141 0-50" H20 thru 0-25 PSID
Model 140 over 0-25 PSID thru 0-100 PSID

140/141-AA-00-OO

3000 P.S.I.G. Working Pressure Aluminum Body, Buna N Diaphragm and Seals, 316 Stainless Steel Internal Metal Parts, Ceramic Magnets, Teflon Guide Bushings, 1/4" FNPT Back Connections, 2-1/2" Round Dial in Corrosion Resistant Engineering Plastic Case with Shatter-Resistant Acrylic Lens.

DIFFERENTIAL RANGE & ACCURACY	
0-50 to 0-400" H_2O (125 mbar to 1 bar) or equivalent	0-15 thru 0-100 P.S.I.D. (1-7 bar) or equivalent
±5% Full Scale (Ascending)	±3-2-3% Full Scale (Ascending)

PART NUMBERING SYSTEM

□□□ – □□ – □□ – □□ – □□□□ – □□□

① **BASIC MODEL NUMBER**

② **MATERIAL**
- A. Aluminum **(3000 P.S.I.G.)**
- B. Brass **(1500 P.S.I.G.)**
- S. 316 S.S. **(3000 P.S.I.G.)**
- Z. Special **(Uncoded Options)**

③ **DIAL SIZE**
- A. 2-1/2" Round Engrd. Plastic Housing Assy.
- C. 4-1/2" Round Engrd. Plastic Housing Assy.
- E. 3-1/2" Round Anod. Alum. Housing Assy.
- G. 4-1/2" Round Anod. Alum. Housing Assy.
- T. Non-Indicating Differential Pressure Switch Only (Select Appropriate Electrical Options)
- Z. Special (Uncoded Options)

④ **SEALS & DIAPHRAGM**
- 0. Buna N **(Standard)**
- 1. *Viton **(60" H_2O & Above)**
- 2. Silicone
- 4. Neoprene **(25 PSID & Below)**
- 5. Ethylene Propylene
- 9. Special **(Uncoded Options)**

⑤ **CONNECTIONS**
- 0. 1/4" FNPT Back Connections **(Standard)**
- 2. Dual 1/4" FNPT Top and Bottom Connections **(Non-Switch Units Only)**
- 4. 7/16"-20 Str. Thd. O-Ring Back Connections
- 5. 1/2" FNPT S.S. Adaptors
- 6. Dual 7/16"-20 Str. Thd. O-Ring Top/Bottom Connections **(Non-Switch Units Only)**
- 9. Special **(Uncoded Options)**

⑥ **OPTIONS (Up to four options)**
- 0. None
- A. Reversed High/Low Process Connections
- B. DIN2353 12-S (12 mm) Steel Tube Fittings (2)
- F. Pipe Mounting Kit **(Not Available with Both Reversed Port and Switches)**
- L. Liquid Fill (not available with maximum follower pointer) (not available with 3-1/2" dial)
- M. Maximum Indicator Follower Pointer
- T. Oxygen Cleaning
- U. S.S. Tag mounted w/S.S. Wire
- V. S.S. Tag mounted w/S.S. Screws
- W. Wall mounting kit
- X. Chemical Seals
- Z. Special **(Uncoded Options)**

NOTE: NOT ALL OPTIONS AVAILABLE IN COMBINATION WITH OTHER OPTIONS.

⑦ **ELECTRICAL CONFIGURATIONS**
(Switch Adjustable Range 10-90% except where stated below)
- 0. None
- A. One (1) Reed Switch in NEMA 4X Enclosure
- B. Two (2) Reed Switches in NEMA 4X Enclosure
- C. One (1) Reed Switch in NEMA 7 (Exp. Proof Enclosure) **(140 Only) (Complete Assy. CSA listed)**
- D. Two (2) Reed Switches in NEMA 7 (Exp. Proof Enclosure) **(140 Only) (Complete Assy. CSA listed)**
- E. One (1) Reed Switch in Nema 4X Aluminum Enclosure
- F. Two (2) Reed Switches in Nema 4X Aluminum Enclosure
- R. One (1) Reed Switch, Flat Pack, Preset Only, Non-Adjustable **(20-100% of Range Only)**
- S. Two (2) Reed Switches, Flat Pack, Preset Only, Non-Adjustable **(20-100% of Range Only)**
- Z. Special **(Uncoded Options)**

(Up to three options)

⑧ **ELECTRICAL SPECIFICATIONS**
(For Resistive Loads)
- A. S.P.D.T., 3 Watts, 0.25 Amp, 125 VAC/VDC (Switch adjustable range 10-90%)
- B. S.P.S.T., 25 Watts, 0.5 Amp, 230 VAC/VDC (Switch adjustable range 10-90%) **(Not Available with R & S Options)**
- Z. Special **(Uncoded Options)**

* Viton® is a registered trademark of DuPoint Dow Elastomers

1/4" F.N.P.T. pressure connections are located on the back of the body as standard. Upon request, they can be rotated to provide top or bottom connections.

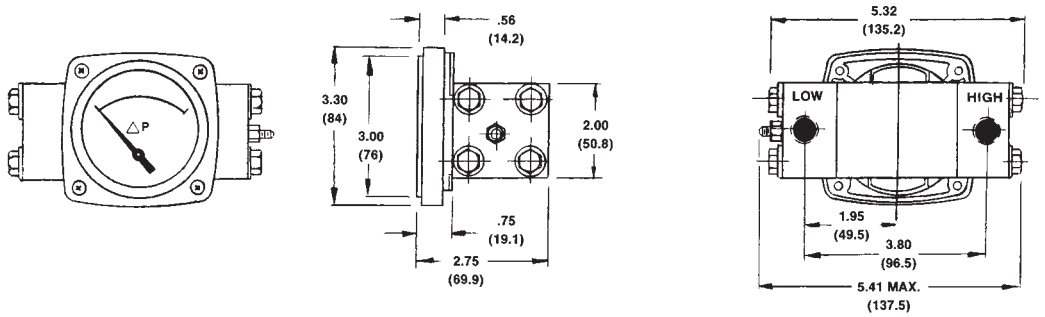
Reversal of the high and low pressure ports to facilitate plumbing is available.

Dual 1/4" FNPT top and bottom connections are available.

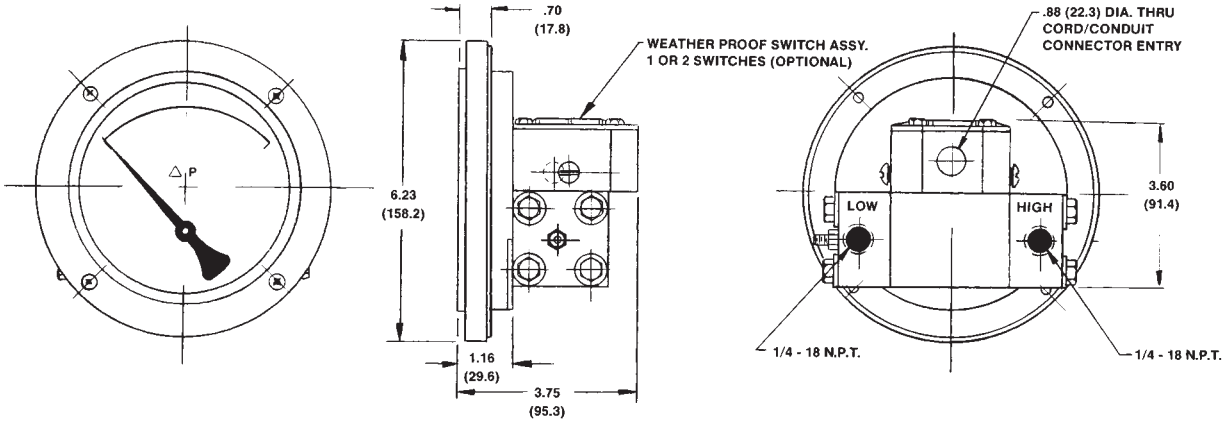
Pipe mounting kits for 2" pipe, plus two different types of wall mounting brackets are options.

MOUNTING INFORMATION & DIMENSIONAL DATA

MODEL 140: 2-1/2" INCH PLASTIC DIAL ASSY.



MODEL 140: 4-1/2" INCH PLASTIC DIAL ASSY.



NOTES:
1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.
3. Mounting Dimensions for 3-1/2" & 4-1/2" Alum. Dial Assys. – Contact Factory

Manufacturer reserves the right to change specifications without prior notice.

PROOF PRESSURE: Two times working pressure or 6,000 PSI whichever is lower at ambient temperature.

TEMPERATURE LIMITS: -40°F(-40°C) to +200°F(+93°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: All Model 140 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards:

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

VISA MasterCard AMERICAN EXPRESS

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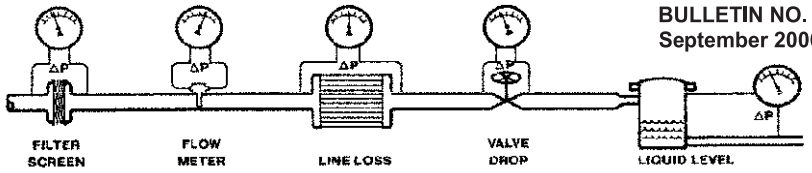
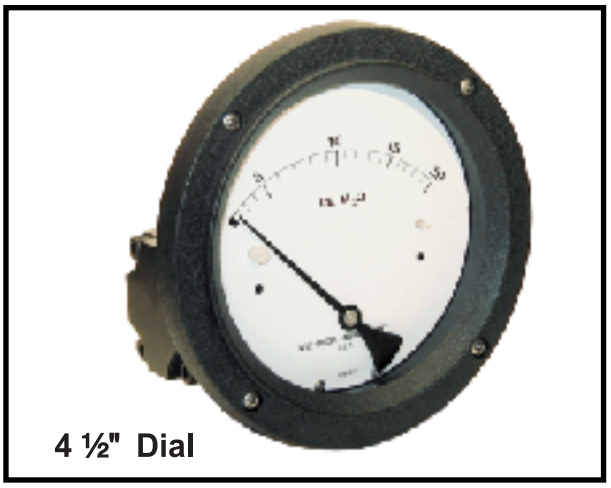


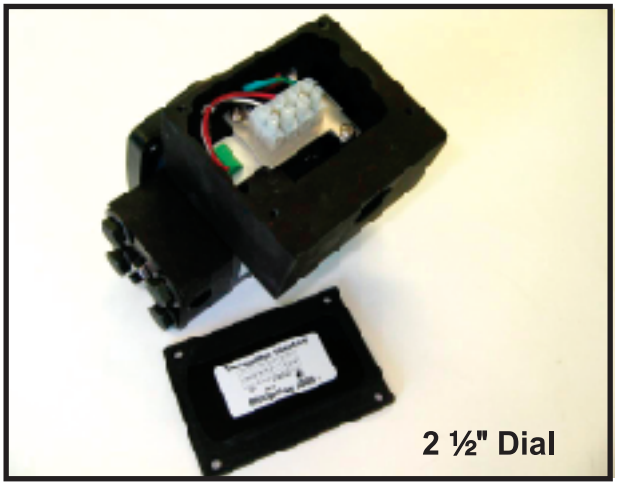
BULLETIN NO. 142/140T/06
September 2006

Model 142/140
Diaphragm-Type Differential Pressure Transmitter

RANGE: 142 (0-20 IN. H_2O to 0-25 PSID) (0-50 mbar to 0-1.7 bar)
140 (0-25 PSID to 0-100 PSID) (0-1.7 bar to 0-7 bar)

The Model 142/140 Transmitter offers a highly visible local display along with the independent 4-20mA output. This allows for precise monitoring at the unit or at the control panel. This economical priced unit works well in tank level applications and in fluids with high solids content.


4 ½" Dial


2 ½" Dial

Gauge Features

- Total separation of high and low pressures by a convoluted elastomer diaphragm.
- Range: 0-20 IN. H2O thru 0-100 PSID (0-50 mbar thru 0 – 7 bar)
- Aluminum, Brass, or 316 / 316L SS Gauge Body.
- AL & SS working pressure 3000 P.S.I.G. (207 bar)
- Brass working pressure 1500 PSIG (103 bar)
- Over-range protection to rated working pressure
- Wetted 316 SS and Ceramic moving components.
- Weather-resistant construction standard.
- Accuracy ± 2% standard (ASME B40.100 Group B)
- Shatter Resistant lens
- 2 ½" and 4 ½" plastic dial assemblies.
- Optional 3 ½" & 4 ½" Anodized Aluminum dial assembly.
- Reverse pressure ports available.
- Five Year Limited Warranty.
- A variety of elastomers available.

Transmitter Features

- 4 – 20 ma Loop Powered Micro Processor based transmitter with pushbutton zero and 4 position terminal strip.
- 8-28 VDC Loop Powered 2-wire interface.
- 1000 Ohm max loop resistance at 28 Vdc.
- ± 2% Accuracy from 20% to 100% of scale,ascending.
- Operating Range – 20ºF to 150ºF (-20ºC to 65ºC)
- Indicator operation is isolated from the Loop Power.
- Assembly is housed in a NEMA 4X (IP65) Aluminum enclosure with ½" NPT access.

Operation: Differential pressure is sensed by flexible elastomer diaphragm and a calibrated range spring. A magnetic coupling transmits the sensing element motion to an indicating pointer. This prohibits the possibility of fluid leaking into the gauge case, while assuring total isolation of the process fluid within the pressure capsule. The diaphragm assures total separation between the high and low pressure signals. It is totally supported at full travel in either direction. The Models 142/140 are protected against over range to its rated working pressure.

Part Numbering System

1 4 2 — ☐ ☐ — ☐ ☐ — ☐ ☐ ☐ ☐ — ☐ ☐ ☐

1. BASIC MODEL NUMBER
142 (0-20 IN. H_20) to 0-25 PSID)
140 (0-25 PSID to 0-100 PSID)

2. BODY MATERIAL
A. Aluminum (3000 PSIG)
B. Brass (1500 PSIG)
S. 316/316L SS (3000 PSIG)

3. DIAL SIZE
A. 2-1/2" Round Uni-Directional Dial
C. 4-1/2" Round Uni-Directional Dial
E. 3 1/2" Round Uni-Directional Anod. Alum. Housing Assembly
G. 4-1/2" Round Uni-Directional Anod. Alum. Housing Assembly
Z. Special

4. SEALS & DIAPHRAGM
0. Buna N
1. * Viton®
5. Ethylene Propylene
9. Special (Uncoded Options)

5. CONNECTIONS
0. 1/4" FNPT Back Connections
4. 7/16"-20 Straight Thread O-Ring (Back Connections)
5. 1/2" FNPT S.S. Adaptors
8. ¼" FNPT End Connections
9. Special (Uncoded Options)

6. OPTIONS (Up to four options)
O. None
A. Reversed High/Low Process Connections
B. DIN2353 12-S (12mm) Steel Tube Fittings (2)
F. Pipe Mounting Kit
L. Liquid Fill (Not available w/follower pointer Option M or 3 ½" Dial)
M. Maximum Indicator Follower Pointer
T. Oxygen Cleaning
U. S.S. Tag w/S.S. Wire
V. S.S. Tag w/S.S. Screws
W. Wall Mounting Kit(**Not available with Back Connections**)
X. Chemical Seals (**Contact Factory For Accuracy**)
Z. Special Uncoded Options

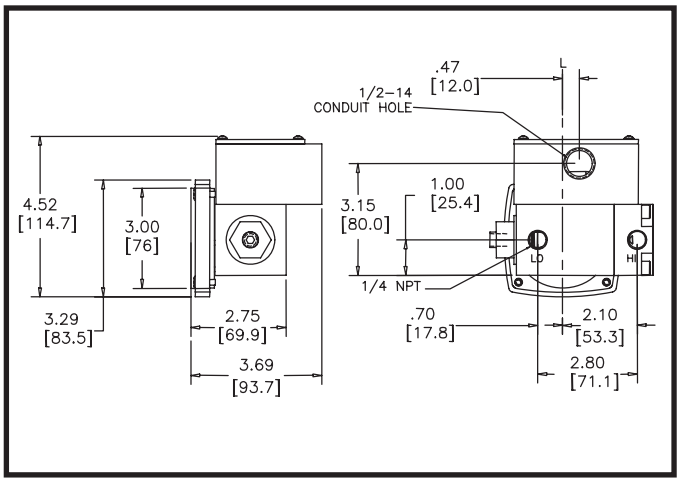
7. ELECTRICAL CONFIGURATIONS
T. 4-20 ma Transmitter in NEMA 4X (IP65) Aluminum Enclosure

8. ELECTRICAL SPECIFICATIONS
T. 4-20 ma Transmitter (Loop Powered 8-28 Vdc Input)

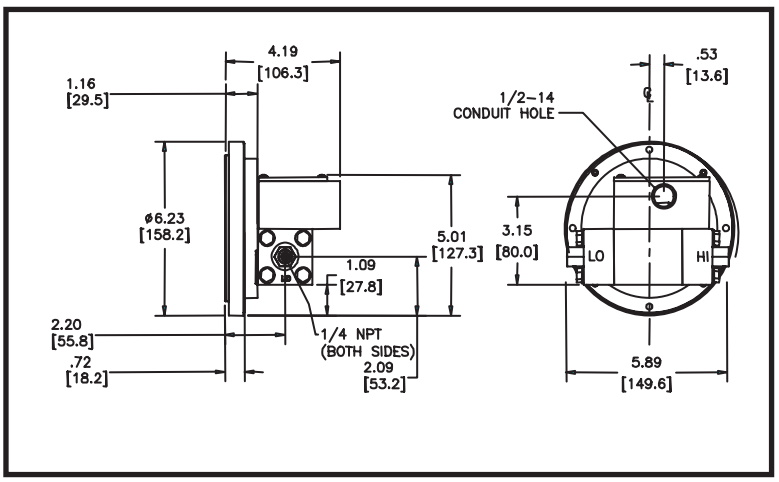
* Viton is a registered trademark of Dupont Dow Elastomers

NOTE: Not all options are available in combination with other options.

Model 142 Back Connected With Transmitter 2 ½" Dial



Model 140 End Connected With Transmitter 4 ½" Dial



Contact Factory for dimensional drawings of other configurations.

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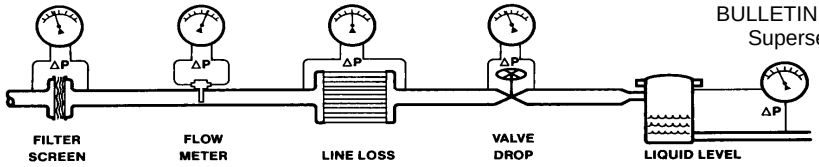


BULLETIN NO. 142/05
Supersedes 142/03

Model 142 "DELTA-METER"
Diaphragm-Type Differential Pressure Gauge

RANGE: 0-20 IN. H_2O TO 0- 25 P.S.I.D.

The Model 142 is ideally suited for use on dissimilar fluids, wet gas, or fluids with a high concentration of solids, etc. A few of its unique features are:

Gauge Features

CE

- Total separation of high and low pressures by a convoluted elastomer diaphragm.
- Range: 0-20 In. H2O thru 0-25 PSID
  (0-50 mbar thru 0 – 1.7 bar)
- AL & SS working pressure 3000 P.S.I.G. (207 bar)
- Brass working pressure 1500 PSIG (103 bar)
- Over-range protection to rated working pressure
- Aluminum, Brass, or 316 / 316L SS Gauge Body.
- Wetted 316 SS and Ceramic moving components.
- Standard weather-resistant construction.
- Accuracy ± 3-2-3 % standard.
- Optional Shatter Resistant lens
- 2 ½" and 4 ½" plastic dial assemblies.
- Optional 3 ½" & 4 ½" Anodized Aluminum dial assembly.
- Reverse pressure ports available.
- Five Year Limited Warranty.

4 ½" Dial

2 ½" Dial with Switch

Switch Features

- Up to two independent adjustable switch points.
- Hermetically Sealed Switch Outputs up to 0.5 amp in SPST configuration and up to 0.25 amp in SPDT configuration.
- SPST outputs available in Normally Open configurations.
- Switch Adjustable from 15% - 95% of Range
- Up to 240 VAC/VDC voltage ratings
- CE Marked to requirements of the Low Voltage Directive
- CSA Certification & UL Listings available for Division 2 Hazardous Locations.

UL LISTED C SA US

5 Year Limited Warranty

Operation: Differential pressure is sensed by flexible elastomer diaphragm and a calibrated range spring. A magnetic coupling transmits the sensing element motion to an indicating pointer. This prohibits the possibility of fluid leaking into the gauge case, while assuring total isolation of the process fluid within the pressure capsule. The diaphragm assures total separation between the high and low pressure signals. It is totally supported at full travel in either direction. The Model 142 is protected against over range to its rated working pressure

Part Numbering System

1	4	2	—			—			—					—			

1 BASIC MODEL NUMBER

2 BODY MATERIAL
- A. Aluminum (3000 PSIG / 1500 PSIG Hazardous)
- B. Brass (1500 PSIG) / 750 PSIG Hazardous)
- S. 316/316L SS (3000 PSIG / 1500 PSIG Hazardous.

3 DIAL SIZE
- A. 2-1/2" Round Uni-Directional Dial
- C. 4-1/2" Round Uni-Directional Dial
- E. 3 1/2" Round Uni-Directional Anod. Alum. Hous. Assy.
- G. 4-1/2" Round Uni-Directional Anod. Alum. Hous. Assy.
- T. Non-indicating Differential Pressure Switch Only (Select Appropriate Electrical Options)
- Z. Special

4 SEALS & DIAPHRAGM
- 0. Buna N
- 1. * Viton®
- 5. Ethylene Propylene
- 9. Special (Uncoded Options)

5 CONNECTIONS
- 0. 1/4" FNPT Back Connections
- 2. Dual1/4" FNPT Top & Bottom Connections
- 4. 7/16"-20 Str. Thd. O-Ring (Back Connections)
- 5. 1/2" FNPT S.S. Adaptors
- 9. Special (Uncoded Options)

NOTE: Not all options are available in combination with other options.

Factory Preset of switches available at no charge (Specify Setting on the order)

Working pressures are derated 50% for use in Hazardous Locations.

6 OPTIONS (Up to four options)
- O. None
- A. Reversed High/Low Process Connections
- B. DIN2353 12-S (12mm) Steel Tube Fittings (2)
- F. Pipe Mounting Kit (Not available with both Reversed Port & Switches)
- L. Liquid Fill (Not available w/follower pointer Option M or 3 ½" Dial)
- M. Maximum Indicator Follower Pointer
- T. Oxygen Cleaning
- U. S.S. Tag w/S.S. Wire
- V. S.S. Tag w/S.S. Screws
- W. Wall Mounting Kit(**Not available with Back Connections**)
- X. Chemical Seals (**Contact Factory For Accuracy**)
- Z. Special Uncoded Options

7 ELECTRICAL CONFIGURATIONS (Switch Adjustable Range 15-95%)
- O. None
- A. One (1) Reed Switch in NEMA 4X / IP66 Enclosure
- B. Two (2) Switches in NEMA 4X / IP66 Enclosure
- E. One (1) Reed Switch in NEMA 4X / IP66 Aluminum Enclosure With CSA / UL Div II Listing.
- F. Two (2) Reed Switches in NEMA 4X / IP66 Aluminum Enclosure with CSA / UL Div II Listing.
- Z. Special

8 ELECTRICAL SPECIFICATIONS
- A. SPDT 3W, 0.25 Amp, 125 VAC/VDC
- B. SPST 25W, 0.5 Amp, 240 VAC/VDC Normally Open
- Z. Special

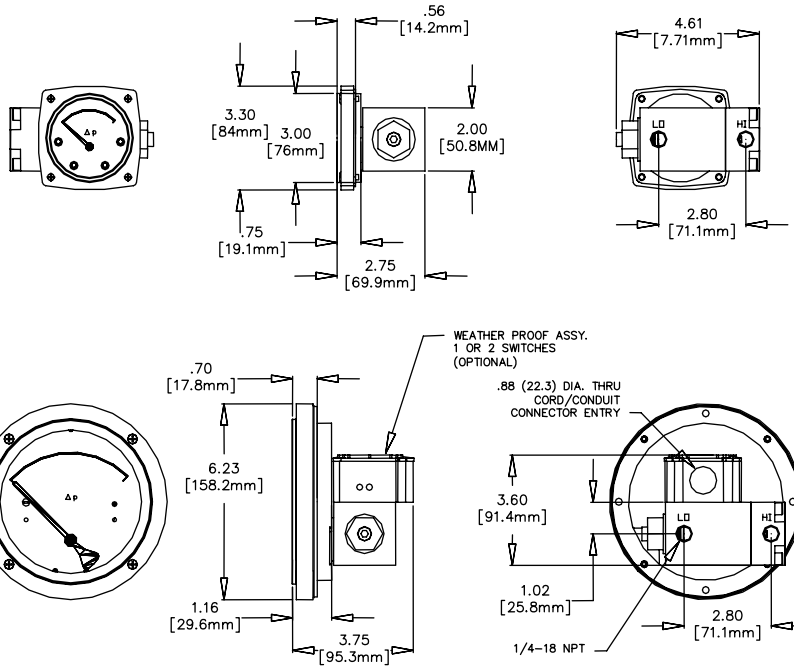
* Viton is a registered trademark of Dupont Dow Elastomers

PROOF PRESSURE: Two times the working pressure or 6000 PSI, whichever is lower at ambient temperature.

TEMPERATURE LIMITS: -40 ˚F (-40˚ C) to 200˚F (93˚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: All Model 142 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1	NACE MR0175
ASME B40.1	NEMA Sts. 250
EN-61010-1	UL Std. No. 50, 508, & 1604
CSA-C22.2 No. 14, 25, & 213	



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BULLETIN NO. 150/01
(Supersedes BULLETIN NO. 150/98)

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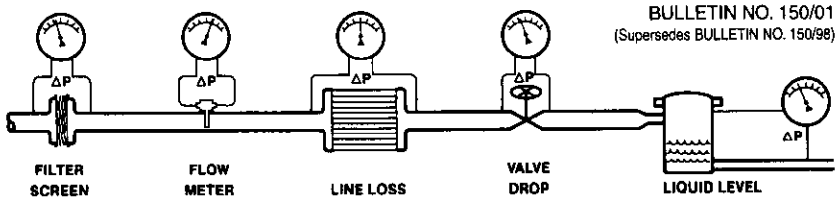
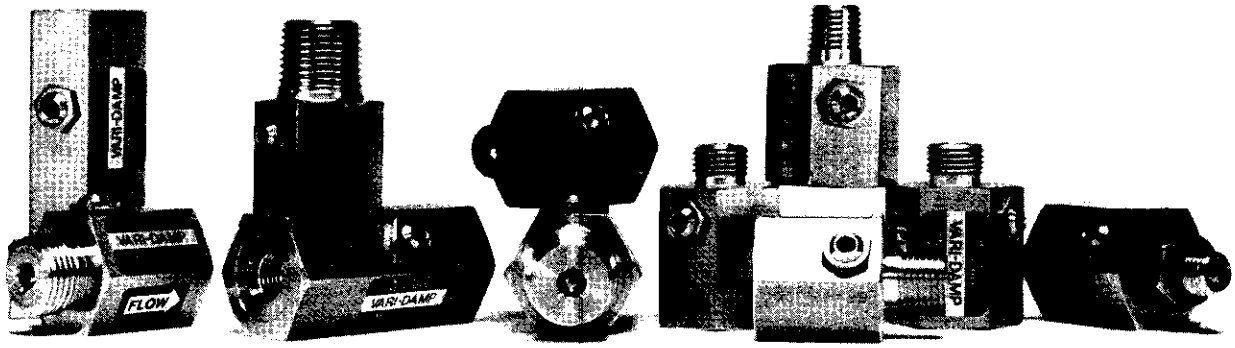
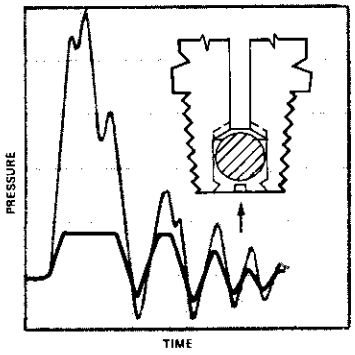


MODEL 150 "VARI-DAMP®" PULSATION DAMPENER

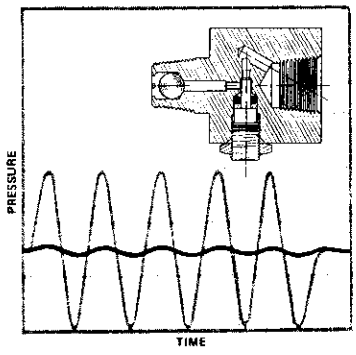


- Provides Infinitely adjustable dampening
- Protects against surges and pressure shocks
- Use with all types of instruments and pressure gauges including differential pressure and compound.
- Optional swivel design eliminates gauge orientation problems

The Model 150 "Vari-Damp®" all purpose pulsation dampener features both a find thread adjustable needle valve for dampening characteristics and a precision ball check to block line surges, shock waves, or fluid hammer. The Model 150 provides outstanding protection for applications where low displacement devices such as bourdon tube gauges or electronic transmitters are used or in high displacement devices where diaphragm, piston, or bellows operated gauges, recorders, or controllers are required. Double-ported instruments should be installed with a Model 150 on each input pressure line.



The Model 150 needle valve provides adjustable dampening characteristics by simply loosening the lock-nut on the adjusting screw and making a slight readjustment to the needle valve setting. Use of the Model 150 is preferred over other commercially available designs that feature several piston diameters or porous metal discs requiring removal and/or disassembly to readjust. The Model 150 adjustable needle valve can be used as a complete shutoff to facilitate changing out of a gauge or instrument. This method is not intended to replace instrument block valves as continual over-torquing could damage the valve seat.



The Model 150 ball check offers protection against surge and/or pressure spikes as indicated by the black lines in the graphs. The 316 stainless steel ball is driven on seat by the pressure surge and held on seat as long as the differential pressure exists across the ball, while metering pressure to the instrument through a calibrated, groove across the ball seating area.

The Model 150 is available in aluminum, brass, or 316 stainless steel. It is offered with a variety of end configurations to handle virtually any application.

PART NUMBERING SYSTEM

1	5	0				

① **BASIC MODEL NUMBER**

② **MATERIAL (BODY)**

A. ALUMINUM
B. BRASS
S. 316 STAINLESS STEEL
Z. SPECIAL

③ **SIZE**

O. 1/4" FNPT X 1/4" MNPT
H. 1/2" FNPT X 1/2" MNPT
Z. SPECIAL

④ **SEALS**

	Temp. Range (Deg. F)
0. Buna N & Teflon	-30° to +250°
1. Viton & Teflon	-15° to +400°
2. Neoprene & Teflon	-45° to +300°
5. Ethylene Propylene & Teflon	-70° to +250°
9. Special	

⑤ **OPTIONS**

0. NONE
9. SPECIAL

STANDARD MODELS, SPECIFICATIONS

BASIC MODEL	DESCRIPTION	THREAD SIZE	BODY MATERIAL	L_1 IN.	L_2 IN.	MAX. W.P. P.S.I.G. (bar)		WEIGHT OZ.	FIG. NO.
150-BH	MALE X FEMALE PIPE	1/2" NPT	BRASS	2.31	.75	5,000	(340)	8	1
150-SH	MALE X FEMALE PIPE	1/2" NPT	316 S.S.	2.31	.75	10,000	(680)	8	1
150-AO	MALE X FEMALE PIPE	1/4" NPT	ALUM.	1.73	.56	3,000	(204)	2	1
150-BO	MALE X FEMALE PIPE	1/4" NPT	BRASS	1.73	.56	3,000	(204)	6	1
150-SO	MALE X FEMALE PIPE	1/4" NPT	316 S.S.	1.73	.56	5,000	(340)	6	1

Please Consult Factory For Other End Configurations

INSTALLATION: The Model 150 pulsation dampener can be installed directly on the instrument to be protected. The Model 150 features a built-in shutoff to allow instrument protection or removal. A shutoff valve in the line is not required. Avoid excessive force when closing to prevent seat galling.
NOTE: CAUTION TO BE EXERCISED WHEN ADJUSTING NEEDLE VALVE. DO NOT ADJUST MORE THAN TWO TURNS FROM CLOSED POSITION. LEAKAGE CAN OCCUR.
MAINTENANCE: The Model 150 can be cleaned by removing the needle adjusting screw, "O" Ring, and Teflon backup ring. Metal parts should be cleaned in a commercial solvent.

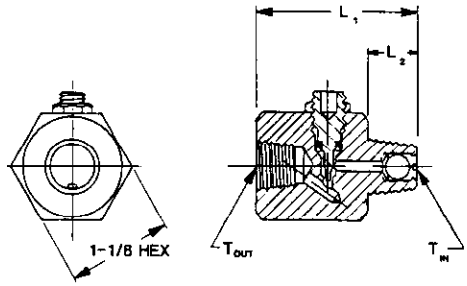


FIG. 1

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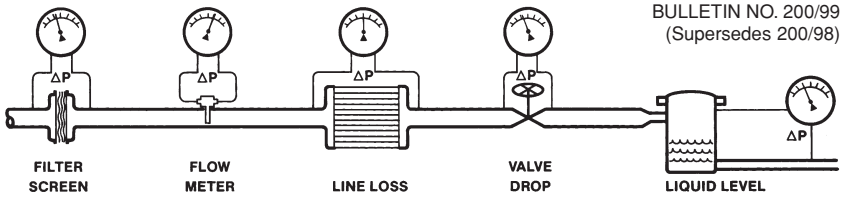
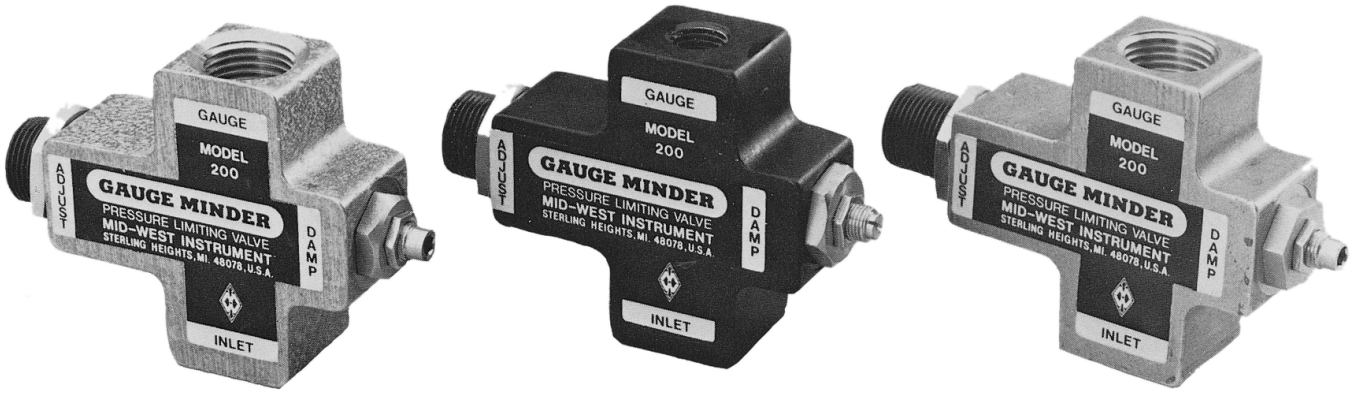


BULLETIN NO. 200/99
(Supersedes 200/98)

MODEL 200 "GAUGE MINDER®" PRESSURE LIMITING VALVE



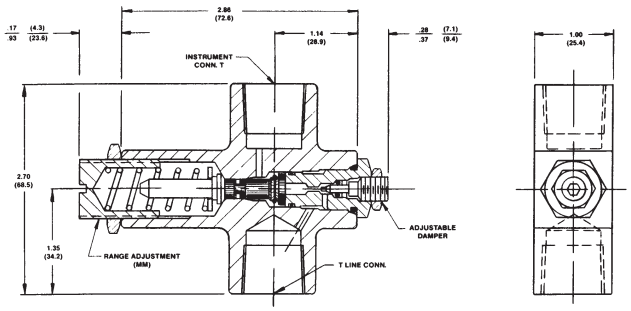
- Pressure limiting valve prevents instrument over-range
- Adjustable needle valve dampens pulsation
- Use with all types of instruments and pressure gauges
- Can be mounted in any position
- Available in aluminum, brass, and 316 S.S.

The Model 200 "Gauge Minder" features a pressure limiting valve that blocks off excess pressure to the instrument, preventing calibration failure, internal damage, and "blow-out" from over-ranging - a principal cause of instrument failure.

The Model 200 is supplied with a set of range springs designed to set the shutoff pressure point at any pressure from 50 to 5000 PSI. The automatic shutoff valve is positive on closing and is non-chattering. Once closed, pressure need only be reduced approximately 10% of set pressure to re-open the valve. The accuracy of the instrument used with the Model 200 is in no way affected up to the set point of the pressure shutoff.

The Model 200 also features an adjustable needle valve designed to dampen system pulsation reducing instrument oscillation, improving readability, and extending instrument life without the addition of a snubber. Instrument reliability is improved and the cost to repair, re-calibrate, or replace the instrument is lowered. Operating safety is also enhanced.

The Model 200 is available in aluminum, brass, or 316 stainless steel with 1/4" FNPT connections for 5000 PSI working pressure and in brass or 316 stainless steel with 1/2" FNPT connections for 10,000 PSI working pressure. Buna N O-rings and Teflon backup rings are standard. Optional seal materials include Viton, Neoprene, and Ethylene Propylene.



NOTES: 1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.

PART NUMBERING SYSTEM

2 0 0 – □ □ – □ □

① **BASIC MODEL NUMBER**

② **MATERIAL (BODY)**
- A. Aluminum
- B. Brass
- S. 316 Stainless Steel
- Z. Special

③ **SIZE***
- O. 1/4" FNPT
- H. 1/2" FNPT
- Z. Special

*Metric Connections Available

④ **SEALS**

0.	Buna N & Teflon	-30° to +250°
1.	Viton & Teflon	-15° to +400°
2.	Neoprene & Teflon	-45° to +300°
5.	Ethylene Propylene & Teflon	-70° to +250°
9.	Special	

⑤ **OPTIONS**
- 0. None
- 7. Factory Presetting of Shut-off Point (Above 1500 psig)
- 8. Preset Shut Off
- 9. Special

The range springs are identified by color, as follows:

Color of Spring	Shut-off Range, PSI
Silver	50 to 120 PSI
Black	100 to 1100 PSI
Gold	1000 to 5000 PSI

Model	Max. Working Pressure PSIG (kg/cm)	Body Material	T
200AO	5,000 (350)	ALUMINUM	1/4" F.N.P.T.
200BO	5,000 (350)	BRASS	1/4" F.N.P.T.
200SO	5,000 (350)	316 S.S.	1/4" F.N.P.T.
200BH	10,000 (700)	BRASS	1/2" F.N.P.T.
200SH	10,000 (700)	316 S.S.	1/2" F.N.P.T.

Manufacturer reserves the right to change specifications without prior notice.

MODEL 200 "GAUGE-MINDER®"

INSTALLATION AND MAINTENANCE INSTRUCTIONS

The Model 200 "Gauge Minder" is mounted in-line with the instrument to be protected and may be mounted in any position. The automatic shutoff set point is adjusted by loosening the lock nut marked "adjust" and turning the adjustment screw. Turning "clock-wise" increases the shutoff pressure and turning "counter clock-wise" reduces the shutoff pressure. The Model 200 is shipped with a 50 to 120 PSI range spring installed, unless otherwise requested. Two additional springs for higher ranges are included as separate parts. The range spring can be changed by removing the adjustment screw.

The operating limits of the instrument to be protected must be considered when determining the point to set the Model 200 shutoff pressure. Commonly, a setting of 110% of full scale of the instrument is used. Instruments with full scale ranges above 1000 PSI generally have a lower safety factor. It is necessary in this instance to set the shutoff point to 100% of full scale of the instrument to prevent calibration failure. After adjustment of the shut-off pressure of the Model 200 is completed the instrument should be over-pressured for several minutes to verify operation. If indicated instrument pressure falls with the shut-off valve closed, there is a connection leak from the Model 200 to the instrument which must be corrected. If indicated instrument pressure rises beyond the shut-off point, the Model 200 is defective and should be returned if new or repaired by cleaning or installing new seals if previously used. **CAUTION: Do not adjust the set point with system pressurized and in the shutoff mode. Reduce system pressure until shutoff valve is open, then make set point adjustment.**

The Model 200 can be shut off manually with the needle valve marked "damp". The lock nut must be loosened. The valve screw is turned "clock-wise" to close. Turning the valve screw "counter clock-wise" one turn from closed position gives a range of pulsation dampening. Adjust the amount of dampening necessary to stop pointer oscillation on the instrument. **NOTE: Caution must be exercised when adjusting needle valve. Do not adjust more than two turns from closed position. Leakage can occur.**

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Bulletin No. 220/06
September 2006

Model 220 Piston Type Indicating/Nonindicating Differential Pressure Switch for Service in Hazardous Locations

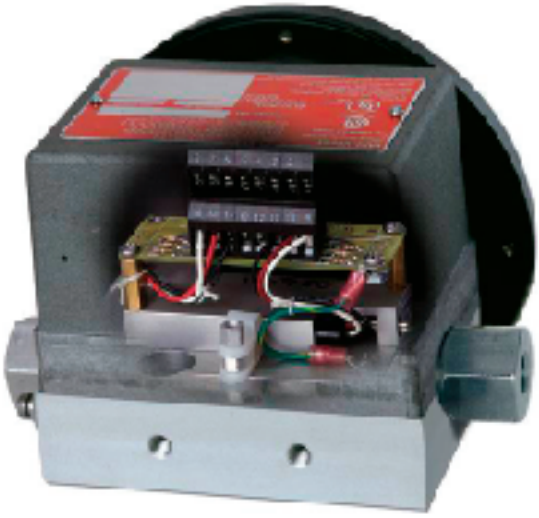
Range: 0-5 PSID to 0-100 PSID (0-0.35 bar to 0-7 bar)

Certified for CSA and UL:

Class I, Division1, Groups B, C & D
Class II, Division 1, Groups E, F & G
Class I, Division 2, Groups A, B, C & D
Class II, Division 2, Groups F & G

Certified for ATEX:

Ex d IIB + H2
Ex II 2GD IP65



- A low cost piston type differential pressure gauge two switches for use in measuring or controlling the pressure drop across filters, strainers, separators, valves, and pumps.
- Simple, rugged, compact design.
- Working pressure 4000 P.S.I.G. (275 bar).
- Over-range protection to maximum pressure.
- Aluminum or 316 wetted pressure containing body assembly.
- Wetted Internals – 316 S.S. and ceramic moving components.
- Weather-resistant gauge construction standard.
- Shatter Resistant lens.
- Accuracy ± 2% standard.*
- Five Year Limited Warranty.

*ASME B40.100 Grade B

- Field wireable terminal strip interface.
- Up to 10A 120/240 VAC switching with DPDT Relay outputs.
- Hermetically Sealed Switch Outputs up to 3 Amps in SPST configuration and up to 1 amp in SPDT configuration.
- SPST outputs available in Normally Open or Normally Closed configurations.
- Up to two independent adjustable switch points.
- ½" Conduit Interface.
- CSA Certified to **Canadian and US** standards.
- Certified for CSA and UL:
  Class I, Division 1, Groups B, C & D
  Class II, Division 1, Groups E, F & G
  Class I, Division 2, Groups A, B, C & D
  Class II, Division 2, Groups F & G
- Certified for ATEX:
  Ex d IIB + H2
  Ex II 2GD IP65

Division 2 units are NEMA 4X

Part Numbering System

2 2 0 — ☐ ☐ — ☐ ☐ — ☐ ☐ ☐ ☐ — ☐ ☐ ☐

1. BASIC MODEL NUMBER

2. BODY MATERIAL
- A. Aluminum (3000 PSIG ATEX, 4000 PSIG (Non-ATEX) for Alum. and S.S.
- S. 316 Wetted pressure containing elements
- Z. Special (Uncoded Options)[10]

3. DIAL SIZE
- C 4-1/2" Round Uni-Directional Dial
- F. 4-1/2" Round Aluminum Dial Housing
- T. Differential Pressure Switch Only (Without Indication)
- Z. Special[10]

4. SEALS
- 0. Buna N
- 1. * Viton®
- 2. Neoprene
- 4. **Teflon®
- 5. Ethylene Propylene
- 6. Perfluoroelastomer
- 9. Special (Uncoded Options)[10]

5. CONNECTIONS
- 2. 1/4" FNPT End Connections
- 7. 1/2" FNPT End Connections (316 S.S.)
- 9. Special (Uncoded Options)[10]

6. OPTIONS (Up to four options)
- O. None
- B. DIN2353 12-S (12mm) Steel Tube Fittings (2)
- F. Pipe Mounting Kit (carbon steel)
- G. Pipe Mounting Kit (stainless steel)[10]
- M. Maximum Indicator Follower Pointer[10]
- T. Oxygen Cleaning
- U. Stainless Steel Tag mounted with S.S. Wire
- V. Stainless Steel Tag mounted with S.S. Screws
- Z. Special (Uncoded Options)[10]

Note: Not all options available in combination with other options.

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**Teflon® is a Registered Trademark of DuPont.

7. ELECTRICAL CONFIGURATIONS
(Select One) (Switch Adjustable Range 10-90% except where stated below) (T6 Temperature Class unless specified otherwise.
- A. One Control Switch in NEMA 4X Enclosure[1, 6, 8]
- B. Two (2) Control Switches in NEMA 4X Enclosure[1, 6, 7, 8]
- J. One (1) Control Switch in NEMA 4X (Explosion Proof Enclosure)[2]
- K. Two (2) Control Switches in NEMA7 (Explosion Proof Enclosure)[2, 7]
- R. One (1) Control Switch in Ex d Enclosure (CE Marked)[2, 9]
- S. Two (2) Control Switches in Ex d Enclosure (CE Marked)[2, 7, 9]
- T. 4-20mA Transmitter in NEMA7/Exd (Explosion Proof Enclosure)[11]
- Z. Special (uncoded options)[10]

8. ELECTRICAL SPECIFICATIONS
(Select 1 input and 1 Output)

INPUT OPTIONS:
- A. No Input Power (For Reed Outputs A, E, F, G,H)
- B. 5/6 VDC
- C. 12 VDC
- D. 24 VDC
- E. 48 VDC
- F. 24 VAC
- G. 120 VAC
- H. 240 VAC
- T. 8-28 Vdc Loop Power (Option T only)[11]

OUTPUT OPTIONS: (Resistive Load)[3]
- A. S.P.D.T., Reed, 3 W, 0.25 Amp, 125 Vac/VDC
- E. S.P.S.T., Reed, 60 W, 3 Amp, 240 VAC/VDC (N.O.)[4]
- F. S.P.S.T., Reed, 60 W, 3 Amp, 240 VAC/VDC (N.C.)[4]
- G. Two (2) S.P.S.T., Reeds, 60W, 3 Amp 240 VAC/VDC[4], (One normally open, one normally closed B, K & S Elec.Configurations only)
- H. S.P.D.T., Reed, 60 W, 1 Amp, 240 VAC/VDC[5]
- R. D.P.D.T., Relay, 10A, @30 VDC, 120/240 VAC[4,8]
- T. 4-20 mA Transmitter (Option T)(±2% accuracy from 20% to 100% of scale, Ascending)[11]
- Z. Special (Contact Factory)[10]

(1) Complete Assembly **CSA & & UL** Certified, Rated Class I Div 2, Groups A, B, C & D; Class II Div 2, Groups F & G (R Output option excluded)
(2) Complete Assembly **CSA & UL** Certified, Rated Class I Div 1, Groups B, C & D; Class II Div 1, Groups E, F & G
(3) For Output Options A through H, the product of the switching voltage and current shall not exceed the power rating.
(4) Switch adjustable range 15-90% of the gauge full scale range.
(5) Switch adjustable range 25-90% of the gauge full scale range.
(6) Enclosure Type 4/4X
(7) For Electrical configurations B, K & S, S.P.D.T. relay output only.
(8) Electrical configuration A & B in combination with Output Option R is not rated for hazardous locations.
(9) ATEX rated CE marked: Ex d IIB + H2 IP65
(10) Not available with electrical configurations R & S.
(11) Not yet CSA & UL Listed or ATEX rated.

STANDARD MODEL SPECIFICATIONS Range: 0-5 PSID to 0-100 PSID (0-0.35 bar to 0-7 bar)

220-AC-02-O(JAA), 4000 P.S.I.G. Working Pressure, Aluminum Wetted pressure containing body assembly, ¼" FNPT End Connections, Stainless Steel/ceramic magnet internals, Buna-N seals, 4 ½" round dial, engineering plastic gauge case with shatter resistant acrylic lens. One 3W, 125 VAC/VDC SPDT reed switch with terminal strip, aluminum explosion proof switch enclosure with ½" FNPT electrical access. CSA Certified and UL Listed. Accuracy ± 2% F.S.* (Ascending)

220-SC-02-O(JAA), 4000 P.S.I.G. Working Pressure, 316 Wetted Pressure containing body assembly, End Plugs, Piston, Spring, Ceramic Magnet, Buna-N Seals, 4 ½" round dial, engineering plastic gauge case with shatter resistant acrylic lens. One 3W, 125 VAC/VDC SPDT reed switch with terminal strip, aluminum explosion proof switch enclosure with ½" FNPT electrical access. CSA Certified and UL Listed. Accuracy ± 2% F.S.* (Ascending)

General Operation & Description: The movement of a floating piston magnet against a calibrated spring senses differential pressure. The gauge pointer, outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure

Note: Due to precision sizing of the piston and the body, bore leakage across the piston will not exceed 15 SCFH air at 100 PSID at ambient conditions. **This gauge should not be used in Hazardous Environments with the low process port open to atmosphere.**

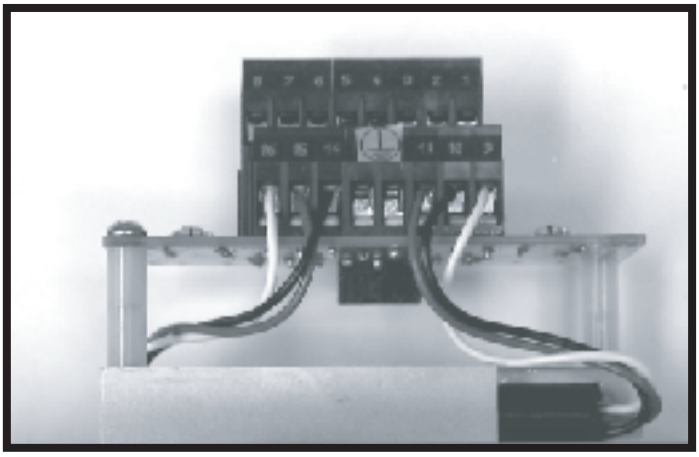
Switches: The switching components are housed under a copper free Aluminum cover. The combination of the gauge body and the cover make up the flame-proof seal. Electrical interface to the internal field wire terminal strip is via a ½" NPT industry standard conduit connection located through the gauge body.

The hazardous environment indicating differential pressure switch is available with one or two hermetically sealed reed switches with optional one or two SPDT or one DPDT relay output. Each switch is independently adjustable within a defined percentage of the full scale range of the gauge and is available in SPDT and SPST (normally open or normally closed configurations) for various load power ratings. The switches can be set to activate or deactivate on rising or falling differential pressure. If the optional relay output is specified, an input operating voltage **must also be specified.**

OUTPUT RATINGS (Resistive Load)

Type	SPST	SPDT	SPDT	DPDT Relay
ELEC Spec.	A A	A		B,C,D,E,F,G, H
Output Option Code	E, F, or G	H	A	R
*Power	60 W	60 W	3W	N/A
Max. Current	3 Amps	1.0 Amps	0.25 Amps	10 Amps
Max. Volts VAC/ VDC	240	240 125		277 / 30
Setting (F.S.)	15% to 90%	25% to 90%	10% to 90%	15% to 90%
Hysteresis (Max/Nom)	20% / 9% Full Scale(F.S.)	20% / 18% Full Scale(F.S.)	10% / 6% Full Scale(F.S.)	20% / 10% Full Scale(F.S.)
Repeatability	1% F.S.	1% F.S.	1% F.S.	1% F.S.

* Product of the switching voltage and current shall not exceed the power rating of the device.

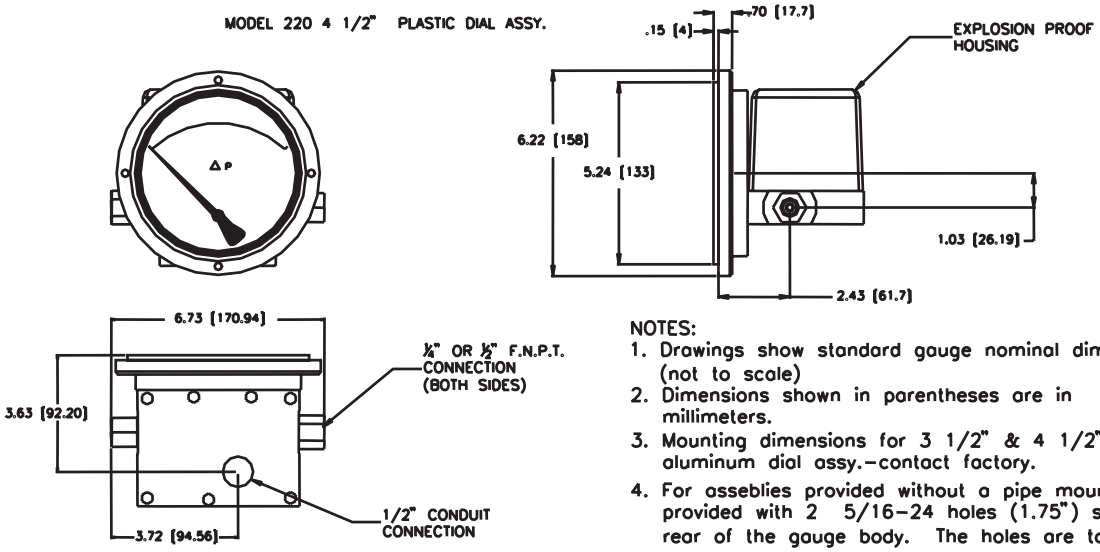


Hazardous Locations Certifications:

Electrical Configurations	Class I, Div. 2 Groups A, B, C & D Class II, Div. 2 Groups F & G NEMA 4X	Class I, Div. 1 Groups B, C & D Class II, Div. 1 Groups E, F & G	Ex d IIB + H_2 IP65
A	X		
B	X		
J		X	X
K		X	X
R			X
S			X

Configurations are Certified for both the U.S. and Canadian markets, to the applicable U.S. and Canadian standards.

MOUNTING INFORMATION & DIMENSIONAL DATA



NOTES:
1. Drawings show standard gauge nominal dimensioins. (not to scale)
2. Dimensions shown in parentheses are in millimeters.
3. Mounting dimensions for 3 1/2" & 4 1/2" aluminum dial assy.–contact factory.
4. For asseblies provided without a pipe mounting bracket, the switch is provided with 2 5/16–24 holes (1.75") separation located on the rear of the gauge body. The holes are tapped a minimum of 6.2 threads deep. Customer selected bolts must allow for 1 free thread after engagement with the gauge body.

PROOF PRESSURE: 16000 PSI

TEMPERATURE LIMITS:

-40°C <Ta <70°C for output option R (Relay Output).
-40°C <Ta <85°C for Electrical Input Options A in combination with Electrical Output options A, E, F, G & H.

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: All Model 220 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards.

ASME B1.20.1	**NACE MR017**
ASME B40.100	**NEMA Std. No. 250**
CSA-C22.2 No. 14, 25 and 30	**SAE J514**
UL Std. No. 50, 508, 698 and 1203	**EN50079-0, EN60079-1, EN50281-1, and EN13463-1**

For information on 4-20mA Transmitter Options refer to Bulletin 220-240T/06.

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Instrument

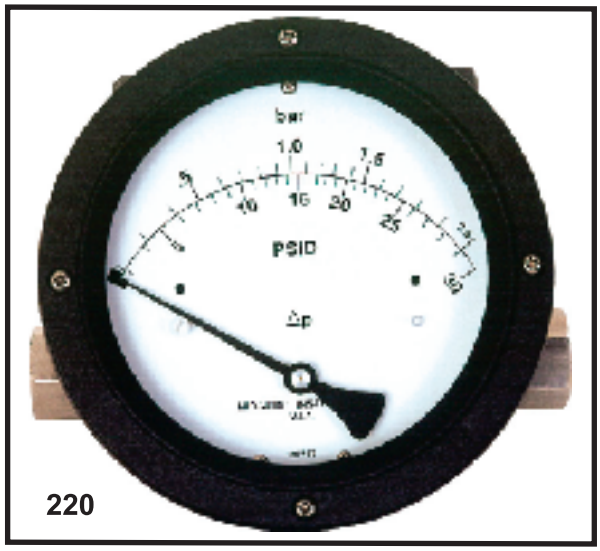
Bulletin No. 220-240T/06
September 2006

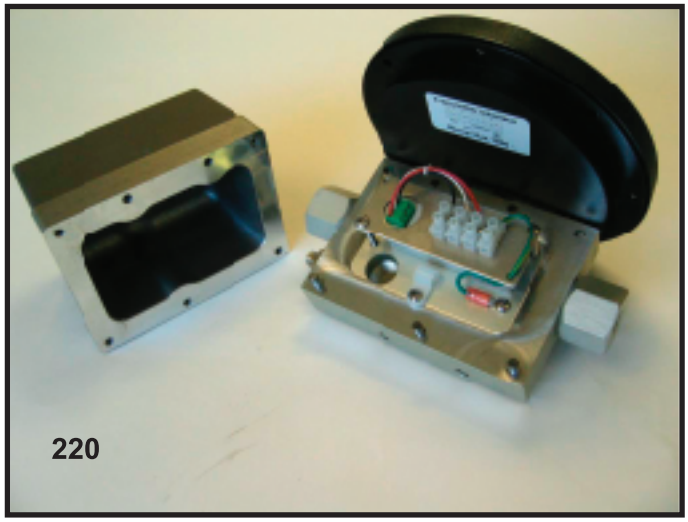
Model 220/240 4-20 mA Transmitter

These Models provide a simple low cost loop powered 8-28 Vdc two wire 4-20 mA Transmitter with a highly visible local display allowing for monitoring at the unit and in the control room.

The transmitter utilizes the same CSA,UL and ATEX rated sensor and explosion proof housing as on the Models 220 and 240 explosion proof switches. Although the transmitter option is not yet listed, the sensors and explosion proof housing are rated for Class I, Division 1 Groups B, C & D, Class II, Division 1 Groups E, F & G and Ex d IIB + H2 IP65.

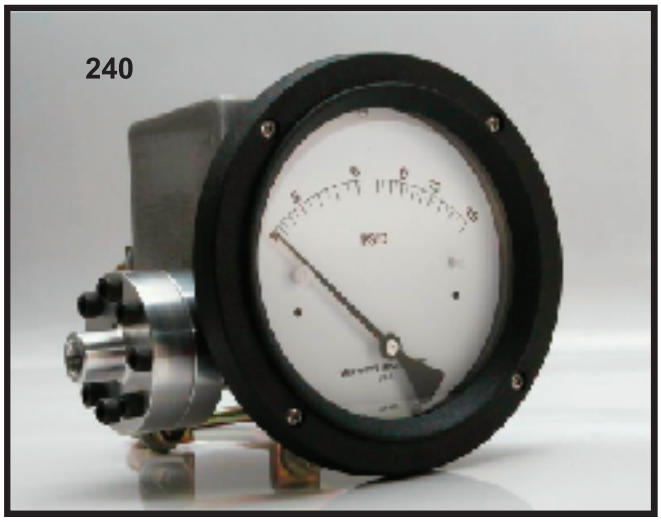
Model 220 – Piston Type Transmitter 0-5 PSID to 0-100 PSID (0-0.35 bar to 0-7 bar)

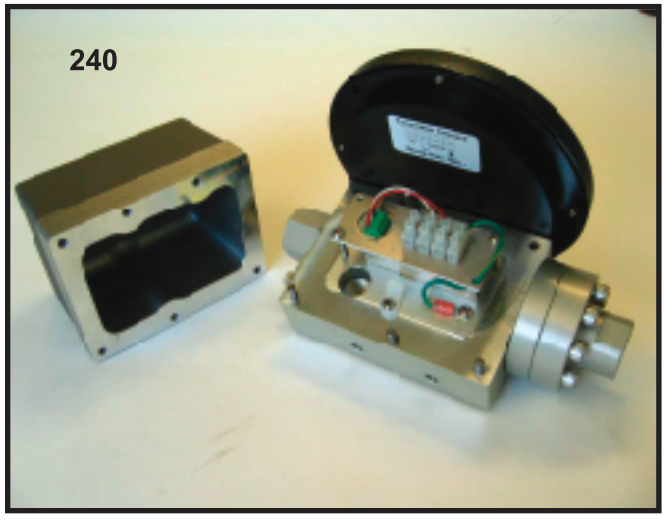




TRANSMITTER OPERATION: Differential pressure is sensed by a piston in the 220 and a flexible elastomers diaphragm in the 240, and a calibrated range spring. A magnetic coupling transmits the sensing element motion to the external indicating pointer. A magnetic angle sensor and electronics senses the angle (relative to the transmitter sensor) of the sensing element magnet which moves linearly in the bore. Each transmitter is individually calibrated to the gauge using an 11 point calibration linearization technique.

Model 240 – Diaphragm Type Transmitter 0-20 IN. H_2O to 0-100 PSID (0-50 mbar to 0-7 bar)





STANDARD MODEL SPECIFICATIONS Range: 0-5 PSID to 0-100 PSID (0-0.35 bar to 0-7 bar)

220-AC-02-O(TTT), 4000 P.S.I.G. Working pressure, aluminum wetted pressure containing body assembly, ¼" FNPT end connections, stainless steel/ceramic magnet internals, Buna-N seals, 4 ½" round dial, engineering plastic gauge case with shatter resistant acrylic lens. 4-20 mA, 8-28 VDC loop powered 2 wire transmitter with terminal strip, aluminum explosion proof enclosure with ½" NPT conduit interface.

Part Numbering System

2 2 0 — □ □ — □ □ — □ □ □ □ — □ □ □

1. BASIC MODEL NUMBER

2. BODY MATERIAL
- A. Aluminum (3000 PSIG ATEX, 4000 PSIG (Non-ATEX) for Alum. and S.S.
- S. 316 Wetted pressure containing elements
- Z. Special (Uncoded Options)[10]

3. DIAL SIZE
- C 4-1/2" Round Uni-Directional Dial
- F. 4-1/2" Round Aluminum Dial Housing
- T. Differential Pressure Switch Only (Without Indication)
- Z. Special (Uncoded Options)[10]

4. SEALS
- 0. Buna N (Standard)
- 1. * Viton®
- 2. Neoprene
- 4. **Teflon®
- 5. Ethylene Propylene
- 6. Perfluoroelastomer
- 9. Special (Uncoded Options)[10]

5. CONNECTIONS
- 2. 1/4" FNPT End Connections (Standard)
- 7. 1/2" FNPT End Connections (316 S.S.)
- 9. Special (Uncoded Options)[10]

6. OPTIONS (Up to four options)
- O. None
- B. DIN2353 12-S (12mm) Steel Tube Fittings (2)
- F. Pipe Mounting Kit (carbon steel)
- G. Pipe Mounting Kit (stainless steel)[10]
- M. Maximum Indicator Follower Pointer[10]
- T. Oxygen Cleaning
- U. Stainless Steel Tag mounted with S.S. Wire
- V. Stainless Steel Tag mounted with S.S. Screws
- Z. Special (Uncoded Options)[10]

7. ELECTRICAL CONFIGURATIONS

(Select One) (Switch Adjustable Range 10-90% except where stated below) (T6 Temperature Class unless specified otherwise.
- A. One Control Switch in NEMA 4X Enclosure [1, 6, 8]
- B. Two (2) Control Switches in NEMA 4X Enclosure[1,6,7,8]
- J. One (1) Control Switch in NEMA 4X (Explosion Proof Enclosure)[2]
- K. Two (2) Control Switches in NEMA7 (Explosion Proof Enclosure)[2,7]
- R. One (1) Control Switch in Ex d Enclosure (CE Marked)[2,9]
- S. Two (2) Control Switches in Ex d Enclosure (CE Marked)[2,7,9]
- T. 4-20mA Transmitter in NEMA7/Ex d (Explosion Proof Enclosure)[11]
- Z. Special (Uncoded Options)[10]

8. ELECTRICAL SPECIFICATIONS
(Select 1 INPUT OPTION and 1 OUTPUT OPTION)

INPUT OPTIONS:
- A. No Input Power (For Reed Outputs A, E, F, G,H)
- B. 5/6 VDC
- C. 12 VDC
- D. 24 VDC
- E. 48 VDC
- F. 24 VAC
- G. 120 VAC
- H. 240 VAC
- T. 8-28 Vdc Loop Power (Option T only)[11]

OUTPUT OPTIONS: (Resistive Load)[3]
- A. S.P.D.T., Reed, 3 W, 0.25 Amp, 125 VAC/VDC
- E. S.P.S.T., Reed, 60 W, 3 Amp, 240 VAC/VDC (N.O.)[4]
- F. S.P.S.T., Reed, 60 W, 3 Amp, 240 VAC/VDC (N.C.)[4]
- G. Two (2) S.P.S.T., Reeds, 60W, 3 Amp 240 VAC/VDC[4]

(One normally open, one normally closed B, K & S Elec.Configurations only)
- H. S.P.D.T., Reed, 60 W, 1 Amp, 240 VAC/VDC[5]
- R. D.P.D.T., Relay, 10A, @30 VDC, 120/240 VAC[4,8]
- T. 4-20 mA Transmitter (Option T) (±2% accuracy from 20% to 100% of scale, Ascending)[11]
- Z. Special (Contact Factory)[10]

Note: Not all options available in combination with other options.

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(1) Complete Assembly **CSA & & UL** Certified, Rated Class I Div 2, Groups A, B, C & D; Class II Div 2, Groups F & G (R Output option excluded)
(2) Complete Assembly **CSA & UL** Certified, Rated Class I Div 1, Groups B, C & D; Class II Div 1, Groups E, F & G
(3) For Output Options A through H, the product of the switching voltage and current shall not exceed the power rating.
(4) Switch adjustable range 15-90% of the gauge full scale range.
(5) Switch adjustable range 25-90% of the gauge full scale range.
(6) Enclosure Type 4/4X
(7) For Electrical configurations B, K & S, S.P.D.T. relay output only.
(8) Electrical configuration A & B in combination with Output Option R is not rated for hazardous locations.
(9) ATEX rated CE marked: Ex d IIB + H2 IP65
(10) Not available with Electrical Configurations R & S
(11) Not yet CSA & UL Listed or ATEX rated

STANDARD MODEL SPECIFICATIONS Range: 0-20 IN. H_2O to 0-100 PSID (0-50 mbar to 0-7 bar)

240AC-02-O(TTT), 1500 P.S.I.G. Working pressure, aluminum wetted pressure containing body assembly, ¼" FNPT end connections, stainless steel/ceramic magnet internals, Buna-N seals, 4 1/2" round dial, engineered plastic gauge case with shatter resistant lens. 4-20mA, 8-28 VDC loop powered 2 wire transmitter with terminal strip, aluminum explosion proof enclosure with ½" NPT conduit interface.

Part Numbering System

2 4 0 — □ □ — □ □ — □ □ □ □ — □ □ □

1. BASIC MODEL NUMBER

2. BODY MATERIAL
- A. Aluminum
- S. 316 Wetted pressure containing elements
- Z. Special (Uncoded Options)[10]

3. DIAL SIZE
- C 4-1/2" Round Dial Uni-Directional
- F. 4-1/2" Round Aluminum Dial Housing
- T. Differential Pressure Switch Only (Without Indication)
- Z. Special (Uncoded Options)[10]

4. SEALS
- 0. Buna N (Standard)
- 1. * Viton®
- 5. Ethylene Propylene
- 9. Special (Uncoded Options)[10]

5. CONNECTIONS
- 2. 1/4" FNPT End Connections (Standard)
- 7. 1/2" FNPT End Connections (316 S.S.)
- 9. Special (Uncoded Options)[10]

6. OPTIONS (Up to four options)
- O. None
- B. DIN 2353 12-S (12mm) Steel Tube Fittings (2)
- F. Pipe Mounting Kit (Carbon Steel)
- G. Pipe Mounting Kit (Stainless Steel)[10]
- M. Maximum Indicator Follower Pointer[10]
- T. Oxygen Cleaning
- U. Stainless Steel Tag mounted with S.S. Wire
- V. Stainless Steel Tag mounted with S.S. Screws
- Z. Special (Uncoded Options)[10]

7. ELECTRICAL CONFIGURATIONS
(Select One) (For DP ranges greater than or equal to 60 PSID the Switch adjustability is from 35% - 100% of the Full Scale Range for all switch options) (T6 Temperature Class unless specified otherwise)
- A. One (1) Control Switch in NEMA 4X Enclosure [1, 6, 8]
- B. Two (2) Control Switches in NEMA 4X Enclosure[1,6,7,8]
- J. One (1) Control Switch in NEMA 4X (Explosion Proof Enclosure)[2]
- K. Two (2) Control Switches in NEMA7 (Explosion Proof Enclosure)[2,7]
- R. One (1) Control Switch in Ex d Enclosure (CE Marked)[2,9]
- S. Two (2) Control Switches in Ex d Enclosure (CE Marked)[2,7,9]
- T. 4-20 mA Transmitter in NEMA 7/Ex d (Explosion proof enclosure)[11]
- Z. Special (Uncoded Options)[10]

8. ELECTRICAL SPECIFICATIONS
(Select 1 INPUT and 1 OUTPUT)
INPUT OPTIONS:
- A. No Input Power (For Reed Outputs A, E, H)
- B. 5/6 VDC
- C. 12 VDC
- D. 24 VDC
- E. 48 VDC
- F. 24 VAC
- G. 120 VAC
- H. 240 VAC (T4(ATEX) T4A (UL/CSA) Temperature Class
- T. 8-28 Vdc loop power (Option T only)[11]

OUTPUT OPTIONS: (Resistive Load)[3]
- A. S.P.D.T., Reed, 3 W, 0.25 Amp, 125 Vac/VDC[4]
- E. S.P.S.T., Reed, 60 W, 3 Amp, 240 VAC/VDC (N.O.)[4]
- H. S.P.D.T., Reed, 60 W, 1 Amp, 240 VAC/VDC[5]
- R. D.P.D.T., Relay, 10A, @30 VDC, 120/240 VAC[4,8]
- T. 4-20 mA Transmitter (Option T) (±2% Accuracy from 20% to 100% of scale, Ascending)[11]
- Z. Special (Uncoded Options)[10]

Note: Not all options available in combination with other options.

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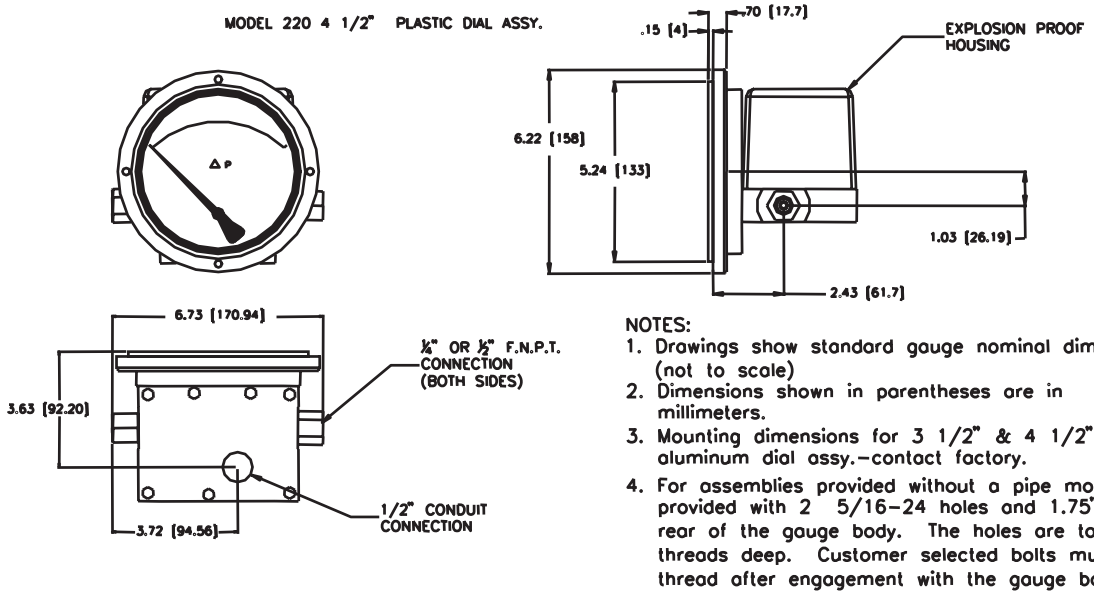
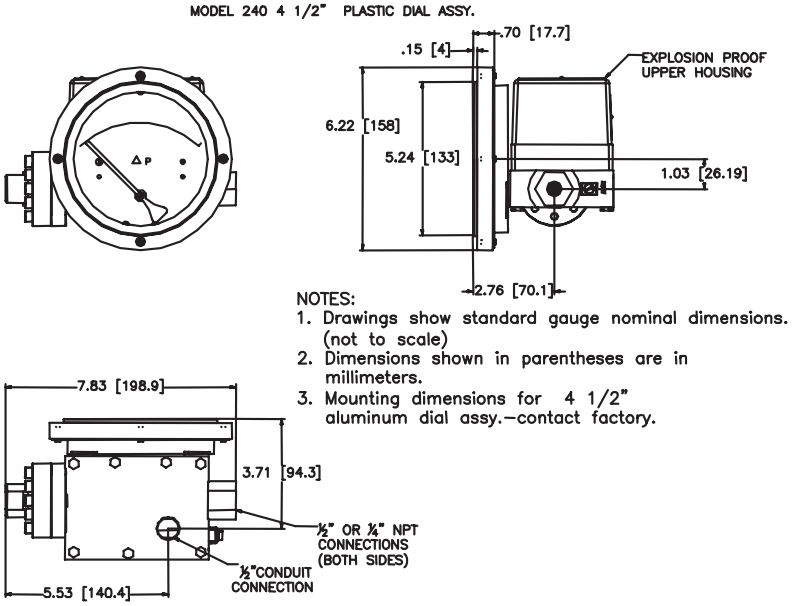
(1) Complete Assembly CSA & & UL Certified, Rated Class I Div 2, Groups A, B, C & D; Class II Div 2, Groups F & G (R Output option excluded).
(2) Complete Assembly CSA & UL Certified, Rated Class I Div 1, Groups B, C & D; Class II Div 1, Groups E, F & G.
(3) For Output Options A through H, the product of the switching voltage and current shall not exceed the power rating.
(4) Switch adjustable range 15-100% of the gauge full scale range.
(5) Switch adjustable range 25-100% of the gauge full scale range.
(6) Enclosure Type 4/4X.
(7) For Electrical configurations B, K & S, S.P.D.T. relay output only.
(8) Electrical configuration A & B in combination with Output Option R is not rated for hazardous locations.
(9) ATEX rated CE marked: Ex d IIB + H2 IP65.
(10) Not available with Electrical Configurations R & S.
(11) Not yet CSA & UL Listed or ATEX rated.

MOUNTING INFORMATION & DIMENSIONAL DATA



NOTES:
1. Drawings show standard gauge nominal dimensioins. (not to scale)
2. Dimensions shown in parentheses are in millimeters.
3. Mounting dimensions for 3 1/2" & 4 1/2" aluminum dial assy.–contact factory.
4. For assemblies provided without a pipe mounting bracket, the switch is provided with 2 5/16–24 holes and 1.75" separation located on the rear of the gauge body. The holes are tapped a minimum of 6.2 threads deep. Customer selected bolts must allow for 1 free thread after engagement with the gauge body.

MOUNTING INFORMATION & DIMENSIONAL DATA



NOTES:
1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.
3. Mounting dimensions for 4 1/2" aluminum dial assy.–contact factory.

STANDARDS: The Model 220 and 240 Series differential pressure transmitters either conform to and/or are designed to the requirements of the following standards.

ASME B1.20.1
ASME B40.100
CSA-C22.2 No. 14, 25 and 30
UL Std. No. 50, 508, 698 and 1203
NACE MR017
NEMA Std. No. 250
SAE J514
EN50079-0, EN60079-1, EN50281-1, and EN13463-1

Warranty: Gauge & Mechanical: 5 years Electrical: 1 year

For information on CSA, UL & ATEX rated explosion proof differential pressure switches please refer to Bulletins 220/06 and 240/06.

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Web Page: www.midwestinstrument.com

Mid-West®
Instrument

Bulletin No. 240/06
September 2006

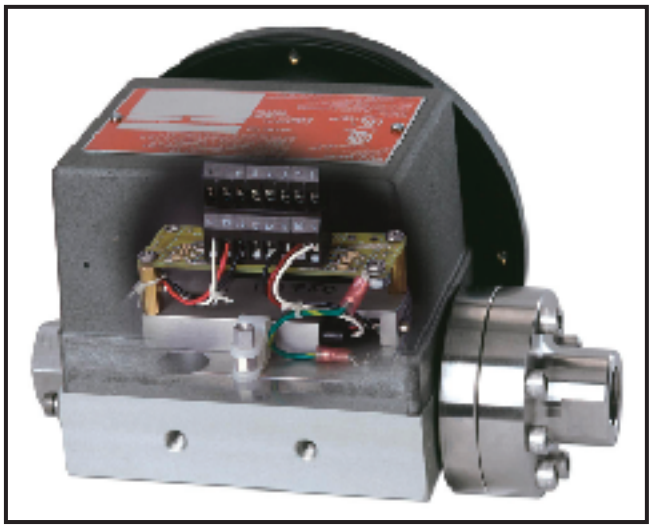
Model 240 Diaphragm Type Indicating/Nonindicating
Differential Pressure Switch for Service In Hazardous Locations
Range: 0-20 IN. H_2O to 0-100 PSID (0-50 mbar to 0-7 bar)

Certified for CSA and UL:

Class I, Division 1, Groups B, C & D
Class II, Division 1, Groups E, F & G
Class I, Division 2, Groups A, B, C & D
Class II, Division 2, Groups F & G

Certified for ATEX:

Ex d IIB + H2
Ex II 2GD IP65

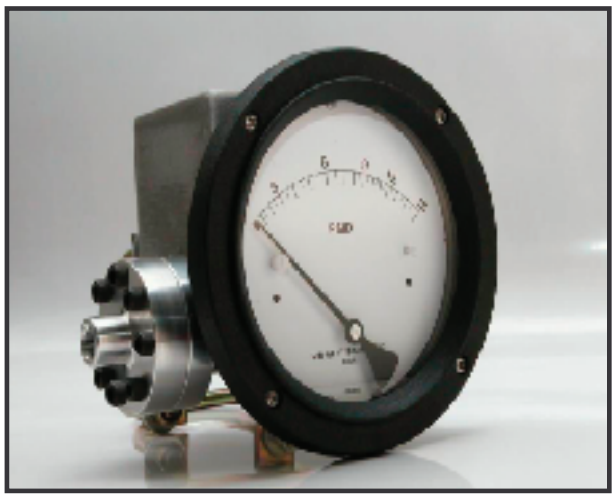


- A low cost diaphragm type differential pressure gauge with one or two switches for use in measuring or controlling the pressure drop across filters, strainers, separators, valves, and pumps.
- Simple, rugged, compact design.
- Working pressure 1500 P.S.I.G. (275 bar).
- Over-range protection to maximum pressure.
- Aluminum or 316 wetted pressure containing body assembly.
- Wetted Internals – 316 S.S. and ceramic moving components.
- Weather-resistant gauge construction standard.
- Shatter Resistant lens.
- Accuracy ± 2% standard.*
- Five Year Limited Warranty.

*ASME B40.100 Grade B

- Field wireable terminal strip interface.
- Up to 10A 120/240 VAC switching with DPDT Relay outputs.
- Hermetically Sealed Switch Outputs up to 3 Amps in SPST configuration and up to 1 amp in SPDT configuration.
- SPST outputs available in Normally Open configuration.
- Up to two independent adjustable switch points.
- ½" Conduit Interface.
- CSA Certified to **Canadian and US** standards.
- Certified for CSA and UL:
  Class I, Division 1, Groups B, C & D
  Class II, Division 1, Groups E, F & G
  Class I, Division 2, Groups A, B, C & D
  Class II, Division 2, Groups F & G
- Certified for ATEX:
  Ex d IIB+H2
  Ex II 2GD IP65

Division 2 Unit is NEMA 4X



Part Numbering System

2 4 0 — ☐ ☐ — ☐ ☐ — ☐ ☐ ☐ ☐ — ☐ ☐ ☐

1. BASIC MODEL NUMBER

2. BODY MATERIAL
- A. Aluminum
- S. 316 Wetted pressure containing elements
- Z. Special (Uncoded Options)[10]

3. DIAL SIZE
- C 4-1/2" Round Uni-Directional Dial
- F. 4-1/2" Round Aluminum Dial Housing
- T. Differential Pressure Switch Only (Without Indication)
- Z. Special[10]

4. SEALS
- 0. Buna N (Standard)
- 1. * Viton®
- 5. Ethylene Propylene
- 9. Special (Uncoded Options)[10]

5. CONNECTIONS
- 2. 1/4" FNPT End Connections (Standard)
- 7. 1/2" FNPT End Connections (316 S.S.)
- 9. Special (Uncoded Options)[10]

6 OPTIONS (Up to four options)
- O. None
- B. DIN 2353 12-S (12mm) Steel Tube Fittings (2)
- F. Pipe Mounting Kit (carbon steel)
- G. Pipe Mounting Kit (stainless steel)[10]
- M. Maximum Indicator Follower Pointer[10]
- T. Oxygen Cleaning
- U. Stainless Steel Tag mounted with S.S. Wire
- V. Stainless Steel Tag mounted with S.S. Screws
- Z. Special (Uncoded Options)[10]

7. ELECTRICAL CONFIGURATIONS
(Select One) (For DP ranges greater than or equal to 60 PSID the Switch adjustability is from 35% - 100% of the Full Scale Range for all switch options) (T6 Temperature Class unless specified otherwise)
- A. One (1) Control Switch in NEMA 4X Enclosure [1, 6, 8]
- B. Two (2) Control Switches in NEMA 4X Enclosure[1,6,7,8]
- J. One (1) Control Switch in NEMA 4X (Explosion Proof Enclosure)[2]
- K. Two (2) Control Switches in NEMA7 (Explosion Proof Enclosure)[2,7]
- R. One (1) Control Switch in Ex d Enclosure (CE Marked)[2,9]
- S. Two (2) Control Switches in Ex d Enclosure (CE Marked)[2,7,9]
- T. 4-20 mA Transmitter in NEMA 7/Ex d (Explosion proof enclosure)[11]
- Z. Special[10]

8. ELECTRICAL SPECIFICATIONS
(Select 1 INPUT and 1 OUTPUT)
INPUT OPTIONS:
- A. No Input Power (For Reed Outputs A, E, H)
- B. 5/6 VDC
- C. 12 VDC
- D. 24 VDC
- E. 48 VDC
- F. 24 VAC
- G. 120 VAC
- H. 240 VAC (T4(ATEX) T4A (UL/CSA) Temperature Class
- T. 8-28 Vdc loop power (Option T only)[11]

OUTPUT OPTIONS: (Resistive Load)[3]
- A. S.P.D.T., Reed, 3 W, 0.25 Amp, 125 Vac/VDC[4]
- E. S.P.S.T., Reed, 60 W, 3 Amp, 240 VAC/VDC (N.O.)[4]
- H. S.P.D.T., Reed, 60 W, 1 Amp, 240 VAC/VDC[5]
- R. D.P.D.T., Relay, 10A, @30 VDC, 120/240 VAC[4,7]
- T. 4-20 mA Transmitter (Option T) (±2% Accuracy from 20% to 100% of scale, Ascending)[11]
- Z. Special (Contact Factory)[10]

Note: Not all options available in combination with other options.

*Viton® is a Registered Trademark of DuPont Dow Elastomers

(1) Complete Assembly CSA & & UL Certified, Rated Class I Div 2, Groups A, B, C & D; Class II Div 2, Groups F & G (R Output option excluded)
(2) Complete Assembly CSA & UL Certified, Rated Class I Div 1, Groups B, C & D; Class II Div 1, Groups E, F & G
(3) For Output Options A through H, the product of the switching voltage and current shall not exceed the power rating.
(4) Switch adjustable range 15-100% of the gauge full scale range.
(5) Switch adjustable range 25-100% of the gauge full scale range.
(6) Enclosure Type 4/4X
(7) For Electrical configurations B, K & S, S.P.D.T. relay output only.
(8) Electrical configuration A & B in combination with Output Option R is not rated for hazardous locations.
(9) ATEX rated CE marked: Ex d IIB + H2 IP65
(10) Not available with electrical configurations R & S.
(11) Not yet CSA & UL Listed or ATEX rated.

STANDARD MODEL SPECIFICATIONS

Range: 0-20 IN. H_2O to 0-100 PSID (0-50 mbar to 0-7 bar)

240-AC-02-O(JAA), 1500 P.S.I.G. Working Pressure, Aluminum wetted pressure containing body assembly, ¼" FNPT end connections, stainless steel/ceramic magnet internals, Buna-N seals, 4 ½" round dial, engineered plastic gauge case with shatter resistant acrylic lens. One 3W, 125 VAC/VDC SPDT reed switch with terminal strip, aluminum explosion proof switch enclosure with ½" FNPT electrical access. **CSA Certified and UL Listed**.

240-SC-02-O(JAA), 1500 P.S.I.G. Working Pressure, 316/316L S.S. wetted pressure containing body assembly, ¼" FNPT end connections, stainless steel/ceramic magnet internals, Buna-N seals, 4 ½" round dial, engineered plastic gauge case with shatter resistant lens. One 3W, 125 VAC/VDC SPDT reed switch with terminal strip, aluminum explosion proof switch enclosure with ½" FNPT electrical access. **CSA Certified and UL Listed.**

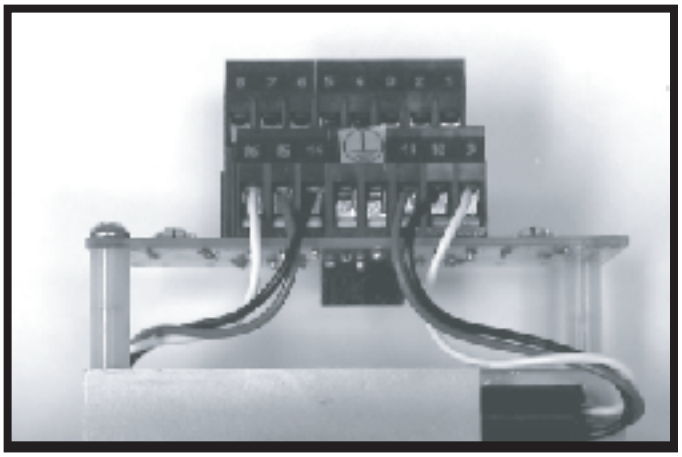
Operation & Description: Differential pressure is sensed by a flexible elastomer diaphragm and a calibrated range spring. The diaphragm assures total separation between the high and low pressure signals. Magnetically operated reed switches, also located outside the pressure housing, actuate dependent upon the positional relationship between the reed switch and the internal driver magnet. The reed contact(s) can be positioned to actuate within a defined percentage of the full-scale range of the gauge. For switching higher currents, the reed switches are used to control output relay(s).

Switches: The switching components are housed under a copper free Aluminum cover. The combination of the gauge body and the cover make up the flame-proof seal. Electrical interface to the internal field wire terminal strip is via a ½" NPT industry standard conduit connection located through the gauge body.

The hazardous environment indicating differential pressure switch is available with one or two hermetically sealed reed switches with optional one or two DPDT relay outputs. Each switch is independently adjustable within a defined percentage of the full scale range of the gauge and is available in SPDT and SPST (normally open or normally closed configurations) for various load power ratings. The switches can be set to activate or deactivate on rising or falling differential pressure. If the optional relay output is specified, an input operating voltage **must also be specified.**

OUTPUT RATINGS (Resistive Load)

Type	SPST	SPDT	SPDT	DPDT Relay
ELEC Spec.	A	A	A	B,C,D,E,F,G, H
Output Option Code	E H		A	R
*Power	60 W	60 W	3W	N/A
Max. Current	3 Amps	1.0 Amps	0.25 Amps	10 Amps
Max. Volts VAC/ VDC	240	240	125	277 / 30
Setting (F.S.)	15% to 100%	25% to 100%	10% to 100%	15% to 100%
Hysteresis (Max/Nom)	20% / 9% Full Scale(F.S.)	20% / 18% Full Scale(F.S.)	10% / 6% Full Scale(F.S.)	20% / 10% Full Scale(F.S.)
Repeatability	1% F.S.	1% F.S.	1% F.S.	1% F.S.



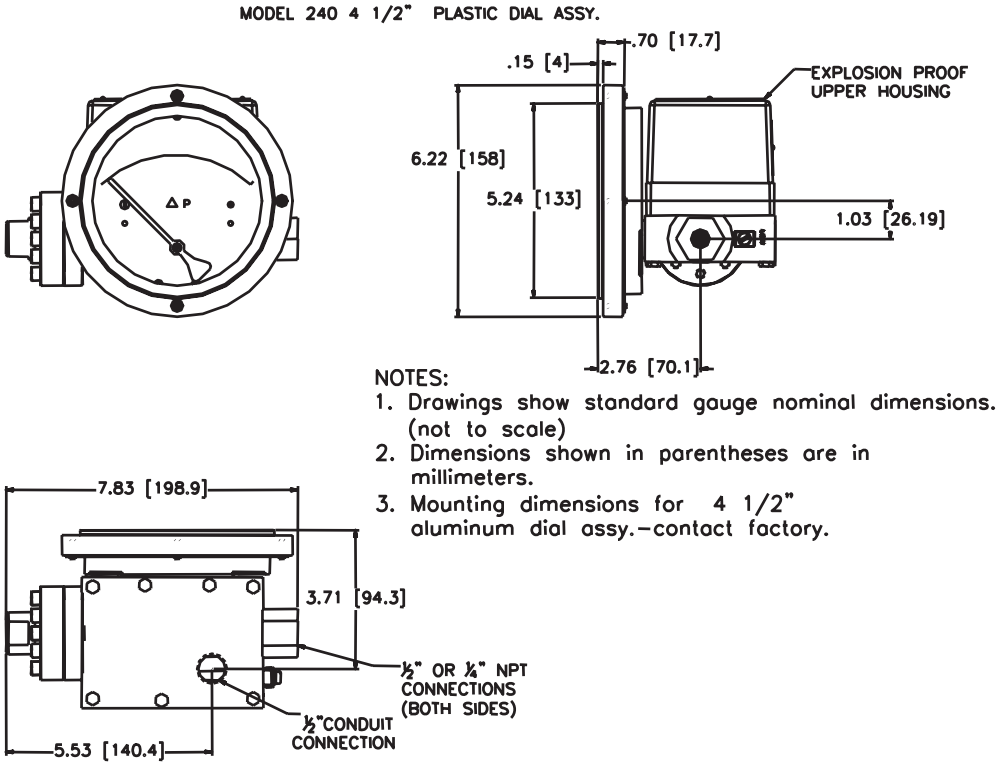
* Product of the switching voltage and current shall not exceed the power rating of the device.

Hazardous Locations Certifications:

Electrical Configurations	Class I, Div. 2 Groups A, B, C & D Class II, Div. 2 Groups F & G NEMA 4X	Class I, Div. 1 Groups B, C & D Class II, Div. 1 Groups E, F & G	Ex d IIB + H2 IP65
A	X		
B	X		
J		X	X
K		X	X
R			X
S			X

Configurations are Certified for both the U.S. and Canadian markets, to the applicable U.S. and Canadian standards.

MOUNTING INFORMATION & DIMENSIONAL DATA



NOTES:
1. Drawings show standard gauge nominal dimensions. (not to scale)
2. Dimensions shown in parentheses are in millimeters.
3. Mounting dimensions for 4 1/2" aluminum dial assy.–contact factory.

PROOF PRESSURE: 6,000 PSI

-40°C <Ta <70°C for output option R (Relay Output).
-40°C <Ta <85°C for Electrical Input Options A in combination with Electrical Output options A, E, F, G & H.

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: All Model 240 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards.

ASME B1.20.1
ASME B40.100
CSA-C22.2 No. 14, 25 and 30
UL Std. No. 50, 508, 698 and 1203
NACE MR017
NEMA Std. No. 250
SAE J514
EN50079-0, EN60079-1, EN50281-1, and EN13463-1

For information on 4-20mA Transmitter Options refer to Bulletin 220-240T/06.

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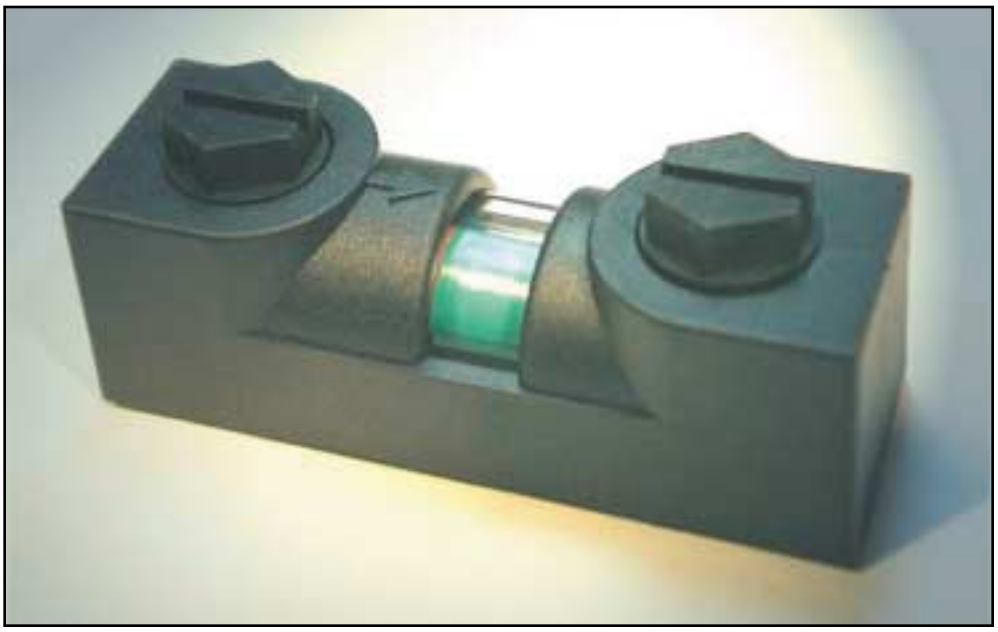
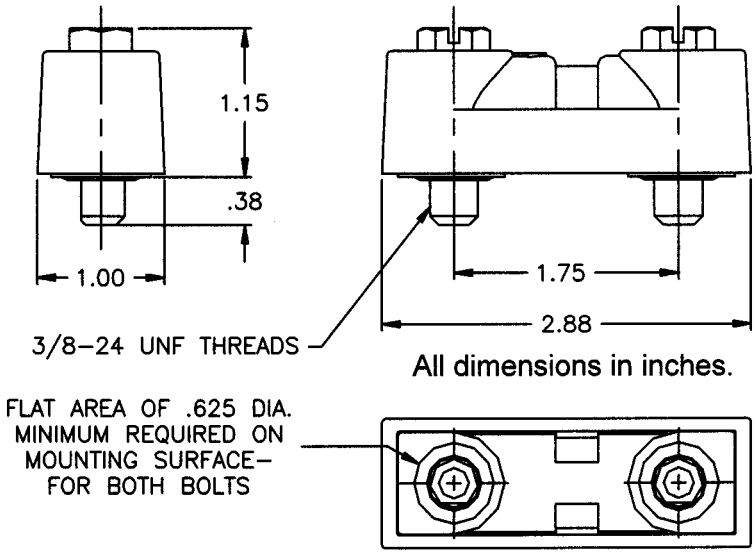
MODEL 444 SERIES
DIFFERENTIAL PRESSURE INDICATOR



The Model 444 Series differential pressure indicator offers a simple, yet functional design for use with filters, strainers, etc. This low cost indicator makes the perfect alternative to more costly differential pressure gauges where readability, small size and price are important considerations. **Design features include:**

- Glass-filled Nylon 6/6 Body
- Clear Nylon Lens
- Buna-N Elastomers
- Ranges from 0-5 thru 0-25 psid*
  *Contact factory for other ranges
- Slotted Hex Bolt 3/8-24UNF
- Directional Flow Arrow
- 200°F (93°C) Temperature Rated
- 300 psig Rated Working Pressure
- Internals: Glass-filled Nylon & Stainless Steel
- Green to Red Sliding Indication
- Chamfered Bolts Ease Installation

REPRESENTED BY:



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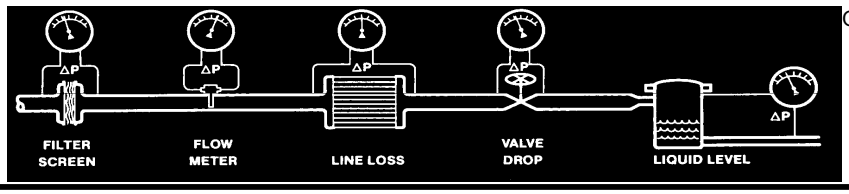


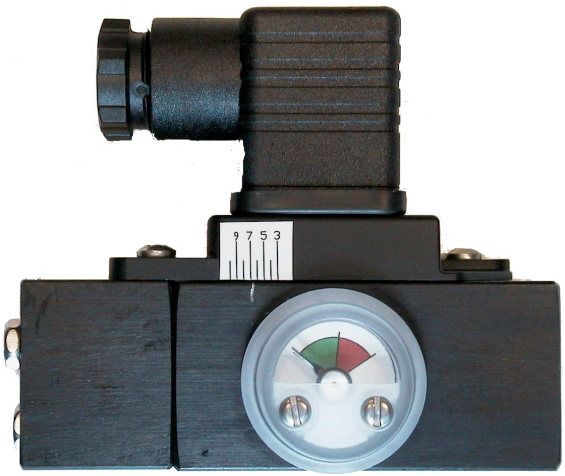
O.522/04A

Model 522 "FILTER-MINDER"
Diaphragm-TYPE Differential Pressure Gauge

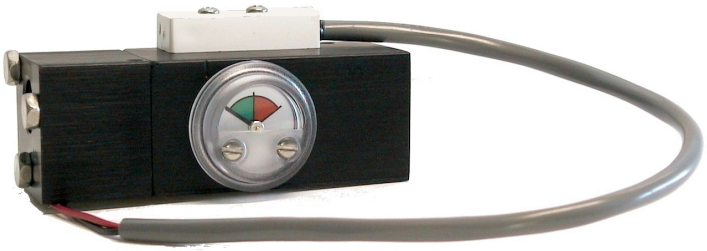
RANGE: 0-5 P.S.I.D. TO 0- 50 P.S.I.D. (.3 bar to 3.4 bar)

Gauge Features

- Range: 0-5 PSID thru 0-50 PSID (.3 bar thru 3.4 bar)
- Max. Static pressure 1000 P.S.I.G. (69 bar).
- Max. Differential pressure: 200 PSID (13.8 bar)
- Aluminum or 316 / 316L SS Gauge Body.
- Wetted 316 SS, Ceramic, & Acetal moving components.
- Available with Buna, Viton, or EPDM Elastomers
- _" FNPT Process Connections (End Connected)
- Weather-resistant construction standard.
- Dial Accuracy ± 3% standard.
- Switch Only (No Dial) available
- 0.8" weatherproof multicolored Dial
- 2 _" optional dial.
- Five Year Limited Warranty.



Adjustable Din Connector



Adjustable Flat Pack

Switch Features

- Switches are optional
- Hermetically Sealed Switch Outputs up to 3 amps in SPST configuration and up to .25 amp in SPDT configuration.
- Switch Adjustable from 40% - 100% of Range *
- Up to 240 VAC/VDC voltage ratings
- Available with Flat Pack case with Jacketed Flying Leads or with DIN IP65 / NEMA 4X Plug-in Connector.
- Optional Switch Set Feedback Decal
- Switch Location Top or Bottom
- CE Marking for Compliance with the Low Voltage Directive is available upon request.

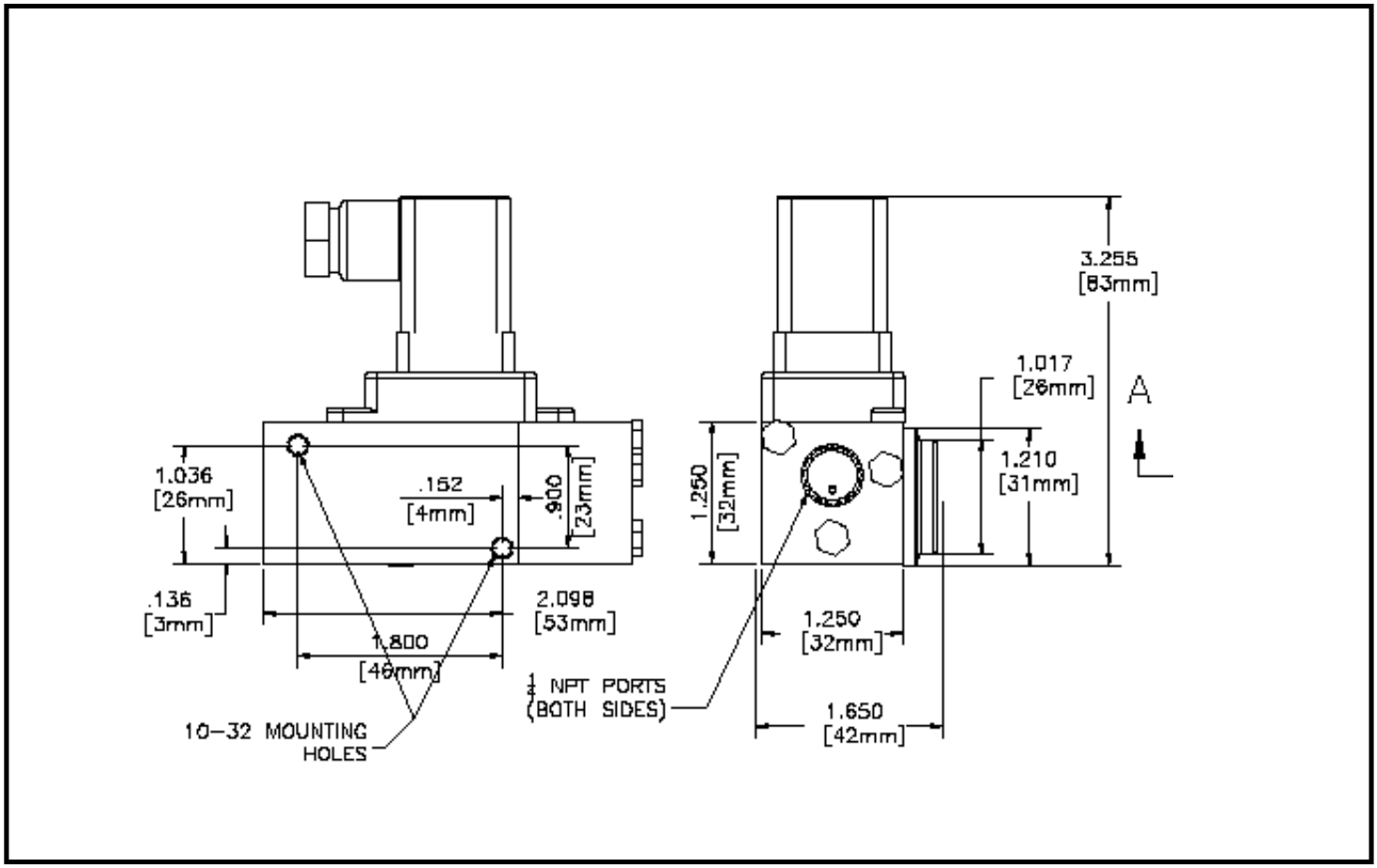
* Dependent on selected switch option.

Operation: Differential pressure is sensed by the movement of a piston magnet against a calibrated spring. The gauge pointer, outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure. When equipped, magnetically operated reed switches, also located outside the pressure housing, actuate dependent upon the positional relationship between the reed switch and the internal magnetic piston. The reed contact(s) can be positioned to actuate within a defined percentage of the full-scale range of the gauge.

Ordering Information:

Contact factory for desired configuration options & pricing.

Dimensional:



TEMPERATURE LIMITS: -40 ˚F (-40˚ C) to 200˚F (93˚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: All Model 522 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1 NACE MR0175
ASME B40.1 NEMA Std. 250
EN-61010-1 UL Std. No. 50 & 508
CSA-C22.2 No. 14

Factory Preset of switches available at no charge (Specify setting on the order)
The use of diaphragm seals is not recommended. Attempts to install such seals on this gauge will void the warranty

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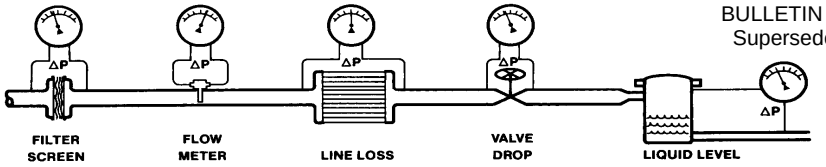


BULLETIN NO.522/06
Supersedes 522/03A

Model 522 "FILTER-MINDER"
Diaphragm-TYPE Differential Pressure Gauge

RANGE: 0-5 P.S.I.D. TO 0- 50 P.S.I.D. (.3 bar To 3.4 bar)

Gauge Features

- Range: 0-5 PSID thru 0-50 PSID (.3 bar thru 3.4 bar)
- Max. Static pressure 1000 P.S.I.G. (69 bar).
- Max. Differential pressure: 200 PSID (13.8 bar)
- Aluminum or 316 / 316L SS Gauge Body.
- Wetted 316 SS, Ceramic, & Acetal moving components.
- Available with Buna or Viton Elastomers
- ¼" FNPT Process Connections (End Connected)
- Weather-resistant construction standard.
- Dial Accuracy ± 5% standard.
- Switch Only (No Dial) available
- 0.8" weatherproof multicolored Dial
- 2 ½" optional dial.
- Five Year Limited Warranty.

522 Family

Adjustable Flat Pack

Switch Features

- Switches are optional
- Hermetically Sealed Switch Outputs up to 3 amps in SPST configuration and up to .25 amp in SPDT configuration.
- Switch Adjustable from 40% - 95% of Range *
- Up to 240 VAC/VDC voltage ratings
- Available with Flat Pack case with Jacketed Flying Leads or with DIN IP65 / NEMA 4X Plug-in Connector.
- Optional Switch Set Feedback Decal
- Switch Location Top or Bottom
- CE Marking for Compliance with the Low Voltage Directive is available upon request.

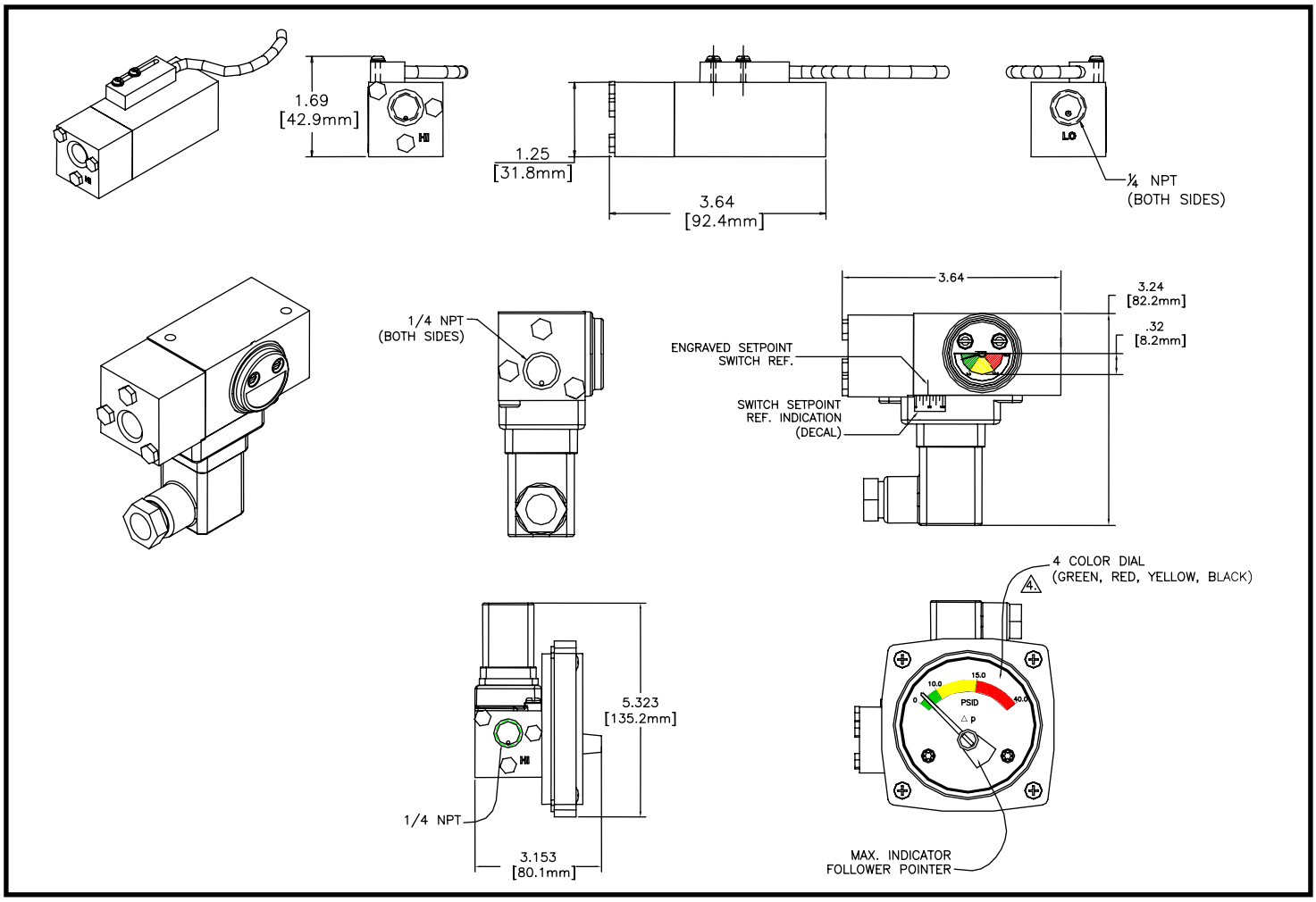
* dependent on selected switch option.

Operation: Differential pressure is sensed by the movement of a piston magnet against a calibrated spring. The gauge pointer, outside the pressure housing, follows the movement of the piston magnet and indicates differential pressure. When equipped, magnetically operated reed switches, also located outside the pressure housing, actuate dependent upon the positional relationship between the reed switch and the internal magnetic piston. The reed contact(s) can be positioned to actuate within a defined percentage of the full-scale range of the gauge.

Ordering Information:

Contact factory for desired configuration options & pricing.

Dimensional:



TEMPERATURE LIMITS: -40 ˚F (-40˚ C) to 200˚F (93˚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: All Model 522 Series differential pressure gauges either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1	NACE MR0175
ASME B40.100	NEMA Std. 250
EN-61010-1	UL Std. No. 50 & 508
CSA-C22.2 No. 14	

Factory Preset of switches available at no charge (Specify Setting on the order)
The use of diaphragm seals is not recommended. Attempts to install such seals on this gauge will void the warranty

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BULLETIN NO. 555/444/02
(Supersedes 555/444/01)

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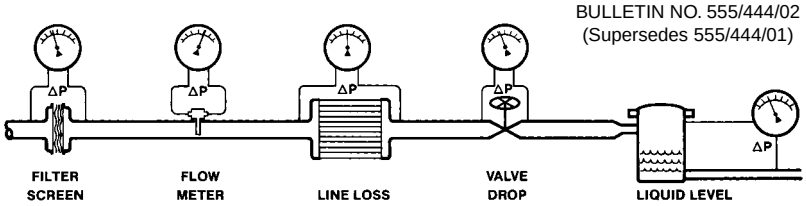
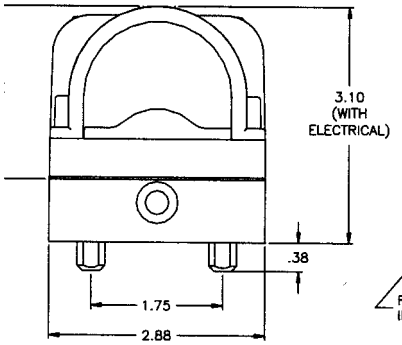
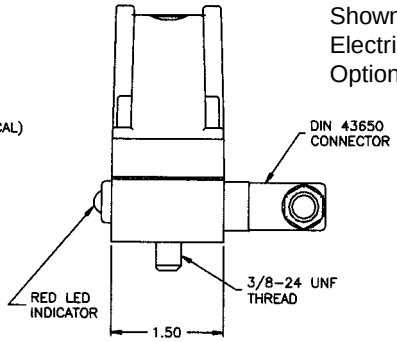
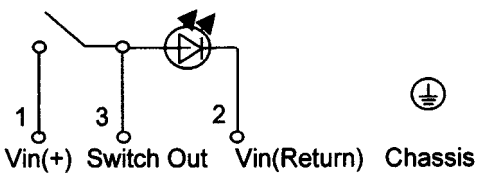






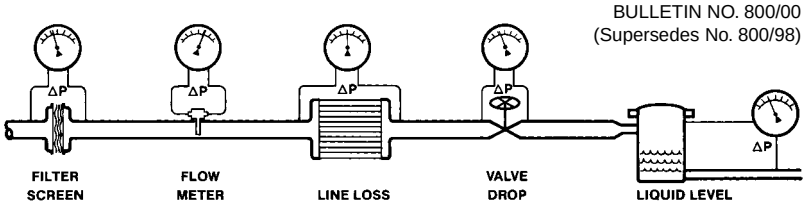
Shown without Electrical Options →

MODEL 555 SERIES
DIFFERENTIAL PRESSURE GAUGE

Differential Pressure Range	6 PSID at Green/Yellow Transition 10 PSID at Yellow/Red Transition	Other Options Possible
Leakage	None, Diaphragm Isolated Hi to Lo	
Pressure (Ratings) Max Working	300 PSIG	
Accuracy	± 5% of Rated Differential Pressure Range at Color Transitions	3 Color Dial: Green/Yellow/ Red. Other Options Possible
Operating Temperature (Max.)	200°F (93°C)	
Body Material	Glass Filled Nylon (GFN)	
Wetted Internals	Stainless Steel, Ceramic, & GFN	
Elastomers	Buna-N	
Movement	Magnetic Piston and Follower Pointer	
Dial	Plastic Lens with 3 Color Dial	Other Options Possible
Electrical: (Optional)		
Switch (Resistive Load):	**SPST**	
Rating:	50 Watts, 0.45 Amps, 240 VAC/VDC	Maximum Ratings
Set Point Accuracy	TBD	
Hysteresis:	8% Nominal	
Indicator:		
Color & Size:	Red 8MM LED	Brightness varies with input voltage
Operational Voltage Range	24VAC/VDC through 240 VAC/VDC	
Process Connections:	3/8-24" Molded Bolts, 1.75" Spacings	
Electrical:	Electrical base can be rotated 180° prior to filter mounting	
Connections:	DIN 43650, 3 Contact Connector + Chassis Gnd 0.138 thru .236 Cable Gland Wire Entry	Includes mating connector
Environmental Rating:	IP 65 Protection Class (Mated)	
Wiring Connector Contacts: **SPST: Normally Open**		Connect input power between contacts 1 & 2. Switch Output is connected to 3. For DC Input pin 1 must be of positive polarity with respect to pin 2

BULLETIN NO. 800/00
(Supersedes No. 800/98)

Mid-West®
Instrument



MODEL 800 SERIES
Flow Test Kits

(Five Year Limited Warranty)

Model 800 Series Test kits are portable devices designed for field monitoring of differential pressure type primary flow elements, such as averaging pitot tubes, orifice plates, venturi's, flow nozzles, elbow meters, etc. Other popular applications are balancing heating and cooling systems, checking filter or strainer pressure drop, pump performance, and leak detection. A wide choice of materials of construction is available depending on the model selected and the application requirements.

The gauges are mounted in a light weight, extremely rugged plastic case with appropriate hoses and valves.

PRECISION TEST KITS

Model Number	805 ①	806 ①	809 ①
			
Functions & Applications	High quality portable test kits for precise flow indication, leak detection, balancing heating & cooling systems, checking pump performance, and checking calibration of transmitters; etc.		

Specifications:

Differential Pressure Range	0-10” thru 0-79.9” H_20 25 mbar thru 199.9 mbar	0-80” thru 0-400” H_20 200 mbar thru 1 bar	0-15 thru 0-500 P.S.I.D. 0-1 thru 0-34 bar
Accuracy	0-10” H_20 thru 0-500 P.S.I.D. $\pm$ 1% Full Scale - Standard		
Dial Size	41/2” - Standard 6” - Optional		
Working Pressure	500 P.S.I.G. (34 bar) Standard		
	NOTE: Pressure rating shown is limited by the hoses. Higher ratings are available as an option. (Contact the factory for details)		

***Standard Materials of Construction:**

1. Gauge	Aluminum Capsule/Brass Internals		
2. Valves	Soft-Seated Brass		
3. Tubing & Fittings	Nylon & Brass		
4. Hoses & End Ftgs.	Nitrile Jacket and Liner. Schrader 1/4” Brass Coupler		
5. Case	Polyethylene		
Hose Length	10 ft. (3 Meters)		
Filters	All test Kits are protected with 90 Micron Brass Filters to minimize plugging with scale, sand, etc. Filter elements can be cleaned or replaced.		
Temperature Limitations	Maximum 150°F (66°C) **Freezing temperatures must be avoided.**		
Optional Features	A wide variety of materials, working pressures and fittings is available.		
Dimensional Data	13.75” x 15.5” x 8.5”	13.75” x 15.5” x 8.5”	13.75” x 15.5” x 8.5”
Approximate Shipping Weight Pounds/Kilos	15 lbs./6.8 kgs	15 lbs./6.8 kgs	15 lbs./6.8 kgs

① 805, 806, 809, & 831 TEST KITS ARE **PLUMBED FOR WATER SERVICE ONLY** (SEE SCHEMATICS ON BACK PAGE).
PLEASE CONTACT FACTORY FOR ASSISTANCE ON KITS FOR USE WITH SERVICES OTHER THAN WATER.

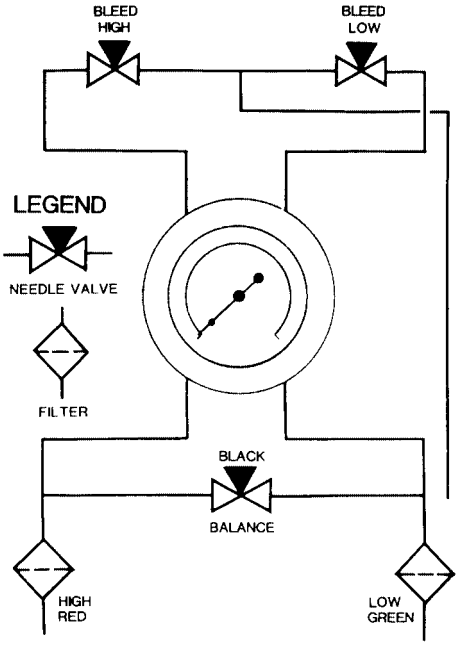
STANDARD DUTY TEST KITS

820	842	831①	841	843
				
	Combined features of 820 & 841			Combined features of 821 & 841
Rugged medium accuracy portable test kits. Popular applications are balancing heating & cooling systems, checking pump performance, local flow indication, checking equipment for excessive pressure drop, leakage, etc.				
0-10 thru 0-100 P.S.I.D. (.7 thru 7 bar)	See 820 & 841	0-5" thru 0-400" H_20 25 mbar thru 1 bar	0-50" H_20 thru 0-100 P.S.I.D. 125 mbar thru 7 bar	See 831 & 841
± 3-2-3% F.S Ascending	See 820 & 841	5" to 0-10" H_20 +/-5% Ascending 0-10" thru 0-400" +/-3-2-3% Ascending	0-50" thru 0-399.9" H_20 ± 5% Ascending 400" H_20 thru 100 P.S.I.D. ± 3-2-3% Ascending	See 831 & 841
2-1/2"	Two-2-1/2"	4-1/2"	2-1/2"	Two-4-1/2"
500 P.S.I.G. (34 bar) STD		300 P.S.I.G. (20 bar)	500 P.S.I.G. (34 bar)	300 P.S.I.G. (20 bar)
NOTE: Pressure rating shown is limited by the hoses or by the gauge, whichever is lower. Higher ratings are available as an option. (Contact factory for details)				
Aluminum/316 S.S. Internals		Plastic/316 S.S. Int'ls. Aluminum/Brass	Alum/316 S.S. Int'ls. Brass	See 831 & 841
NONE		Soft-Seated Brass	NONE	
Nylon & Brass				
Nitrile Jacket and Liner. Schrader 1/4" Brass Coupler.				
Polypropylene		Polyethylene	Polypropylene	
5 ft. (1.5 Meters)		10 Ft. (3 Meters)	5 Ft. (1.5 Meters)	
All Test Kits are protected with 90 Micron Brass Filters to minimize plugging with scale, sand, etc. Filter elements can be cleaned or replaced.				
Maximum 150°F (66°C) **Freezing temperatures must be avoided.**				
A wide variety of materials, working pressures and fittings is available.				
12.25" x 6" x 7"	12.25" x 6" x 7"	13.75" x 15.5" x 8.5"	12.25" x 6" x 7"	16.5" x 7.25" x 9"
3.5 lbs./1.6 kgs	10 lbs./4.5 kgs	12 lbs/5.5 kgs (plastic) 15 lbs./6.8 kgs (metal)	8 lbs./3.6 kgs	12 lbs./5.5 kgs

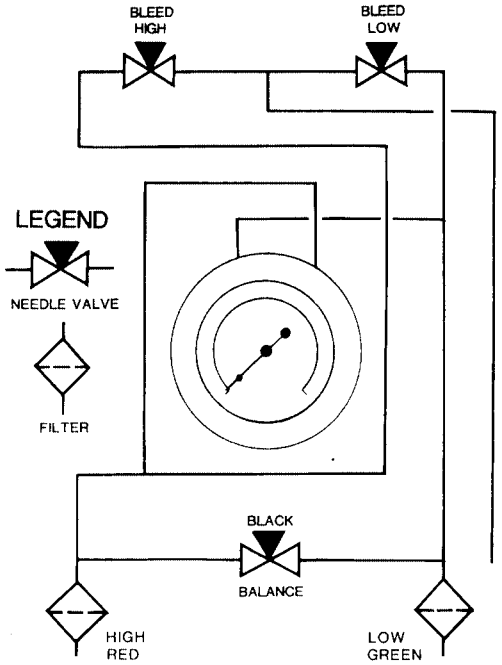
Contact Your Local Representative For Details.
Manufacturer reserves the right to change specifications without prior notice.

SCHEMATIC DIAGRAMS

MODEL 805/806 TEST KIT



MODEL 809 TEST KIT

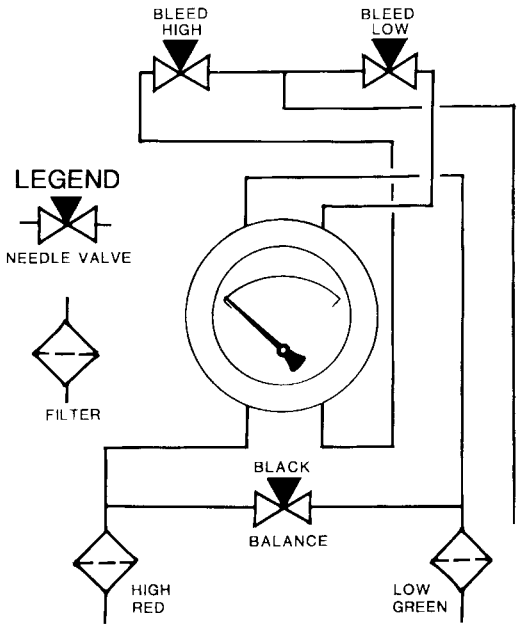


All Mid-West Instrument test kits either conform to and/or are designed to the requirements of the following standards:

ASME B1.20.1	NACE MR0175
ASME B40.1	NEMA Std. No. 250
CSA-C22.2 No. 14.25 and 30	SAE J5141
EN-61010-1	UL Std. No. 50, 508 and 1203

R E P R E S E N T E D B Y :

MODEL 831 TEST KIT



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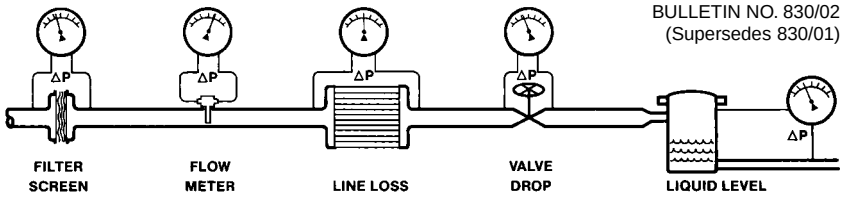
Printed in U.S.A.

Mid-West®
Instrument

BULLETIN NO. 830/02
(Supersedes 830/01)



MODEL 830
Backflow Prevention Assembly Test Kit

- 4-1/2" Round Dial (0-15 P.S.I.D.)
- ± .2 P.S.I.D. Accuracy (Descending)
- 1-1/2" Round Dial Line Pressure Gauge
- Soft-Seated Needle Valves
- In Line Hose Filters
- Double-Walled Carrying Case with Removable, Hinged Cover
- Laminated Test Procedures
- **Designed to test the following Backflow Prevention Assemblies:**

  Reduced Pressure Principle (R.P.)

  Double-Check Valve (D.C.)

  Pressure Vacuum Breaker (P.V.B.)

  Reduced Pressure Principle - Detector (R.P.D.A.)

  Double-Check Detector (D.C.D.A.)

MODEL 830
Backflow Prevention Assembly Test Kit

Mid-West Instrument Model 830 provides the capability for testing all brands of reduced pressure principle, pressure vacuum breaker, and double check valve backflow prevention assemblies. **It is capable of performing all known test procedures including those recommended by ASSE, AWWA, FCCC and HR-USC, and NEWWA.**

This test kit features improvements developed over thirty years as the industry "standard," including filters on all hoses, a compartment for storing various adaptor fittings and kit suspension chain, and a rugged, molded plastic carrying case with removable cover for ease of use.

Test procedures are laminated in clear plastic and stored in the lid of the test kit case.

Specifications:

Gauge Type	Diaphragm Differential Pressure
Dial Size & Range	(4-1/2") 0-15 P.S.I.D. with a (1-1/2") Line Pressure Gauge
Differential Pressure Accuracy	± .2 P.S.I.D. (Descending)
Working Pressure	200 P.S.I.G.
Materials of Construction	NOTE: Materials shown are standard. For optional materials, contact the local Mid-West Instrument representative.
Gauge	Engineering Plastic Body, with E.P.D.M. Diaphragm & S.S. Internal Metal Parts
Valves	Soft-Seated Brass
Tubing & Fittings	Brass & Nylon
Hoses & End Ftgs.	Nitrile jacket and liner. Schrader 1/4" brass coupler
Case	Polyethylene
Hose Length	(Three) each 5' long (color-coded). (One) each 4' long clear bleed tube
Filters	Test kit is protected with 90 micron filters to minimize plugging with scale, sand, etc. Elements can be cleaned or replaced.
Adaptor Fittings	3 sets of brass fittings provided for hookup to all standard size test cocks.
Temperature Limitations	Maximum 150° F. **Freezing temperatures must be avoided.**
Special Note:	Test kit is capable of performing all known test procedures including those recommended by ASSE, AWWA, FCCC and HR-USC, and NEWWA.
Physical Dimensions	14-1/2" wide x 9" deep x 16" high (approximate)
Weight	14 lbs./6.4 kilos

Manufacturer reserves the right to change specifications without prior notice.

REPRESENTED BY:

Mid-West® Instrument

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Printed in U.S.A.

"THE ULTIMATE BACKFLOW TEST KIT"

Mid-West Instrument's New Family of 845 Test Kits

5-VALVE TEST KIT
845-5

Weight – 3.6 lbs.

3-VALVE TEST KIT
845-3

Weight – 3.3 lbs.

2-VALVE TEST KIT
845-2

Weight – 2.9 lbs.

845 Test Kit Case

Weight – 3.2 lbs.
Size: 18 " L x 9"W x 9 " H

A more spacious durable carrying case with foam padding and two external integral storage compartments for fittings, tools, etc.

MODEL 845
Backflow Prevention Assembly Test Kit Specifications

Mid-West Instrument Model 845 provides the capability for testing all brands of reduced pressure principle, pressure vacuum breaker and double check valve backflow prevention assemblies

It is capable of performing all known test procedures including those recommended by ASSE, AWWA, FCCC and HR-USC and NEWWA.

This test kit features improvements developed over 30 years as the industry "standard", including filters on all hoses, compartments for storing various adaptor fittings and tools is built into the new carrying case.

Test procedures are laminated in clear plastic and stored in the lid of the test kit case.

SPECIFICATIONS

Gauge Type	Diaphragm Differential Pressure
Dial Size & Range	(4 ") 0-15 P.S.I.D./0-100 kpa
Differential Pressure Accuracy	± .2 P.S.I.D. (Descending)
Working Pressure	200 P.S.I.G.
Temperature Limitations	Maximum 150°F **Freezing Temperatures must be avoided**
Materials of Construction:	
• **Gauge**	Engineering Plastic Body, with E.P.D.M. Diaphragm, Brass, 316 S.S. and Engineering Plastic Internals
• **Valves**	Soft-Seated Brass Needle Valves
• **Line Pressure Gauge**	1 " 0-200 PSIG
• **Tubing & Fittings**	Brass & Nylon
• **Hoses & End Fittings**	Buna-N jacket and liner. Schrader " brass coupler
Hose Length	Three (3) each 5' long (color-coded). One 4' long clear bleed tube.
Filters	Test kit is protected with 90 micron filters to minimize plugging with scale, sand, etc. Elements can be cleaned or replaced.
Adaptor Fittings	Three sets of brass fittings provided

Manufacturer reserves the right to change specifications without prior notice.

Mid-West® Instrument

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Mid-West® Instrument

Ultimate Backflow Test Kits
Over 30 Years of Input from
Backflow Technicians

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Web Site: www.backflowtestkits.com E-mail:sales@midwestinstrument.com

Mid-West is
Proud to Introduce!

"NEW"

Leave in the Case or Remove it with ease…
QUICK and EASY
One pull of the latch pin and it's out

Model 835

5-Valve Backflow Prevention Test kit

For over 30 years Mid-West Instrument has been producing Quality Backflow Test Kits. Our Model 830 has been a benchmark of the industry for decades. Constant input from field testers led to refinements such as inline filters, laminated test procedures, removable lids, soft seated needle valves & line pressure gauges.

Continuing development led to the Model 845 which is available in 5-valve, 3-valve and 2-valve configurations, delivered to our customers in a spacious durable carrying case with external fitting compartments.

The development has continued… We are proud to introduce our upgraded Model 845-5 with a new manifold. We have a newly redesigned Manifold with hoses coming off the bottom with valves positioned on the front. This new designed allowed us to perfect the newest addition to our family of backflow test kits. Model 835…

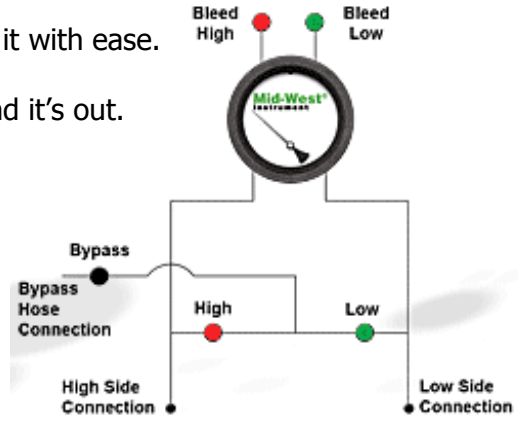
Our **New Model 835** blends the best of all Mid-West test kits, the newly designed 5-valve 845-5 mounted in our legendary Model 830 case. Tests can be performed with the gauge securely mounted in the case, or it can be quickly and easily removed when portability is an issue. These features alone make our **New Model 835** stand out from the crowd.

We have also redesigned our already popular backflow website www.backflowtestkits.com for ease of use. You can learn about our backflow test kits, available accessories, order product, & locate one of our stocking distributors and service centers.

"NEW" MODEL 835

Backflow Prevention Assembly Test Kit

Leave in the Case or Remove it with ease.
QUICK and EASY
One pull of the latch pin and it's out.

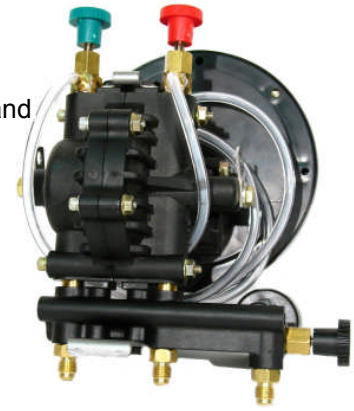


Functions and Applications:
Model 835 (5) valve kit provides the capability for testing all brands of reduced **Pressure Principle**, **Pressure Vacuum Breaker** and **Double Check Valve** backflow prevention assemblies.

ΔP RANGE: 0-15 PSID / 0-100 KPA

Product Features/Benefits

- Tests can be performed with gauge mounted in the case or removed.
- Quick Release Latch Pin Mechanism
- Over 30 Years of Input from Backflow Technicians
- (5) Valve Test Kit
- Specially Designed for Testing Backflow Prevention Assemblies
- Soft-Seated Brass Needle Valves (with replaceable valve seats)
- Test kit is protected with 90 micron filters to minimize plugging with scale, sand etc. Filter elements can be cleaned or replaced.
- Durable Molded Plastic Carrying Case with Removable lid.
- Test procedures are laminated in clear plastic
- 5 Year Warranty



"New" Manifold Design

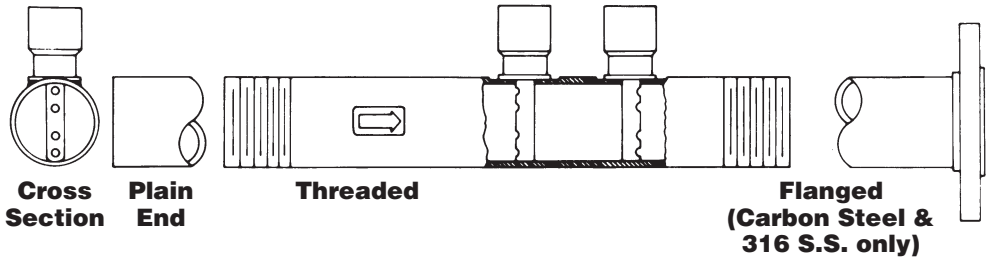
Specifications

- Gauge Type Diaphragm Differential Pressure
- Dial Size & Range (4 ") 0-15 PSID / 0-100 KPA
- Differential Pressure Accuracy ± .2 P.S.I.D. (Descending)
- Working Pressure: 200 PSID
- Body Material: Glass Reinforced Engineering Thermoplastic.
- Wetted Internals: EP Elastomers, Brass and 316 S.S. Metal Parts
- Line Pressure Gauge: 1 " 0-200 PSIG
- Hoses & End Fittings: Buna-N jacket and liner. Schrader " brass coupler -
- Hose Length: Three (3) each / 5' long (color-coded).
- Bleed Tube, One each / 4' long clear bleed tube.
- Adaptor Fittings: (3) sets of brass fittings provided for hookup to all standard size test cocks.
- Gauge Weight: 3.6lbs / 1.6kg
- Weight, Gauge & Case combined: 11.6lbs / 5.2kg
- Case: Polyethylene
- Size: 14 " W x 9"W x 16" H
- Temperature Limitations: Maximum 150°F/65°C.
  FREEZING TEMPERATURES MUST BE AVOIDED

It is capable of performing all known test procedures including those recommended by ASSE, AWWA, FCCC and HR-USC and NEWWA.

BULLETIN NO. 300/02
(Supersedes 300/00)

MODEL 300



Functions & Applications:

An inline flow element for measurement of flow in pipe lines from 1/2" (nominal) through 3" (nominal)

Specifications:

Materials		Carbon Steel (a)		316 Stainless Steel (b)		CPVC Solvent Welded
Pipe Size		1/2", 3/4", 1", 1 1/2", 2", 2 1/2", 3"				1/2", 3/4", 1", 1 1/2", 2", 2 1/2", 3" Schedule 80 only
End Connections		Threaded	Welded	Threaded	Welded	Threaded - Standard Plain End - Optional
Working Pressure (PSIG) Carbon Steel Based on -20 to 600°F 316 S.S. Based on -20 to 200°F CPVC (Water Service) Up to 73.4°F (23°C) For other media and/or temperatures, see Engineering Data.	**Pipe Size**	**Schedule 40**	**Schedule 40**	**Schedule 40**	**Schedule 40**	**Schedule 80**
	1/2	1320	2950	2080	4640	300
	3/4	1130	2400	1770	3770	240
	1	1020	2240	1600	3520	220
	1 1/2	830	1660	1310	2600	170
	2	740	1390	1170	2190	140
	2 1/2	750	1530	1180	2400	150
	3	690	1320	1080	2080	130
NOTES:		For flange applications, see ASME/ANSI B16.5 or Mid-West Bulletin No. ASDE/Latest. (a) Pressures & Temperatures are based on ASTM A53 Grade A Welded Schedule 40 Carbon Steel Pipe. (b) Pressures & Temperatures are based on ASTM A 312 TP 316 Welded Schedule 40 Stainless Steel Pipe. For additional System Pressure (PSIG) vs Temperature (°F) see Mid-West Bulletin No. ASDE/Latest.				
Instrument Connections		1/4" FNPT (Standard), 1/2" (Optional for C.S. or S.S. only)				

Special Features:

Utilizes two averaging flow elements of equal area to sense stagnation (RAM) and static differential pressure providing minimum permanent pressure loss.

Related Products Available:

Indicators & Switches	A broad selection of indicators, with or without switching, are available. For details, please refer to Mid-West Bulletins on Models 105 & 130.
Portable Indicators	A wide variety of portable indicators are also available. Please see Mid-West Bulletin 800/Latest.

Part Numbering System

3 0 0 - A A - 0 0 - A A

1 Basic Model Number

2 Material
A - Steel
B - 316 Stainless Steel
C - CPVC

3 Size
(Nominal Pipe Size)
A - 1/2"
B - 3/4"
C - 1"
D - 1 1/2"
E - 2"
F - 2 1/2"
G - 3"

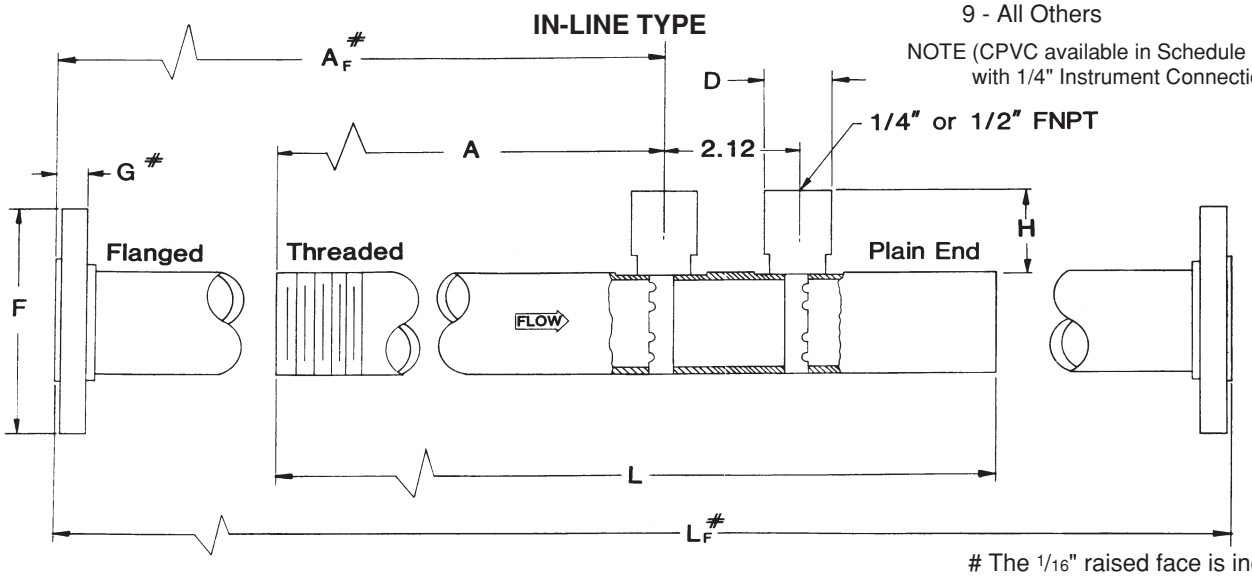
4 Pipe Schedule
0 - Schedule 40
1 - Schedule 80
9 - All Others

5 Construction
0 - Solvent Welded CPVC
1 - Welded (Steel & Stainless Steel)

6 Instrument Connections
A - 1/4" FNPT (Standard)
B - 1/2" FNPT (Optional)

7 End Configuration
A - Threaded
F - Flanged (150# RF)
P - Plain End
Z - All Others

NOTE (CPVC available in Schedule 80 only & with 1/4" Instrument Connections only)



The 1/16" raised face is included in thickness "G" and length A_F & L_F

Dimensional Data

Manufacturer reserves the right to change specifications without prior notice.

Pipe Size (Nominal)	L	A	A_F	H	D		F	G	L_F
				(Max.)	1/4" FNPT	1/2" FNPT	Flanged Only*		
1/2"	6"	2 3/16"	2 7/16"	1.38			3.5	.44	6.62
3/4"	6"	2 3/16"	2 3/8"	1.38			3.88	.50	6.53
1"	8"	3 11/16"	3 7/8	1.38			4.25	.56	8.5
1 1/2"	8"	3 11/16"	3 15/16"	1.38	.75	1.12	5.0	.69	8.63
2"	10"	4 15/16"	5 1/4"	1.38			6.0	.75	10.75
2 1/2"	10"	4 15/16"	5 5/16"	1.38			7.0	.88	10.87
3"	12"	5 15/16"	6 5/16"	1.38			7.5	.94	13.0

*** Dimensions are for socket weld flanges (150 lb.). For other flange ratings consult factory.**

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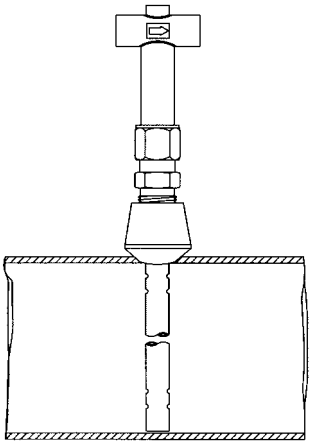
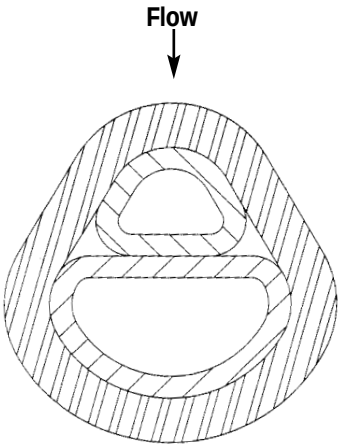
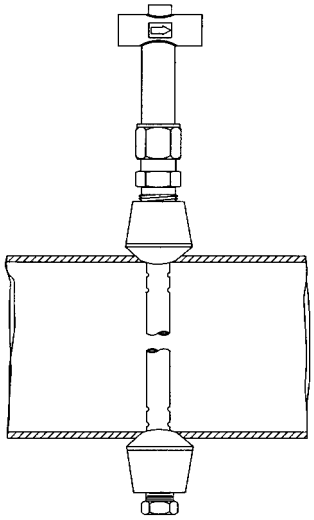
BULLETIN NO. 301/01A
(Supersedes 301/01)

MODEL 301

Single Supported	Cross-Section	Double Supported
	 “Tear-Drop” Shape	

Applications:

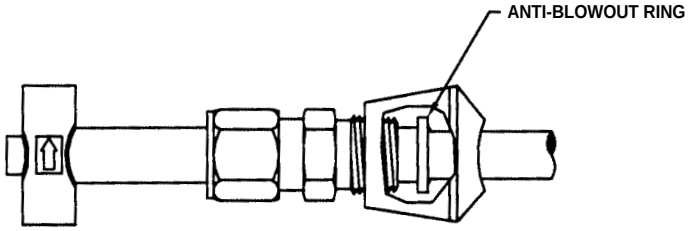
A flow element or insert type sensor for measurement of flow in pipe lines from 3" through 24"
(For larger line sizes contact factory with application details)

Specifications:

Materials of Construction	1/2” Flow Element — 316 Stainless Steel (welded), Attaching Hardware – Carbon Steel (standard) or 316 Stainless Steel (optional)	
Pipe Size & Schedule	3" through 12" nominal pipe size Schedule 40 (3" thru 10") Standard above 10" (other pipe schedules optionally available)	6" through 24" nominal pipe size Schedule 40 (3” thru 10”) Standard above 10" (other pipe schedules optionally available)
Instrument Connections	1/4" FNPT (standard) - 1/2" FNPT (optional)	
Maximum Dp	See “Delta Tube Application & System Design Data” Booklet, Bulletin No. ASDE/Latest (Table No. 2)	
Maximum Working Pressure Rating for Flow Element and Attaching Hardware	2980 P.S.I.G. for carbon steel and 3210 P.S.I.G. for stainless steel attaching hardware, both at -20° – +300°F. Note: Safe system pressure and temperature limits are dependent upon the specific system configuration. For typical system temperature and pressure operating parameters, see ASDE/Latest (Table No. 4)	

Special Features:

Utilizes unique “Tear-Drop” shaped averaging pitot tube with anti-blowout protection.
Provides low permanent pressure loss and low sensitivity to misalignment with respect to flow accuracy.



Part Numbering System

3 0 1 - A G - 0 0 - A O

1 Basic Model No.

2 Material
A - 316 S.S. Flow Element w/Carbon Steel Attaching Hardware
B - All 316 Stainless Steel

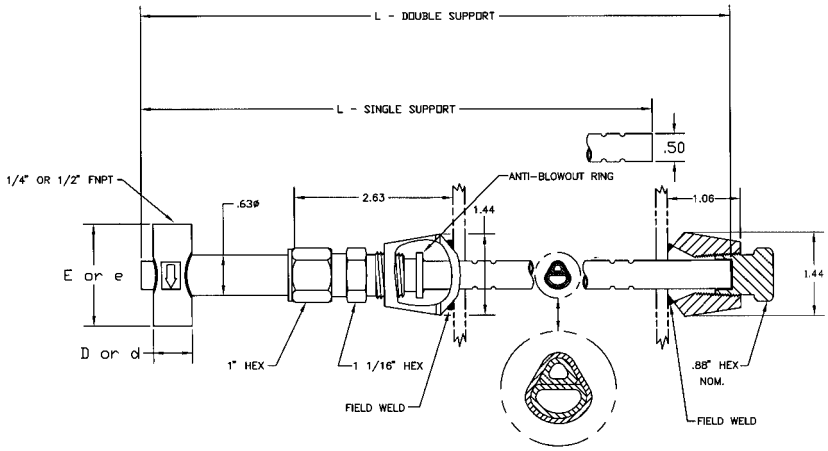
3 Size
G - 3"
H - 4"
J - 6"
K - 8"
L - 10"
M - 12"
N - 14"
P - 16"
Q - 18"
R - 20"
S - 24"

4 Schedule
0 - Schedule 40 (3" through 10") ("Standard" Above 10")
9 - All Other Pipe Schedule

5 Construction
0 - Single Supported (3" thru 12")
1 - Double Supported (6" thru 18")

6 Instrument Connections
A - 1/4" FNPT (Standard)
B - 1/2" FNPT (Optional)
T - Direct Transmitter Mount

7 Options
0 - None (Standard)
A - Security Chain
B - Installation in Vertical Pipe
C - Saddle Clamp



Dimensional Data

Manufacturer reserves the right to change specifications without prior notice.

Nominal Pipe Dia.	D(1/2")	d(1/4")	E(1/2")	e(1/4")	L	
					Single Support	Double Support
3"	1.12	.75	3.0	1.4	8.2	–
4"					9.2	–
6"					11.3	12.9
8"					13.2	14.9
10"					15.3	17.0
12"					17.3	19.0
14"					–	20.3
16"					–	22.3
18"					–	24.3
20"					–	26.3
24"					–	30.3

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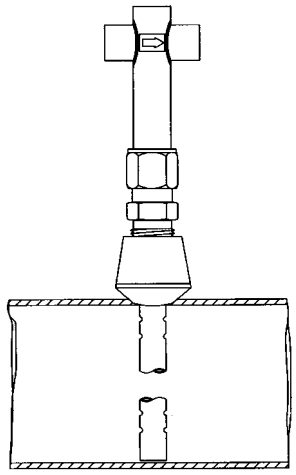
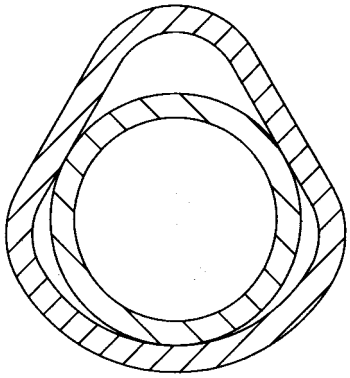
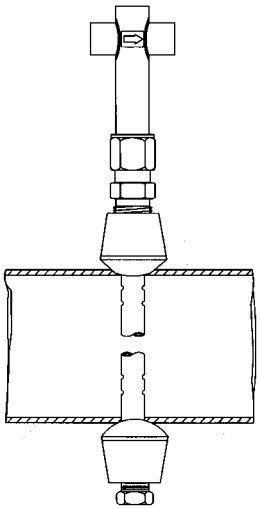
BULLETIN NO. 302/01A
(Supersedes 302/01)

MODEL 302

Single Supported	Cross-Section	Double Supported
	Flow  "Tear-Drop" Shape	

Applications:

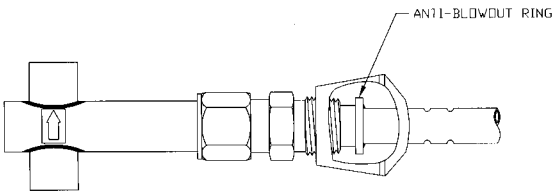
A flow element or insert type sensor for measurement of flow in pipe lines from 3" through 36"
(For larger line sizes contact factory with application details)

Specifications:

Materials of Construction	1" Flow Element — 316 Stainless Steel (welded), Attaching Hardware – Carbon Steel (standard) or 316 Stainless Steel (optional)	
Pipe Size & Schedule	3" through 16" nominal pipe size Schedule 40 (3" thru 10") Standard above 10" (other pipe schedules optionally available)	10" through 36" nominal pipe size Schedule 40 Standard above 10" (other pipe schedules optionally available)
Instrument Connections	1/4" FNPT (standard) - 1/2" FNPT (optional)	
Maximum Dp	See "Delta Tube Application & System Design Data" Booklet, Bulletin No. ASDE/Latest (Table No. 2)	
Maximum Working Pressure Rating for Flow Element and Attaching Hardware	1550 P.S.I.G. at – 20˚ to +300˚F for both carbon steel and stainless steel attaching hardware Note: Safe system pressure and temperature limits are dependent upon the specific system configuration. For typical system temperature and pressure operating parameters, see ASDE/Latest (Table No. 4)	

Special Features:

Utilizes unique "Tear-Drop" shaped averaging pitot tube with anti-blowout protection.
Provides low permanent pressure loss sensitivity to misalignment with respect to flow accuracy.



Part Numbering System

3 0 2 - A G - 0 0 - A O

1 Basic Model No.

2 Material
A - 316 S.S. Flow Element w/Carbon Steel Attaching Hardware
B - All 316 Stainless Steel

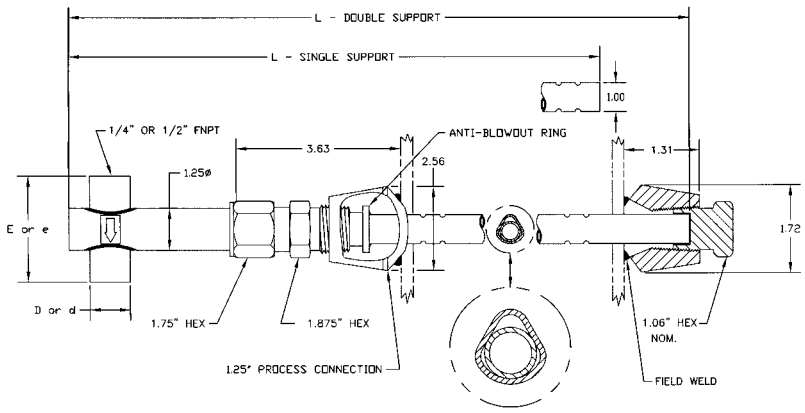
3 Size
G - 3"
H - 4"
J - 6"
K - 8"
L - 10"
M - 12"
N - 14"
P - 16"
Q - 18"
R - 20"
S - 24"
T - 30"
U - 36"

4 Schedule
0 - Schedule 40 (3" through 10") ("Standard" Above 10")
9 - All Other Pipe Schedule

5 Construction
0 - Single Supported (3" thru 16")
1 - Double Supported (10" thru 36"

6 Instrument Connections
A - 1/4" FNPT (Standard)
B - 1/2" FNPT

7 Options
0 - None (Standard)
A - Security Chain
B - Installation in Vertical Pipe
C - Saddle Clamp



Dimensional Data

Manufacturer reserves the right to change specifications without prior notice.

Nominal Pipe Dia.	D(1/2")	d(1/4")	E(1/2")	e(1/4")	L	
					Single Support	Double Support
3"	1.12	.75	3.0	2.5	9.5	–
4"					10.4	–
6"					12.5	–
8"					14.4	–
10"					16.6	18.3
12"					18.5	20.3
14"					19.7	21.6
16"					21.7	23.6
18"					–	25.6
20"					–	27.6
24"					–	31.6
30"					–	37.6
36"					–	43.6

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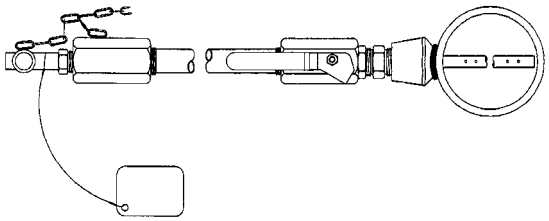
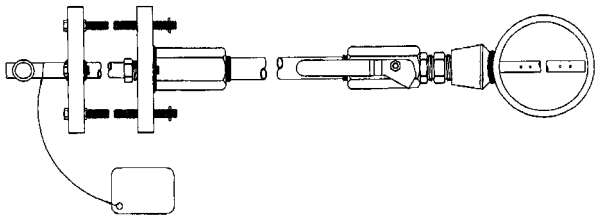
Bulletin No. 311-323/02
(Supersedes 311-323/01)

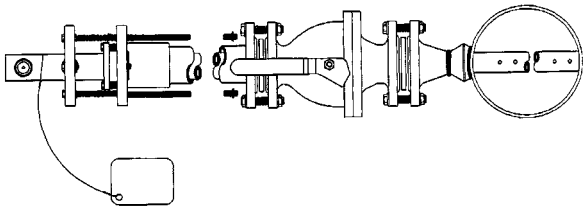
MODELS 311, 312
(TYPICAL)
1/2" & 1" SIZE
FLOW ELEMENTS



MODELS 321, 322, 331, 332
(TYPICAL)
1/2" & 1" SIZE
FLOW ELEMENTS



MODEL 323
(TYPICAL)
2 1/4" SIZE
FLOW ELEMENT



FUNCTIONS & APPLICATIONS:

Provides for insertion & removal of Delta-Tube (Averaging Pitot Tube) in a pressurized system.

Specifications:	MODELS 311 & 312	MODELS 321, 322, 331 & 332	MODEL 323
Materials of Construction	Flow Element — 316 Stainless Steel, Attaching Hardware Carbon Steel (standard) or 316 Stainless Steel (optional)		
Instrument Connections	1/4" FNPT (STANDARD) - 1/2" FNPT (OPTIONAL)		
STANDARD NOMINAL Pipe Size & Schedule	311 - 3" THRU 24" 312 - 3" THRU 60"	321 - 3" THRU 24" 322 - 3" THRU 60" 331 - 3" THRU 24" 332 - 3" THRU 60"	323 - 14" THRU 60"
MAXIMUM DP (IN H_20)	See Mid-West Instrument Application And System Design Data Booklet		
MAXIMUM PERMISSIBLE FLOW RATES (WATER) @ 100°F	311 - 3" - 500 GPM 24" - 6500 GPM 312 - 3" - 750 GPM 60" - 31000 GPM	321-331 - 3" - 500 GPM 24" - 6500 GPM 322-332 - 3" - 750 GPM 60" - 31000 GPM	323 - 14" - 12000 GPM 60" - 80000 GPM
MAXIMUM WORKING PRESSURE RATING @ 100°F	100 PSI (7 BAR)	321-1225 PSI (85 BAR) 322-1000 PSI (69 BAR) 331-1225 PSI (85 BAR) 332-1225 PSI (85 BAR)	275 PSI (19 BAR)
	See Mid-West Instrument Application And System Design Data Booklet For Derating @ Elevated Temperature		

Special Features:

When appropriate drilling equipment is used, the Delta-Tap can be installed & provide flow measurement information without the necessity of system shutdown.

Related Products Available:

A broad variety of flow indicators, with or without switches are available, as well as portable test kits, pulsation dampeners, pressure limiting valves & instrument manifolds.

Part Numbering System

3 1 1 - A G - 0 0 - A A

1 Basic Model No.

2 Pressure Rating based at 100°F
1 - 100 P.S.I.G.
2 - 275 - 1225 P.S.I.G.
3 - 1225 - 2020 P.S.I.G.
(available in models 331, 332 only)

3 Flow Element Size
1 - 1/2"
2 - 1"
3 - 2 1/4"

4 Material (attaching hardware)
A - Carbon Steel (standard, with 316 Stainless Steel flow element)
B - All 316 Stainless Steel
Z - Special (contact factory)

5 Pipe Size

G - 3"	N - 14"	U - 36"
H - 4"	P - 16"	V - 42"
J - 6"	Q - 18"	W - 48"
K - 8"	R - 20"	X - 60"
L - 10"	S - 24"	Z - Special (contact factory)
M - 12"	T - 30"	

6 Pipe Schedule
0 - 40 Or "Standard"
9 - All Others Including Cast Iron Pipe, Concrete Lined, Fibreglass, Buried, Etc. Specify Details

7 Construction
0 - Single Supported
1 - For Vertical Pipe
9 - Other (contact factory)

8 Instrument Connections
A - 1/4" FNPT (Standard)
B - 1/2" FNPT (Optional)
Z - Other (contact factory)

9 Seal Material
A - *Teflon® (standard)
B - **Grafoil®
Z - Special (contact factory)

*Teflon® is a Registered Trademark of DuPont.
**Grafoil® is a Registered Trademark of UCAR Carbon Company Inc.

Isolation Valve Information

Model 311, 321, 331 - 3/4" FNPT Full Ported Ball Valve, Standard (Carbon Steel Standard: 316 S.S. Optional)
Model 312, 322, 332 - 1 1/2" FNPT Full Ported Ball Valve, Standard (Carbon Steel Standard: 316 S.S. Optional)
Model 323 - 3" Flanged Full Bore 150# R.F. Ball Valve, Standard (Carbon Steel Standard: 316 S.S. Optional)

NOTE: Standard valves have reinforced Teflon® seats.

CONTACT FACTORY FOR OTHER AVAILABLE VALVES.

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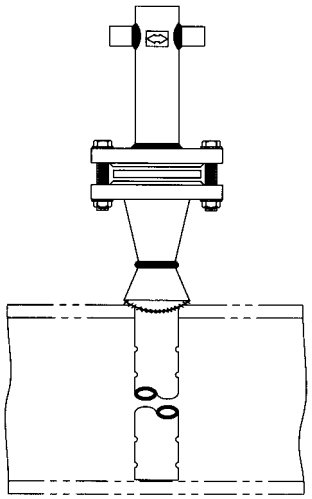
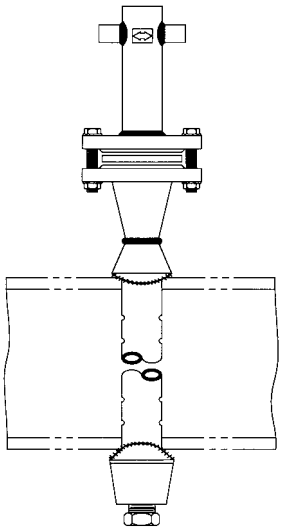
Printed in U.S.A.

Bulletin No. 343-383/01
(Supersedes 343-383/99A)

FLANGED MODELS 343 thru 383

Single Supported	Double Supported
	

A flanged flow element or insert type sensor for measurement of flow in pipe lines from 14" through 60"
(For larger line sizes contact factory with application details)

Functions & Applications:

Specifications:

Materials of Construction	Flow Element — 316 Stainless Steel (welded), Attaching Hardware – Carbon Steel (standard) or 316 Stainless Steel (optional)	
Pipe Size & Schedule	14" through 60" nominal pipe size Standard or Schedule 40 (other pipe schedules optionally available)	20" through 60" nominal pipe size Standard or Schedule 40 (other pipe schedules optionally available)
Instrument Connections	1/4" FNPT (standard) - 1/2" FNPT (optional)	
Maximum Dp	See “Delta Tube Application & System Design Data” Booklet, Bulletin No. ASDE/Latest (Table No. 2)	
Maximum Working Pressure Rating for Flow Element and Attaching Hardware	For Class 150# flange @ 100˚F (38˚c) - 235 P.S.I.G. (1620kPa) max. For Class 150# flange @ 600˚F (315˚c) - 140 P.S.I.G. (965kPa) max. For other temperature or flange ratings consult ANSI-B16.5	

Special Features:

Available with Class 150# flanges (standard) or Class 300, 600, 900, or 1500 as optional

Related Products Available:

Indicators & Switches	A broad selection of indicators, with or without switching, are available. For details please refer to Mid-West Bulletins on Models 105 & 130.
Portable Indicators	A wide variety of portable indicators are also available. Please see Mid-West Bulletin 800/Latest

Manufacturer reserves the right to change specifications without prior notice.

Part Numbering System

3 4 3 - A N - 0 0 - A A

1 Basic Model No.

2 Flange Rating
4 - 150#
5 - 300#
6 - 600#
7 - 900#
8 - 1500#
9 - Special

3 Flow Element Diameter
3 - 2-3/8"

4 Material
(Flow Element-316 S.S.), Attaching Hardware:
A - Carbon Steel
B - Stainless Steel
Z - Special

5 Pipe Size

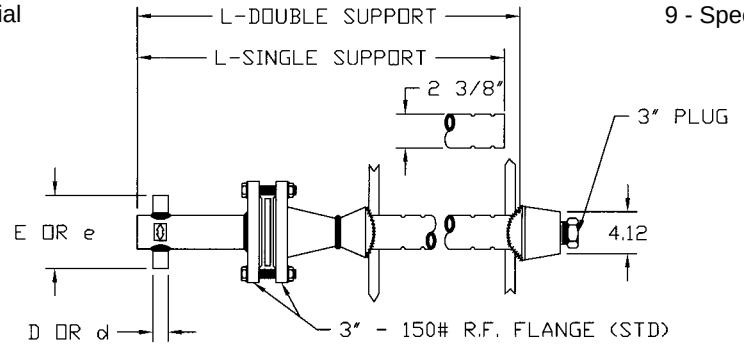
N - 14"	S - 24"	W - 48"
P - 16"	T - 30"	X - 60"
Q - 18"	U - 36"	Y - 72"
R - 20"	V - 42"	Z - Special

6 Pipe Schedule
0 - Standard Schedule
9 - Special

7 Construction
0 - Single Supported
(For Installation in Horizontal Pipe)
1 - Double Supported
(For Installation in Horizontal Pipe)
2 - Single Supported
(For Installation in Vertical Pipe)
3 - Double Supported
(For Installation in Vertical Pipe)
9 - Special

8 Instrument Connections
A - 1/4" FNPT (Standard)
B - 1/2" FNPT
Z - Special

9 Gasket Material
A - C.S. & Graphite
O - None (Standard)
Z - Special



Dimensional Data

XXXXX = FIELDWELD

Nominal Pipe Dia.	D(1/2") Model 343	d(1/4") Model 343	E(1/2") Model 343	e(1/4") Model 343	L-Single Support Model 343	L-Double Support Model 343
14"	1.12	.75	4.12	3.63	24.81	25.31
16"					26.81	27.31
18"					28.81	29.31
20"					30.81	31.31
24"					34.81	35.31
30"					40.81	41.31
36"					46.81	47.31
42"					52.81	53.31
48"					58.81	59.31
60"					70.81	71.31
72"					82.81	83.31

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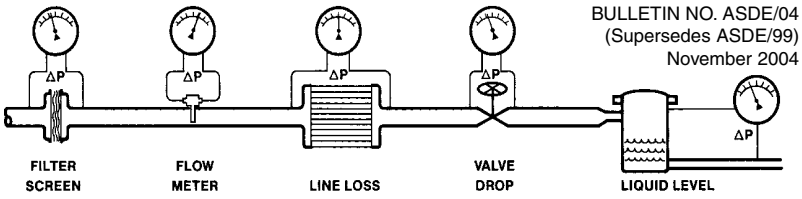


BULLETIN NO. ASDE/04
(Supersedes ASDE/99)
November 2004

Delta tube®

APPLICATION & SYSTEM DESIGN DATA

TABLE OF CONTENTS

NOMENCLATURE

The following symbols and terminology are used for all equations and calculations used in conjunction with the DELTA-TUBE.

Symbol	Description	Units
ACFM	Actual Cubic Ft/min.	ft^3/min.
C_f	Flow Coefficient	dimensionless
CFM	Cubic Ft/min. (see ACFM)	ft^3/min.
D	Pipe Inside Diameter	inches
D_e	Equivalent Diameter	inches
GPM	Flow	gal/min.
h	Height of Duct	inches
P	Pressure	lb/in^2 (Gauge)
Q	Volume Flow	gal/min.
R_D	Reynolds Number	dimensionless
SCFM	Standard Cubic Ft/min.	ft^3/min.
s_f	Specific Gravity of the Fluid at Flow Conditions (See Fig. 3)	dimensionless
s_s	Specific Gravity of the Fluid at Standard Conditions (See Fig. 3)	dimensionless
V	Fluid Velocity	ft/sec.
W	Weight Flow	lbs/hr.
w	Width of Duct	inches
w_f	Specific Weight at Flow Conditions (See Fig. 1)	lb/ft^3
w_s	Specific Weight at Standard Conditions for Gas $w_s = s_s \times w_s$ (AIR)	lb/ft^3
—	w_s (AIR) = .0764 lbs/ft^3 (See Fig. 1)	
ΔP	Differential Pressure	in. H_2O
p	Flowing Density	$\frac{\text{lb-sec}^2}{\text{ft}^2}$
μ	Absolute Viscosity	$\frac{\text{lb-sec}}{\text{ft}^2}$
μ_{cp}	Viscosity (Centipoise)	centipoise

CONVERSION TO STANDARD CONDITIONS

Standard Pressure = 1 ATMOSPHERE
= 14.696 lb/in^2
Absolute Pressure = (14.696 + Gauge Pressure) lbs/in^2

Standard Temperature = 60°F
= 520°R (Absolute)
°R = °F + 460

TO CONVERT ACFM TO SCFM

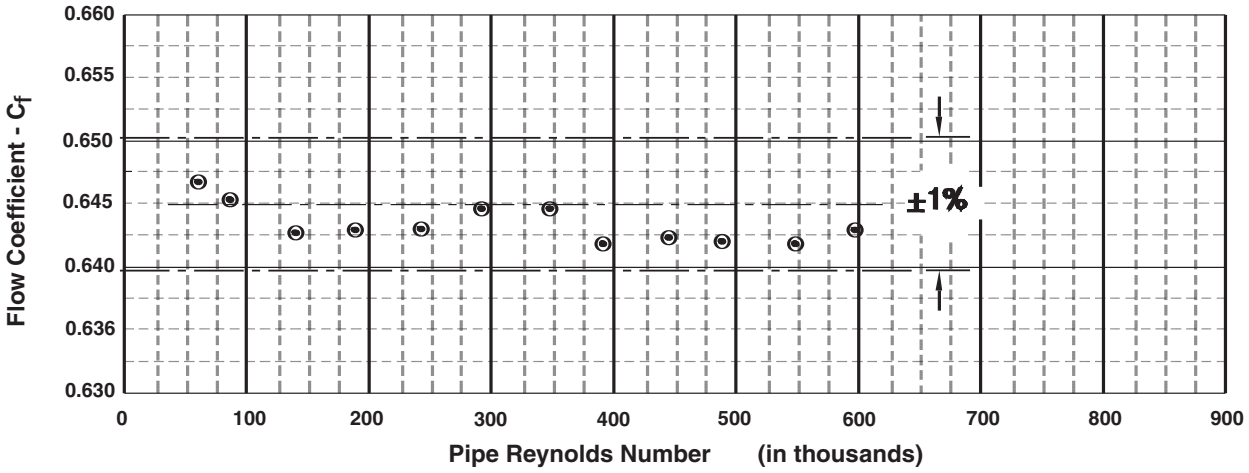
$$SCFM = ACFM \frac{\text{Line Pressure (Absolute)}}{\text{Std. Pressure (Absolute)}} \bullet \frac{\text{Std. Temperature (Absolute)}}{\text{Line Temperature (Absolute)}}$$

TO CONVERT SPECIFIC WEIGHT AT STANDARD TO SPECIFIC WEIGHT AT FLOW CONDITIONS

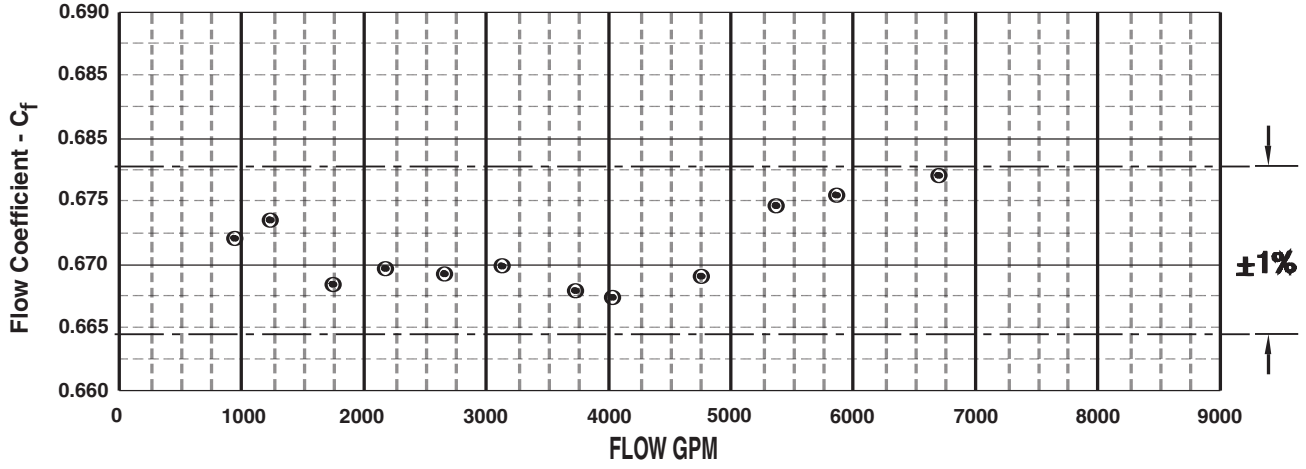
$$w_f = w_s \frac{\text{Line Pressure (Absolute)}}{\text{Std. Pressure (Absolute)}} \bullet \frac{\text{Std. Temperature (Absolute)}}{\text{Line Temperature (Absolute)}}$$

FIGURE 11 – TYPICAL FLOW COEFFICIENT TEST DATA

MODEL 301 FLOW ELEMENT IN A 3" SCHEDULE 40 PIPE*

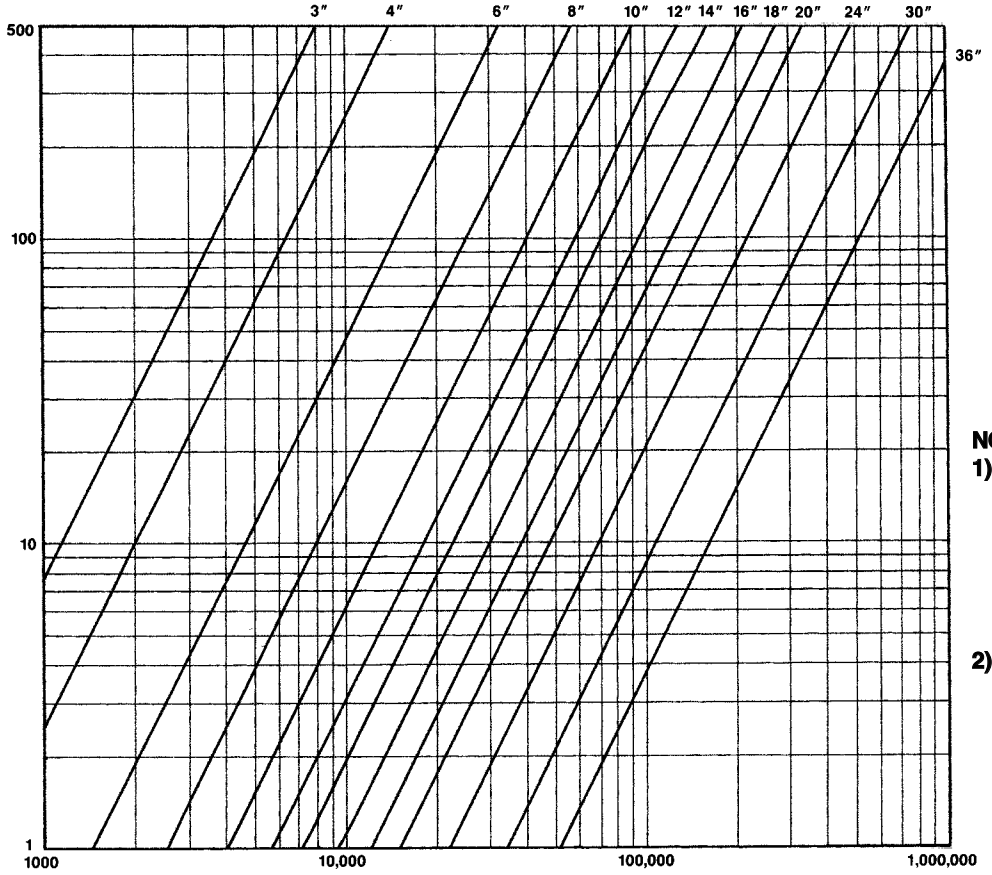


MODEL 302 FLOW ELEMENT IN A 12" STANDARD PIPE*



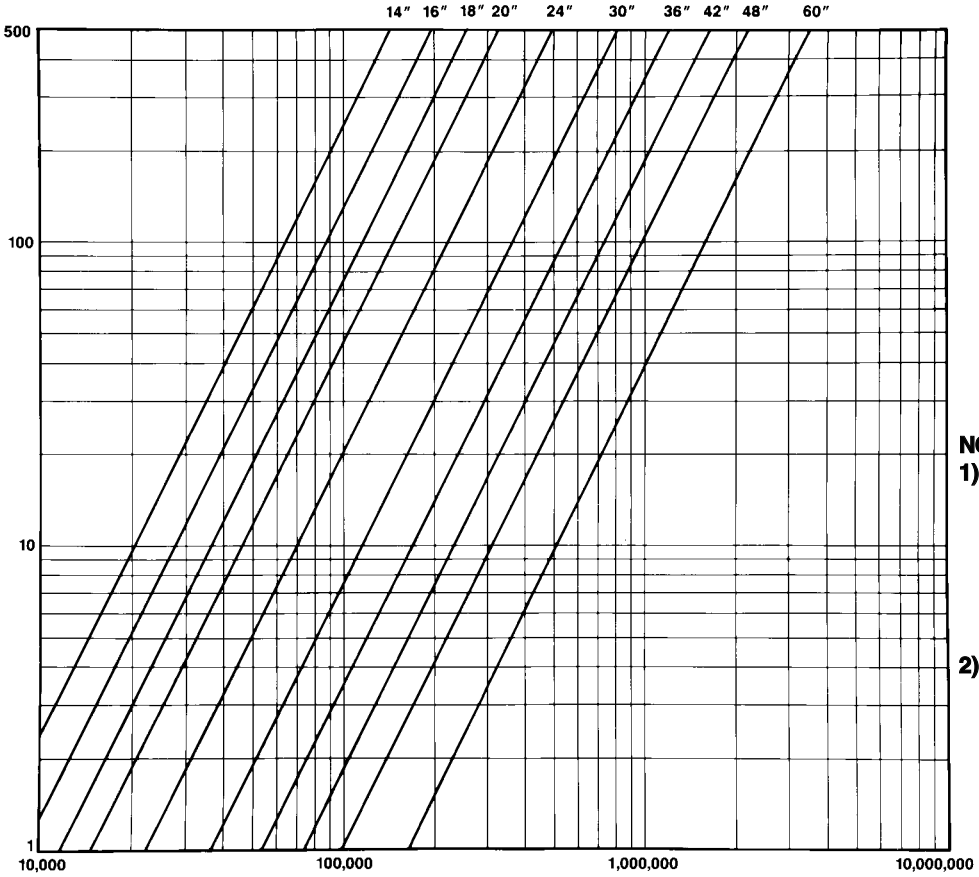
* Test performed by Alden Research Laboratory Inc.

FIGURE 10 – AIR HIGH PRESSURE 70°F., 114.7 PSIA



MODELS 302, 312, 322, 332, 342, 352, 362, 372, 382 & 392

NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.



MODELS 323, 343, 353, 363, 373, 383 & 393

NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

I INTRODUCTION

The Delta-Tube, like the orifice plate, the flow nozzle, or the venturi meter, depends on the basic Bernoulli energy balance equation and the continuity equation, (Equations 1, 2 and 3).

$$\frac{P_1}{w_1} + \frac{V_1^2}{2g} = \frac{P_2}{w_2} + \frac{V_2^2}{2g} \qquad \text{(Eq. 1)}$$

$$Q_1 = Q_2 \qquad \text{(Eq. 2)}$$

$$Q = AV \qquad \text{(Eq. 3)}$$

All of the equations used for Delta-Tube flow calculations are transformations of these basic equations. The transformations are used to accommodate standard measurement practices and units of measure.

II PROCEDURE FOR SIZING A DELTA-TUBE SYSTEM

A) ***Define the system operating parameters:***
This is most simply done by completing form DAD-98 (Figure 14) for the appropriate media – liquid, gas or steam.

B) ***Determine the Reynolds Number (R_D) of the system.***
The standard flow coefficients are based on turbulent flow conditions $R_D > 5000$). The Reynolds number should be checked at the lowest measured flow where the stated accuracy is required.

$$R_D = \frac{.0001319 \times W}{D \times \mu} \qquad \text{(Eq. 4)}$$

$$\ldots \text{or } R_D = \frac{6.318 \times W}{D \times \mu_{cp}} \qquad \text{(Eq. 5)}$$

$$\ldots \text{or } R_D = \frac{.06588 \times Q \times s_s}{D \times \mu} \qquad \text{(Eq. 6)}$$

$$\ldots \text{or } R_D = \frac{31.662 \times Q}{D \times \mu_s} \qquad \text{(Eq. 7)}$$

$$\ldots \text{or } R_D = \frac{28.978 \times SCFM \times s_f}{D \times \mu_{cp}} \qquad \text{(Eq. 7a)}$$

Where: W = Flow in lb/hr.
Q = Flow in gal/min. @ flow conditions.
SCFM = Flow in ft^3/min.
D = Pipe Inside Diameter in inches.
μ = Absolute Viscosity in lb-sec/ft^2.
μ_{cp} = Viscosity in centipoise.
μ_s = Viscosity in stokes.
R_D = Reynolds number.
s_s = Specific gravity of liquid @ 60°F.
s_f = Specific gravity of the fluid at flow conditions.

If the calculations indicate that R_D is below 2000, the metering section should be resized to increase R_D at minimum measured flow rate so it is greater than 5000. If R_D is between 2000 & 5000, the accuracy will be acceptable for most applications. Where systems permit, the metering section should be sized so that $R_D > 5000$ for all measured flow conditions.

The metering section should conform to the configuration shown in Figure 2.

TABLE 1

FLOW COEFFICIENTS (C_f) vs MODEL NO.
PROBE SIZE & PIPE INSIDE DIAMETER

MODEL			300	301(a)	302(b)	323	343(c)
F.E. Dia.			1/4"	1/2"	1"	2-1/4"	2-3/8"
Inside Dia.	Nominal Pipe Size	Pipe Sch.	Flow Coefficients (C_f)				
.546	1/2	80	.352	–	–	–	–
.622	1/2	40	.385	–	–	–	–
.742	3/4	80	.450	–	–	–	–
.824	3/4	40	.487	–	–	–	–
.957	1	80	.537	–	–	–	–
1.049	1	40	.559	–	–	–	–
1.500	1-1/2	80	.631	–	–	–	–
1.610	1-1/2	40	.647	–	–	–	–
1.939	2	80	.684	–	–	–	–
2.067	2	40	.694	–	–	–	–
2.323	2-1/2	80	.705	.637	–	–	–
2.469	2-1/2	40	.709	.638	–	–	–
2.624	3	160	.712	.639	–	–	–
2.900	3	80	.716	.641	.640	–	–
3.000	–	–	.717	.642	.640	–	–
3.068	3	40	.718	.642	.640	–	–
3.438	4	160	–	.645	.642	–	–
3.826	4	80	–	.647	.643	–	–
4.000	–	–	–	.648	.643	–	–
4.026	4	40	–	.648	.643	–	–
5.187	6	160	–	.653	.645	–	–
5.761	6	80	–	.655	.646	–	–
6.000	–	–	–	.656	.647	–	–
6.065	6	40	–	.656	.647	–	–
6.813	8	160	–	.659	.648	–	–
7.625	8	80	–	.661	.649	–	–
7.981	8	40	–	.662	.649	–	–
8.000	–	–	–	.662	.649	–	–
8.500	10	160	–	.663	.650	–	–
9.562	10	80	–	.666	.651	–	–
10.000	–	–	–	.667	.652	–	–
10.020	10	40	–	.667	.652	–	–
10.126	12	160	–	.667	.652	–	–
11.374	12	80	–	.667	.652	–	–
11.938	12	40	–	.670	.653	–	–
12.000	12	STD	–	.670	.653	–	–
12.500	14	80	–	.671	.654	.548	.538
13.124	14	40	–	.672	.654	.554	.545
13.250	14	STD	–	.672	.654	.557	.549
14.000	–	–	–	.674	.655	.565	.557
14.314	16	80	–	.674	.655	.569	.561
15.000	16	40	–	.675	.655	.575	.568
15.250	16	STD	–	.675	.656	.580	.572
16.000	–	–	–	.676	.656	.584	.576
16.124	18	80	–	.677	.656	.585	.577
16.876	18	40	–	.678	.656	.593	.586
17.250	18	STD	–	.678	.657	.593	.586
17.938	20	80	–	.679	.657	.597	.591
18.000	–	–	–	.679	.657	.598	.591
18.812	20	40	–	.680	.658	.603	.597
19.250	20	STD	–	.680	.658	.605	.599
20.000	–	–	–	.681	.658	.609	.603

Continued

a) ALSO APPLIES TO MODELS 307, 311, 341, 351, 361, 371, 381, 391
b) ALSO APPLIES TO MODELS 306, 308, 3123, 342, 352, 362, 372, 382, 392
c) ALSO APPLIES TO MODELS 353, 363, 373, 383, 393

TABLE 1 *Continued*

FLOW COEFFICIENTS (C_f) vs MODEL NO. FLOW ELEMENT SIZE & PIPE INSIDE DIAMETER							
MODEL			300	301(a)	302(b)	323	343(c)
F.E. Dia.			1/4"	1/2"	1"	2-1/4"	2-3/8"
Inside Dia.	Nominal Pipe Size	Pipe Sch.	Flow Coefficients (C_f)				
21.562	24	80	–	.683	.659	.616	.611
22.624	24	40	–	.684	.659	.621	.616
23.250	24	STD	–	.684	.660	.623	.618
24.000	24	–	–	.685	.660	.626	.621
29.000	30	XS	–	.689	.662	.641	.637
29.250	30	STD	–	.689	.662	.641	.637
30.000	–	–	–	.690	.662	.643	.639
35.000	36	XS	–	.693	.663	.652	.650
35.250	36	STD	–	.693	.664	.653	.650
36.000	–	–	–	.694	.664	.654	.651
41.000	42	XS	–	CONTACT FACTORY	CONTACT FACTORY	.661	.658
41.250	42	STD	–			.662	.659
42.000	–	–	–			.663	.660
47.000	48	XS	–			.668	.665
47.250	48	STD	–			.668	.665
48.000	–	–	–			.668	.666
59.250	60	STD	–			.677	.675
60.000	–	–	–			.677	.675

a) ALSO APPLIES TO MODELS 303, 307, 311, 321, 331, 341, 351, 361, 371, 381, 391
b) ALSO APPLIES TO MODELS 306, 308, 312, 322, 332, 342, 352, 362, 372, 382, 392
c) ALSO APPLIES TO MODELS 353, 363, 373, 383, 393

III DIFFERENTIAL PRESSURE (ΔP) CALCULATIONS

A. *Define the system operating parameters:*
This is most simply done by completing form DAD-98 (Figure 12) for the appropriate media – liquid, gas or steam.

B. ***You may use the standard flow charts*** **(Figure 5-10) to determine the approximate ΔP produced. This technique should only be used to check system feasibility or to select the appropriate flow element size for the initial calculation.**

C. *Calculate ΔP* at maximum, normal & minimum flow where accurate measurement is required using the following equations.

Where Fluid Velocity is known:

$$\Delta P = \frac{w_f}{334}\left(\frac{V}{C_f}\right)^2 \qquad \text{(Eq. 8)}$$

Where: ΔP = Differential pressure in inches of water @ 60°F
W_f = Specific Weight (lbs/ft³) @ flow conditions
V = Velocity in ft/sec.
C_f = Flow Coefficient (See Table 1)

Where Volume Flow Rate for Liquids is Known:

$$\Delta P = \left[\frac{Q \times \sqrt{s_f}}{5.667 \times C_f \times D^2}\right]^2 \qquad \text{(Eq. 9)}$$

Where: ΔP = Differential pressure in inches of water @ 60°F
Q = Flow in gal/min.
C_f = Flow Coefficient (See Table 1)
D = Pipe Inside Diameter in inches
s_f = Specific Gravity of liquid @ flow condition

Where mass flow rate of the liquid, gas or steam is known:

$$\Delta P = \left[\frac{W}{359.12 \times C_f \times D^2 \times \sqrt{w_f}}\right]^2 \qquad \text{(Eq. 10)}$$

Where: ΔP = Differential Pressure in inches of water @ 60°F
W = Mass Flow Rate in lbs/hr.
C_f = Flow Coefficient (See Table 1)
D = Pipe Inside Diameter in inches
w_f = Specific Weight of fluid @ flow conditions

Where volume flow rate of the gas is known at standard conditions:

$$\Delta P = \left[\frac{SCFM \times w_s}{5.985 \times C_f \times D^2 \times \sqrt{w_f}}\right]^2 \qquad \text{(Eq. 11)}$$

Where: ΔP = Differential Pressure in inches of water @ 60°F
SCFM = Flow Rate in standard ft³/min
w_s = Specific Weight of gas @ standard conditions
C_f = Flow Coefficient (See Table 1)
D = Pipe Inside Diameter in inches
w_f = Specific Weight of fluid @ flow conditions

Note: If the differential pressure at minimum flow is less than 2" H_2O, downsize the metering section to increase the ΔP. See Figure 2 for appropriate metering section configuration.

IV DELTA-TUBE AND INSTRUMENT SELECTION

A) Compare the differential pressure at maximum flow with the values shown in Table 2. If the calculated values of ΔP exceed those shown, go to a larger diameter flow element or a double support configuration.

Note: If the process temperature is above 100°F (73°F for CPVC Model 300) check Table 3 for the appropriate temperature derating factor. Multiply the value in Table 2 by the derating factor in Table 3 to determine the maximum permissable ΔP at the system operating temperature.

B) If a larger flow element is required, recalculate the ΔP and repeat Step IV A) above.

C) Compare the system temperature and pressure to the values shown in Table 4. If the system temperature and/or pressure exceeds these values, contact the factory for other options.

D) When the Delta-Tube selection is finalized, select the proper ΔP range for the indicator or transmitter. As a general rule the instrument range should be selected so the normal flow reading is at 2/3 to 3/4 of the instrument range.

V FLOW CALCULATIONS

For normal plant or control applications, the following equations may be used to determine flow.

To calculate liquid volume flow rate:

$$Q = 5.677 \times C_f \times D^2 \times \sqrt{\frac{1}{s_f}} \times \sqrt{\Delta P} \qquad \text{(Eq. 12)}$$

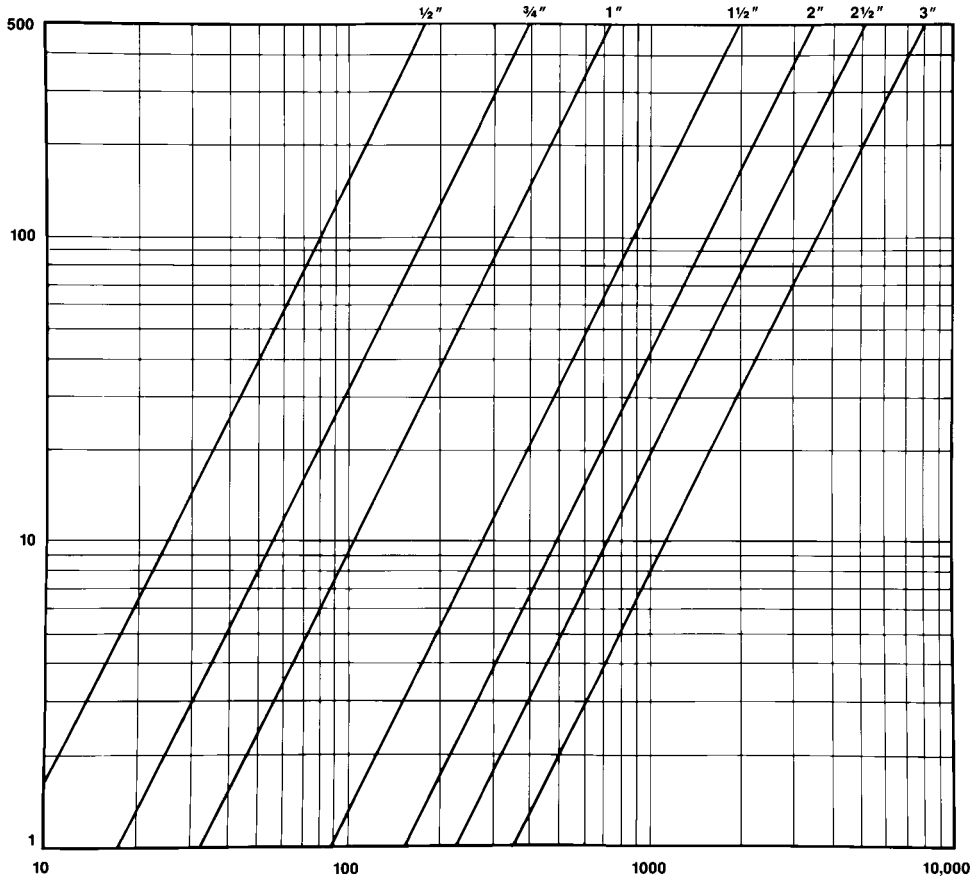
Where: Q = Flow in gal/min.
C_f = Flow Coefficient (see Table 1)
D = Pipe Inside Diameter in inches
s_f = Specific Gravity of the fluid @ flow conditions
ΔP = Differential Pressure in inches of water @ 60°F

To calculate mass flow rate for liquid, gas or steam:

$$W = 359.12 \times C_f \times D^2 \times \sqrt{w_f} \times \sqrt{\Delta P} \qquad \text{(Eq. 13)}$$

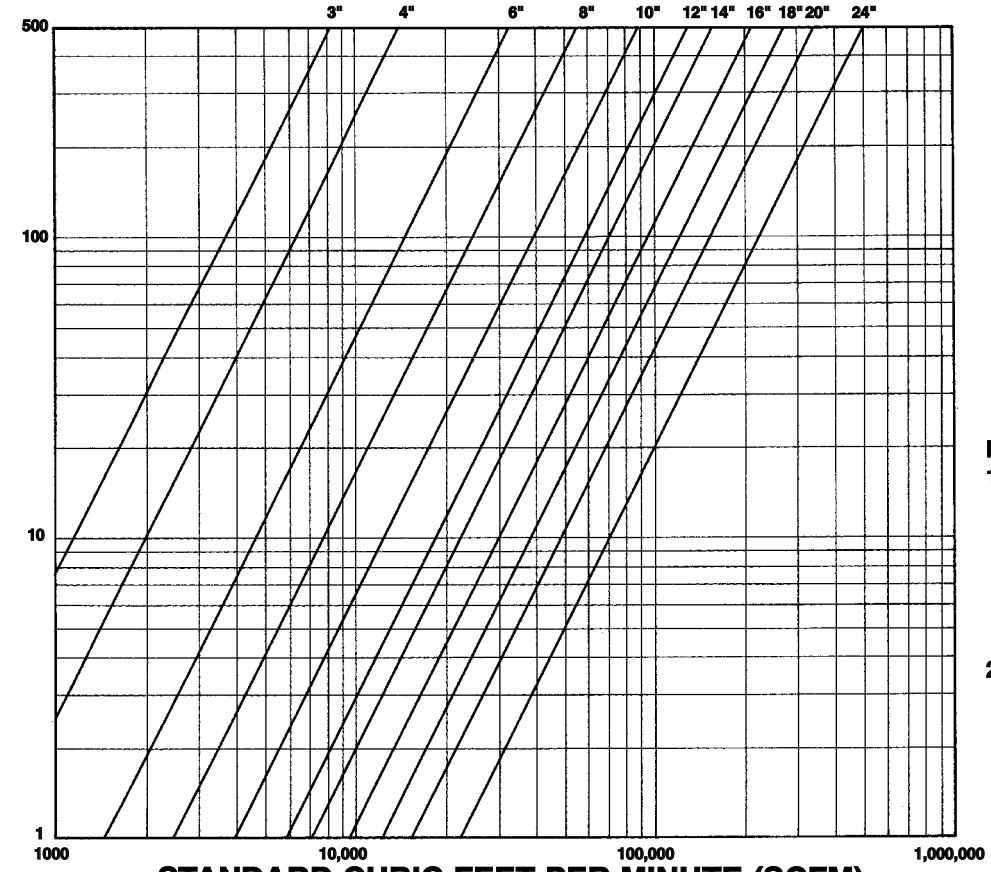
Where: W = Flow in lbs/hr.
C_f = Flow Coefficient (See Table 1)
D = Pipe Inside Diameter in inches
w_f = Specific Weight of fluid @ flow conditions
ΔP = Differential Pressure in inches of water @ 60°F

FIGURE 9 – AIR HIGH PRESSURE 70°F., 114.7 PSIA



MODEL 300

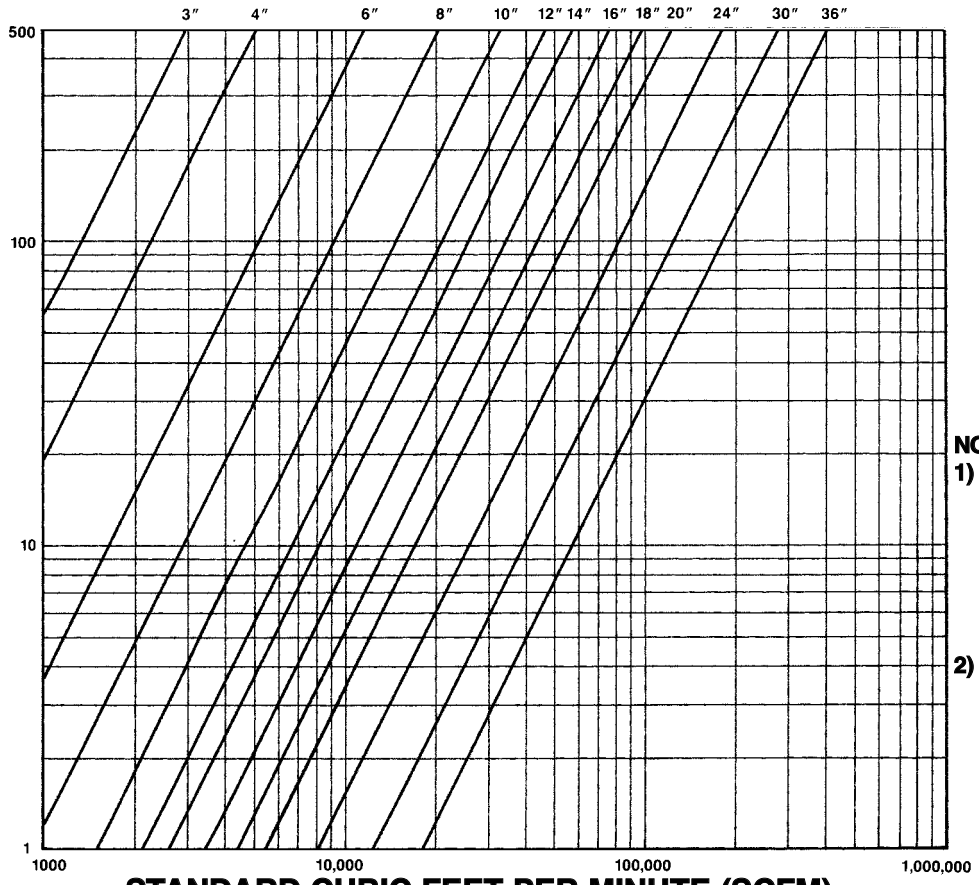
NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.



301, 311, 321, 331, 341, 351, 361, 371, 381 & 391

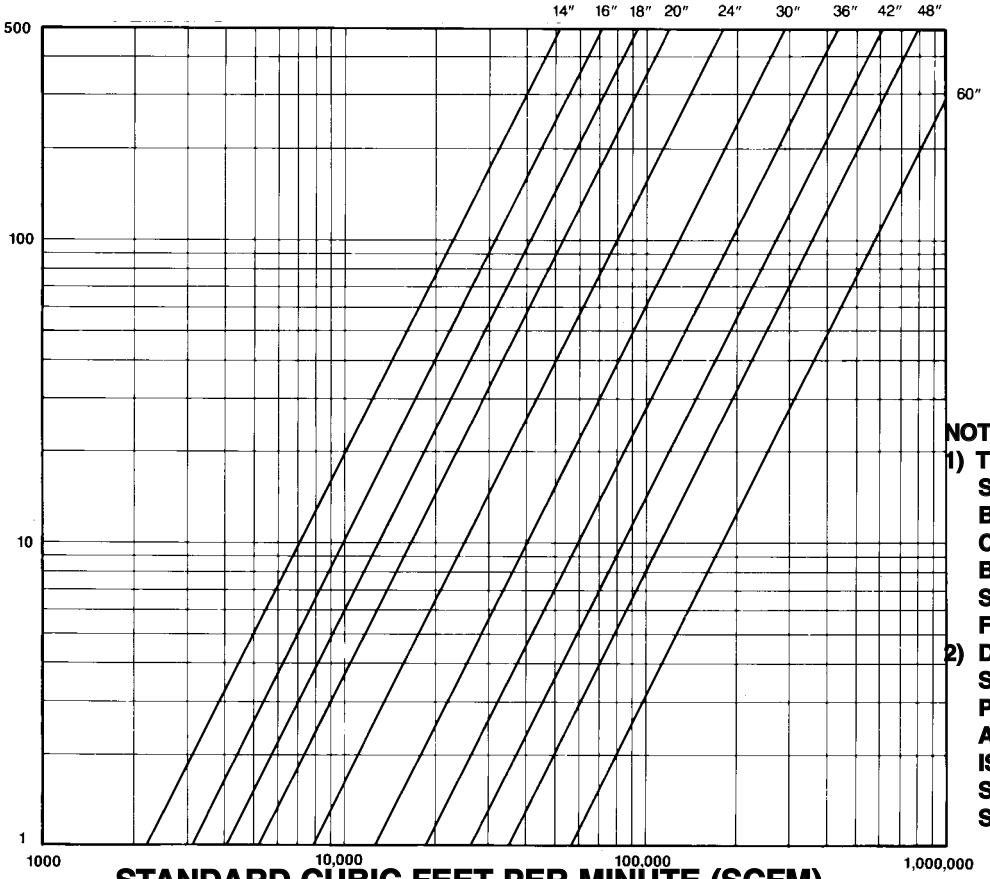
NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

FIGURE 8 – AIR LOW PRESSURE 70°F., 14.7 PSIA



NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

MODELS 302, 306, 308, 312, 322, 332, 342, 352, 362, 372, 382 & 392



NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

MODELS 323, 343, 353, 363, 373, 383 & 393

To calculate gas volume flow rate at standard condtions:

$$SCFM = 5.985 \times C_f \times D^2 \times \sqrt{\frac{w_f}{w_s}} \times \sqrt{\Delta P} \quad \text{(Eq.14)}$$

C_f = Flow Coefficient (see Table 1)
D = Pipe Inside Diameter in inches
w_f = Specific Weight @ flow conditions
w_s = Specific Weight @ standard conditions
ΔP = Differential pressure in inches of water @ 60°F

VI ΔP AND FLOW IN RECTANGULAR DUCTS

In cases where square or rectangular ducts are employed, it is necessary to convert the square or rectangular section to an equivalent circular section.

This is done by calculating an equivalent round duct which has flow and pressure loss equal to that of the square or rectangular duct.

The equivalent circular duct is calculated as follows:

$$D_e = \frac{1.3\ (h \times w)^{.625}}{(h + w)^{.25}} \quad \text{(Eq. 20)}$$

Where: D_e = Equivalent diameter in inches
h = Height of the duct in inches
w = Width of the duct in inches

Used D_e to select the appropriate C_f and to perform calculations as shown in Sections II through V.

TABLE 2

PERMISSIBLE ΔP (IN H_2O) vs MODEL & PIPE SIZE

MATERIAL	CPVC	316 SS	316 SS	316 SS	316 SS	316 SS	ALUM.	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS	316 SS
MODEL	300	300	301	301	302	302	306[a]	307[a]	308[a]	311[b]	312[c]	323	341[d]	341[d]	342[e]	342[e]	343[f]	343[f]
SUPPORT TYPE	D.S.	D.S.	S.S.	D.S.	S.S.	D.S.	D.S.	D.S.	D.S.	S.S.	S.S.	S.S.	S.S.	D.S.	S.S.	D.S.	S.S.	D.S.
FLOW ELEMENT SIZE	1/4"	1/4"	1/2"	1/2"	1"	1"	1"	1/2"	1"	1/2"	1"	2-1/4"	1/2"	1/2"	1"	1"	2-3/8"	2-3/8"
NOMINAL PIPE SIZE & SCHEDULE	MAXIMUM PERMISSIBLE ΔP (IN H_2O)																	
1/2-2 (40)	800	3000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1/2 (40)	565	3000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3 (40)	360	1960	680	–	1710	–	–	–	–	185	370	–	155	–	400	–	–	–
4 (40)	–	–	390	–	990	–	–	–	–	125	265	–	110	–	285	–	–	–
6 (40)	–	–	170	–	435	–	4200	1070	2650	70	155	–	60	–	165	–	–	–
8 (40)	–	–	95	–	250	–	–	–	–	45	105	–	40	–	110	–	–	–
10 (40)	–	–	55	–	160	640	–	–	–	30	75	–	25	–	80	295	–	–
12 (40)	–	–	40	–	110	450	1070	260	670	25	55	–	20	–	60	220	–	–
14 (STD)	–	–	–	140	90	365	–	–	–	20	50	330	18	70	50	185	540	–
16 (STD)	–	–	–	105	65	275	–	–	–	18	40	270	14	55	40	145	435	–
18 (STD)	–	–	–	85	–	215	475	115	325	14	30	220	10	45	30	115	355	–
20 (STD)	–	–	–	65	–	170	–	–	–	10	25	185	7	35	25	95	300	1070
24 (STD)	–	–	–	40	–	115	260	65	175	7	20	140	7	25	20	70	220	750
30 (STD)	–	–	–	–	–	75	–	–	–	–	13	95	–	–	14	45	145	490
36 (STD)	–	–	–	–	–	50	120	25	75	–	9	70	–	–	10	30	105	340
42 (STD)	–	–	–	–	–	–	–	–	–	–	7	50	–	–	7	25	80	255
48 (STD)	–	–	–	–	–	–	65	17	40	–	5	40	–	–	5	19	60	195
60 (STD)	–	–	–	–	–	–	–	–	–	–	–	25	–	–	3	12	40	125
72 (STD)	–	–	–	–	–	–	40	10	18	–	–	–	–	–	–	–	–	–

a) MODEL 306, 307, 308 DIMENSIONS ARE NOMINAL DUCT DIMENSIONS OF INSTALLED LENGTH.
b) MAXIMUM ΔP ALSO APPLIES TO MODELS 321 & 331.
c) MAXIMUM ΔP ALSO APPLIES TO MODELS 322 & 332.
d) MAXIMUM ΔP ALSO APPLIES TO MODELS 351, 361, 371, 381 & 391.
e) MAXIMUM ΔP ALSO APPLIES TO MODELS 352, 362, 372, 382 & 392.
f) MAXIMUM ΔP ALSO APPLIES TO MODELS 353, 363, 373, 383 & 393.

S.S. = SINGLE SUPPORT D.S. = DOUBLE SUPPORT

NOTE: THIS DATA IS FOR 100°F FOR ALL MATERIALS EXCEPT CPVC WHICH IS FOR 73°F. SEE TABLE 3 FOR ELEVATED TEMPERATURE DERATING FACTORS.

TABLE 3

DERATING FACTORS FOR CALCULATING ALLOWABLE ΔP AT ELEVATED TEMPERATURES

TEMP. °F.	100	120	150	180	200	300	400	500	600	700	800
316 S.S.	1.00	1.00	1.00	1.00	.87	.76	.69	.64	.60	.57	.55
CPVC	.78	.62	.44	.25	NOT RECOMMENDED						
ALUM.	1.00	1.00	1.00	1.00	.95	.83	.47	NOT RECOMMENDED			

TO DETERMINE THE MAXIMUM ALLOWABLE ΔP AT ELEVATED TEMPERATURES, MULTIPLY THE MAXIMUM ΔP SHOWN IN TABLE 2 BY THE APPROPRIATE DERATING FACTORS SHOWN ABOVE.

FIGURE 2 - METERING SECTION CONFIGURATION

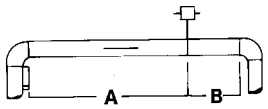
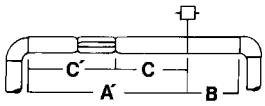
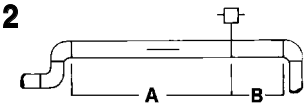
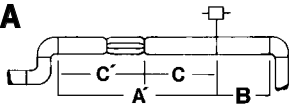
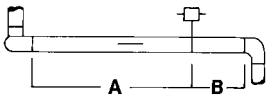
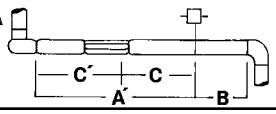
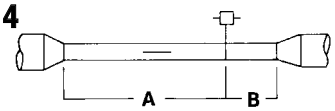
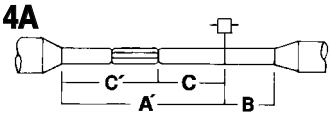
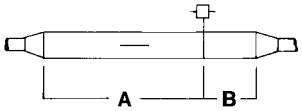
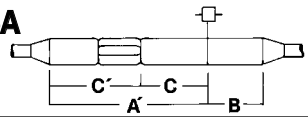
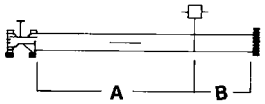
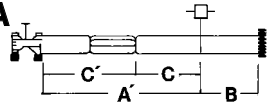
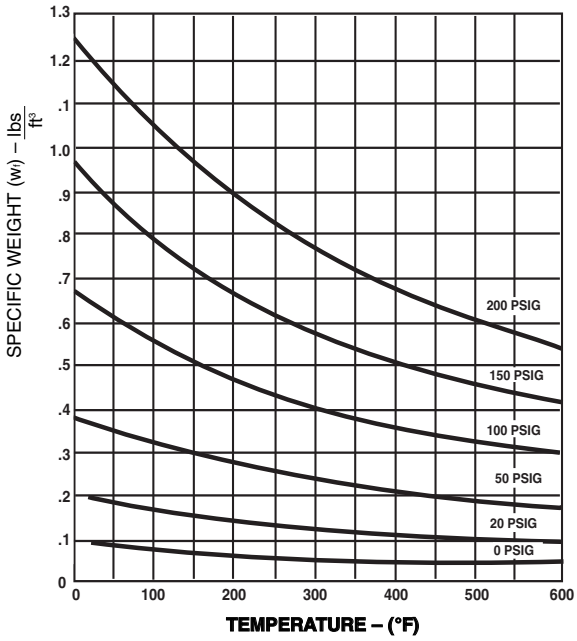
	Upstream Dimension in Pipe Diameters					
	Without vanes		With vanes			
	In Plane A	Out of Plane A	A'	C	C'	B
1 	7	9				3
1A 			6	2.7	3.3	
2 	9	14				3
2A 			8	3.6	4.4	
3 	19	24				4
3A 			9	4.1	4.9	
4 	8	8				3
4A 			8	3.6	4.4	
5 	8	8				3
5A 			8	3.6	4.4	
6 	24	24				4
6A 			9	4.1	4.9	

FIGURE 1 – SPECIFIC WEIGHT (w_f) FOR AIR VS. TEMPERATURE (°F) & PRESSURE (PSIG)

SPECIFIC WEIGHT OF AIR @ 60°F & 14.696 PSIA = .0764 $\frac{lbs}{ft^3}$



VIBRATION

When Delta Tubes are used in high velocity gas streams, vibrations are induced due to the "Von Karmen" effect. If the "Von Karmen" frequency coincides with the natural frequency of Delta Tube, structural damage may occur.

Virbration effects need not be considered if:

1. The media is a liquid.
2. The maximum generated differential pressure is equal or less than 20% of the maximum rated differential pressure of the Delta Tube.
3. The model 300 is used.

The Mid-West Delta-Tube differential pressure versus flow calculation computer program provides calculated resonant flow ranges. These resonance calculations are for the Delta Tube only with no consideration given to the piping system in which they are installed.

If your application will be operating in the resonant range and outside of the above three exceptions

The following alternatives should be considered:

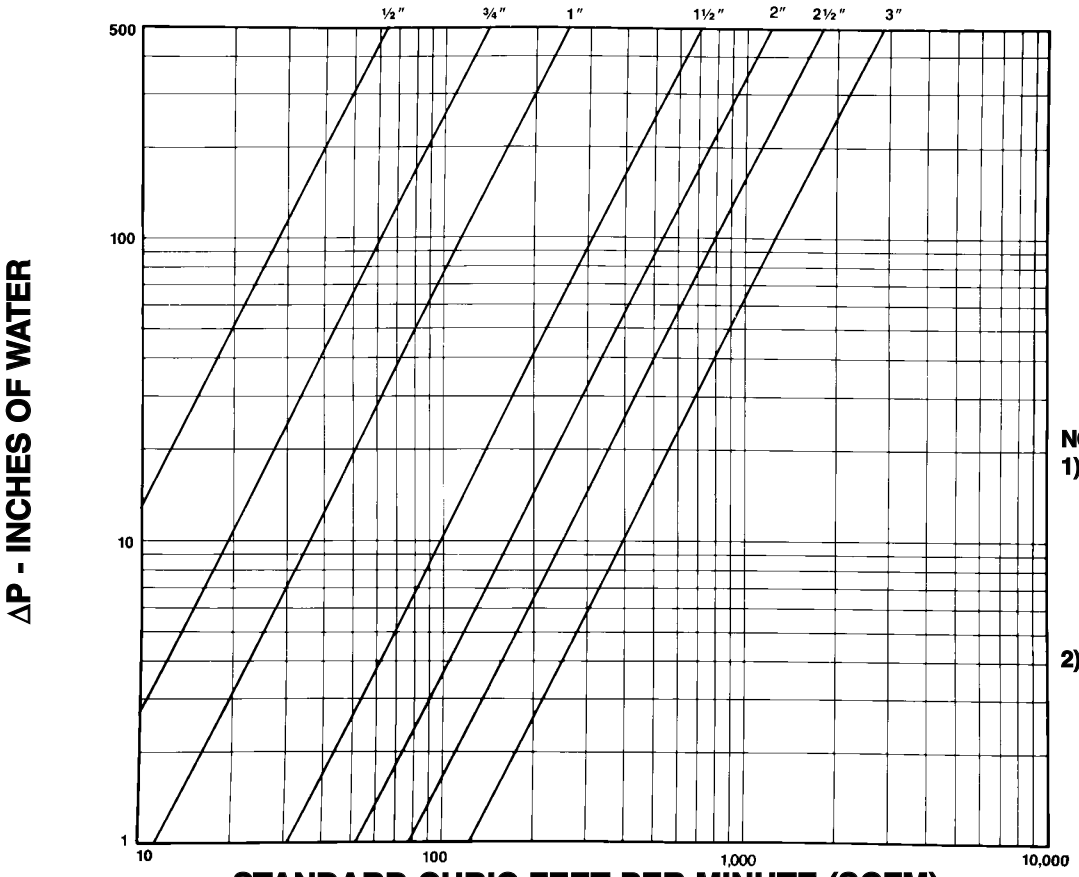
- Use double supported Delta Tube.
- Move to a larger diameter Delta Tube.
- Change meter run size to move resonance out of operating range.

In each case the vibration condition must be re-checked for proper operation.

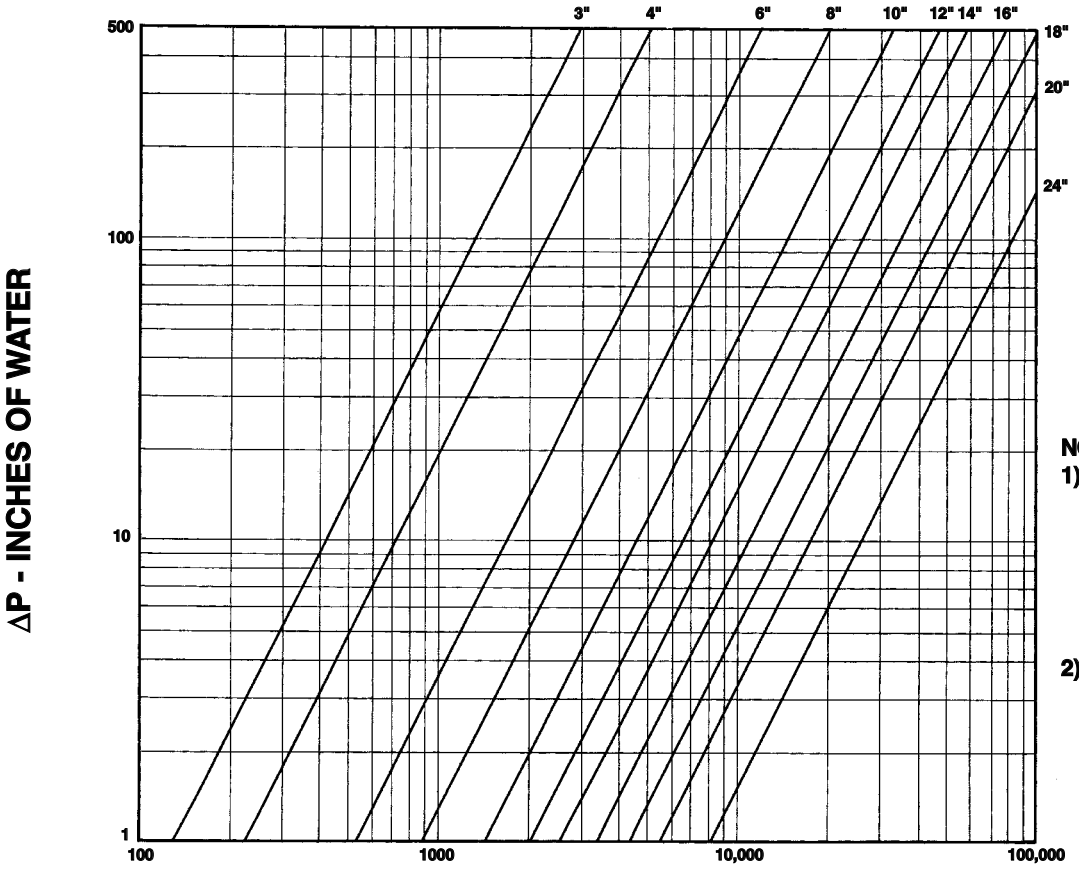
B = Downstream Dimension in Pipe Diameters

NOTE: The Delta Tube produces a repeatable signal in installations with less than the recommended upstream and downstream straight pipe lengths. These non-optimum locations still provide repeatable flow data and can be used for control or comparison applications where absolute accuracy is not the primary requirement.

FIGURE 7 – AIR-LOW PRESSURE 70°F., 14.7 PSIA

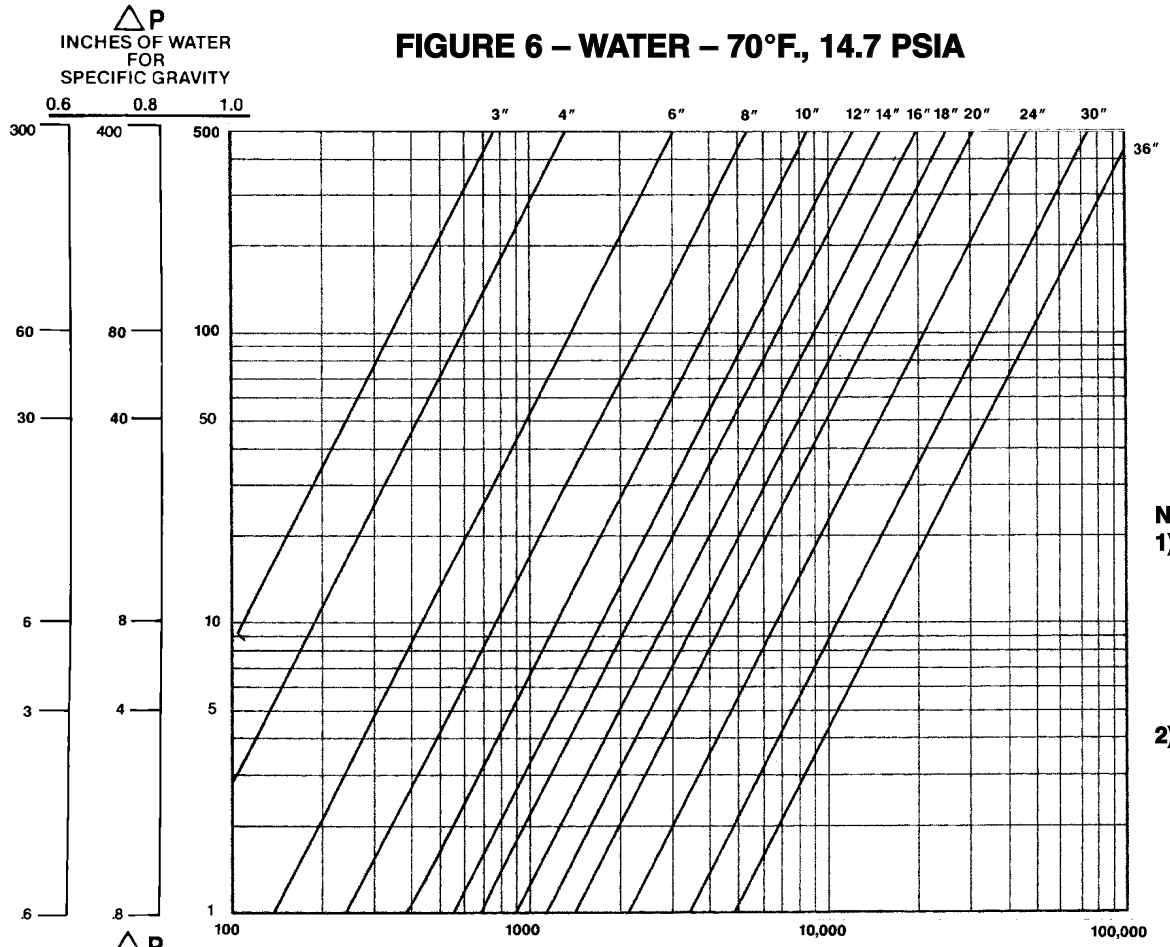


NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.



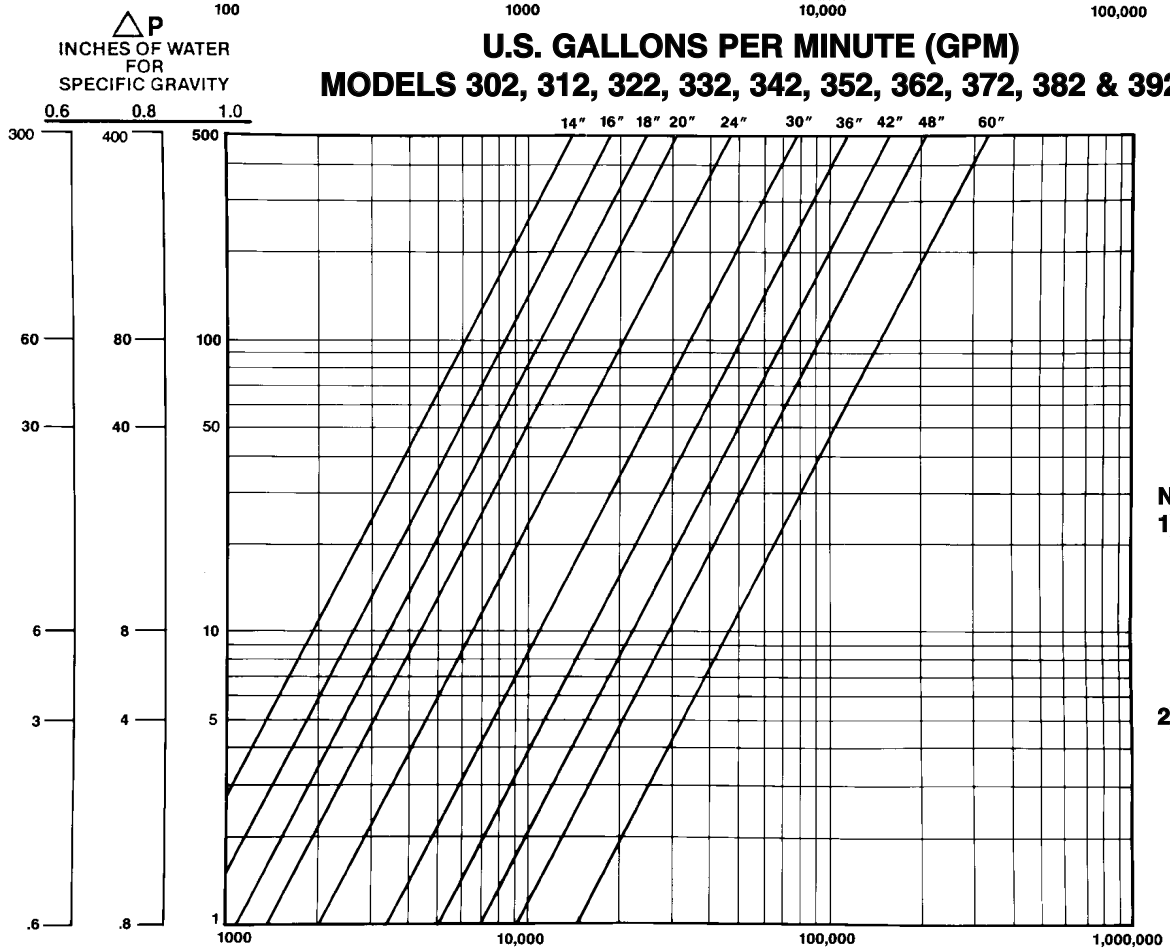
NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECKFOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

FIGURE 6 – WATER – 70°F., 14.7 PSIA



NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

U.S. GALLONS PER MINUTE (GPM)
MODELS 302, 312, 322, 332, 342, 352, 362, 372, 382 & 392



NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

U.S. GALLONS PER MINUTE (GPM)
MODELS 323, 343, 353, 363, 373, 383 & 393

TABLE 4
MAXIMUM ALLOWABLE SYSTEM PRESSURE (PSIG) vs TEMPERATURE °F)[f]
(EXCEPT STEAM APPLICATIONS[a])

MODEL 300 CPVC

PIPE SIZE	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"
MATERIAL	CPVC (SCHEDULE 80)						
TEMP. (°F)	PRESSURE (PSIG)						
-20 to 73	300	240	220	170	140	150	130
80	280	225	205	160	130	140	120
100	235	190	170	130	110	115	100
120	195	155	140	110	90	95	85
140	150	120	110	85	70	75	65
160	110	90	80	60	50	55	45
180	75	60	55	40	35	35	30

MODELS 306, 307, 308, 311, 312
ALL PIPE SIZES

MODEL	306	307	308	311	312
MATERIAL	AL	SS	SS	CS/SS	CS/SS
F.E. SIZE	1"	1/2"	1"	1/2"	1"
TEMP. (°F)	PRESSURE (PSIG)				
0 to 400	15	15	15	100	100

MODEL 300 CARBON STEEL[b]

PIPE SIZE	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"
ENDS	THREADED							WELDED						
TEMP. (°F)	PRESSURE (PSIG)													
-20 TO 600	1320	1130	1020	830	740	750	690	2950	2400	2240	1660	1390	1530	1320
700	1280	1100	990	800	720	730	670	2870	2330	2170	1610	1350	1480	1280

MODEL 300 STAINLESS STEEL[c]

PIPE SIZE	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"	1/2"	3/4"	1"	1-1/2"	2"	2-1/2"	3"
ENDS	THREADED							WELDED						
TEMP. (°F)	PRESSURE (PSIG)													
-20 to 200	2080	1770	1600	1310	1170	1180	1080	4640	3770	3520	2600	2190	2400	2080
300	2020	1730	1560	1270	1140	1150	1060	4520	3680	3430	2540	2130	2340	2020
400	2000	1710	1540	1260	1120	1130	1040	4460	3630	3380	2510	2100	2310	2000
500	1980	1700	1530	1250	1110	1120	1030	4430	3610	3360	2490	2090	2290	1980
600	1880	1610	1450	1180	1060	1070	980	4200	3420	3190	2360	1980	2170	1880
700	1800	1540	1390	1130	1010	1020	940	4030	3280	3050	2260	1900	2080	1800
800	1750	1500	1350	1100	980	990	910	3910	3180	2970	2200	1840	2020	1750

MODEL 301, 302 – ALL PIPE SIZES

MODEL	301	302	301	302
F.E. SIZE	1/2"	1"	1/2"	1"
MATERIAL	C.S.		316 S.S.	
TEMP. (°F)	PRESSURE (PSIG)			
-20 to 100	2980	1550	3210	1550
200	2980	1550	3210	1550
300	2980	1550	3210	1550
400	2980	1530	3170	1530
500	2980	1420	2950	1420
600	2980	1330	2760	1330
700	2860	1270	2640	1270
800	N.R.	N.R.	2540	1220

MODEL 321, 322, 323, 331, 332 – DELTA TAPS - ALL PIPE SIZES

MODEL	321	322	323	331	332	321	322	323	331	332
F.E00. SIZE	1/2"	1"	2-1/4"	1/2"	1"	1/2"	1"	2-1/4"	1/2"	1"
MATERIAL	CARBON STEEL					316 S.S.				
TEMP. (°F)	PRESSURE (PSIG)									
0 to 99	2000	1000	285	2020	1580	2000	1000	275	2000	1500
100	1225	1000	285	2020	1580	1225	1000	275	1225	1225
200	850	850	260	1750	1580	850	850	240	850	850
300	450	450	230	750	750	450	450	215	450	450
400	100	100	200	200	200	100	100	195	100	100

Note: Pressures & temperatures shown are for reinforced teflon seated ball valves. Consult the factory for valve options for higher pressures & temperatures.

ALL FLANGED MODELS - ALL PIPE SIZES
MODELS 300, 341, 351, 361, 371, 381, 391, 342, 352, 362, 372, 382, 392, 343, 353, 363, 373, 383, 393

FLANGE RATING	150#	300#	400#	600#	900#	1500#	2500#	150#	300#	400#	600#	900#	1500#	2500#
MATERIAL	CARBON STEEL[d]							STAINLESS STEEL[e]						
TEMP. (°F)	PRESSURE (PSIG)													
-20 to 100	285	740	990	1480	CONTACT FACTORY			275	720	960	1440	CONTACT FACTORY		
200	260	675	900	1350				240	620	825	1240			
300	230	655	875	1315				215	560	745	1120			
400	200	635	845	1270				195	515	686	1030			
500	170	600	800	1200				170	480	635	955			
600	140	550	730	1095				140	450	600	905			
700	110	535	710	1065				110	430	575	865			
800	NOT RECOMMENDED							80	415	555	830			

NOTE: a) The allowable pressures & temperatures shown **DO NOT APPLY TO STEAM SYSTEMS**. See bulletin SKSG for maximum allowable pressures & temperatures for steam systems.
b) Pressures & temperatures are based on ASTM A 53 grade A welded schedule 40 carbon steel pipe.
c) Pressures & temperatures are based on ASTM A 312 TP 316 welded schedule 40 stainless steel pipe.
d) Pressures & temperatures are based on ASTM A 105 C.S. flanges & compatible components.
e) Pressures & temperatures are based on ASTM A 182-F316 flanges & compatible components.
f) All data is based on ANSI standards B16, 11, B16, 34, B16, 5, B31.1.

FIGURE 3
SPECIFIC GRAVITY (S_f) vs. TEMPERATURE (°F) FOR TYPICAL LIQUIDS

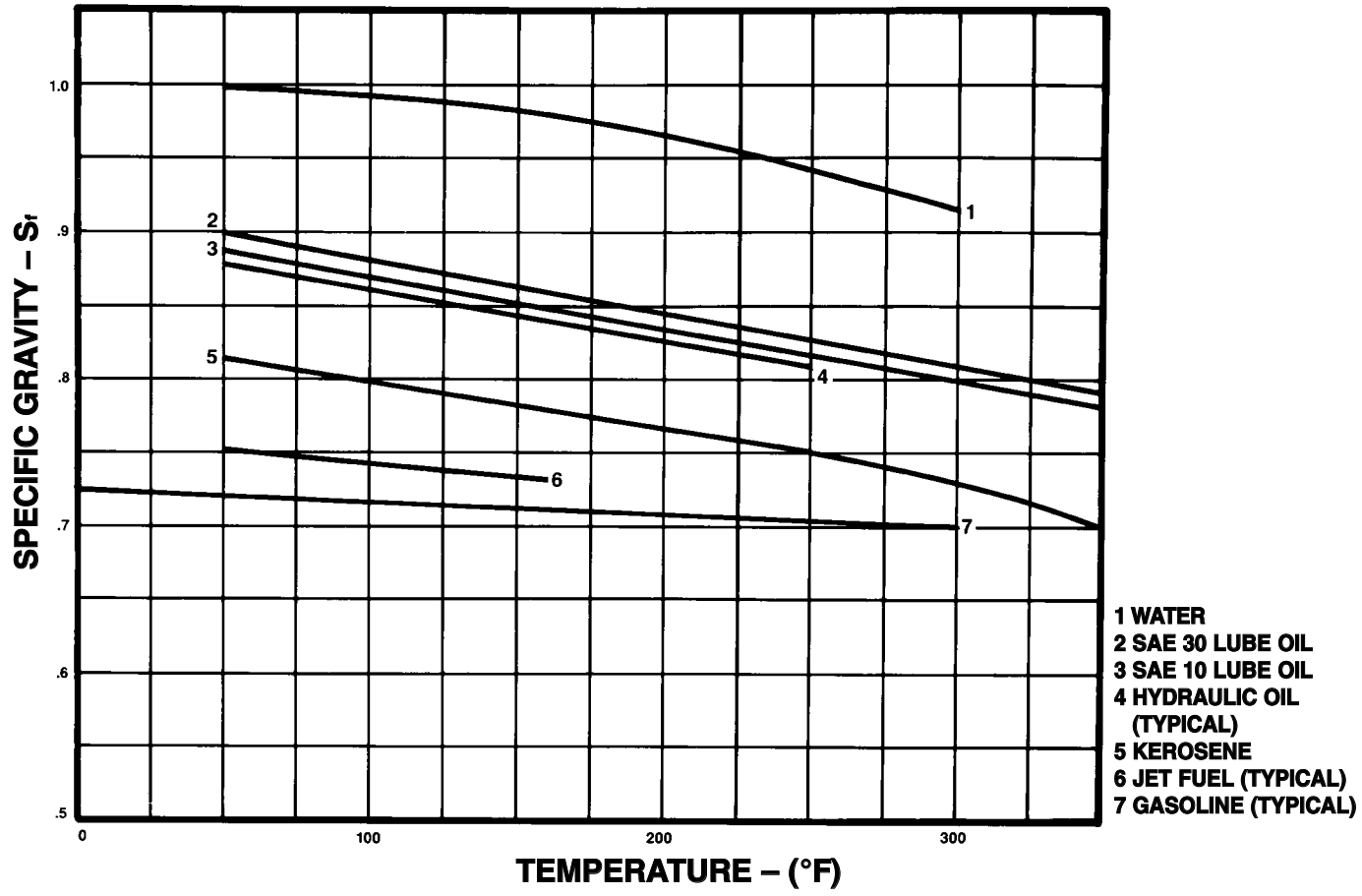


FIGURE 4
SPECIFIC WEIGHT $\left(w_f - \frac{lbs.}{ft^3}\right)$ vs. TEMPERATURE (°F) & PRESSURE (PSIG) FOR STEAM

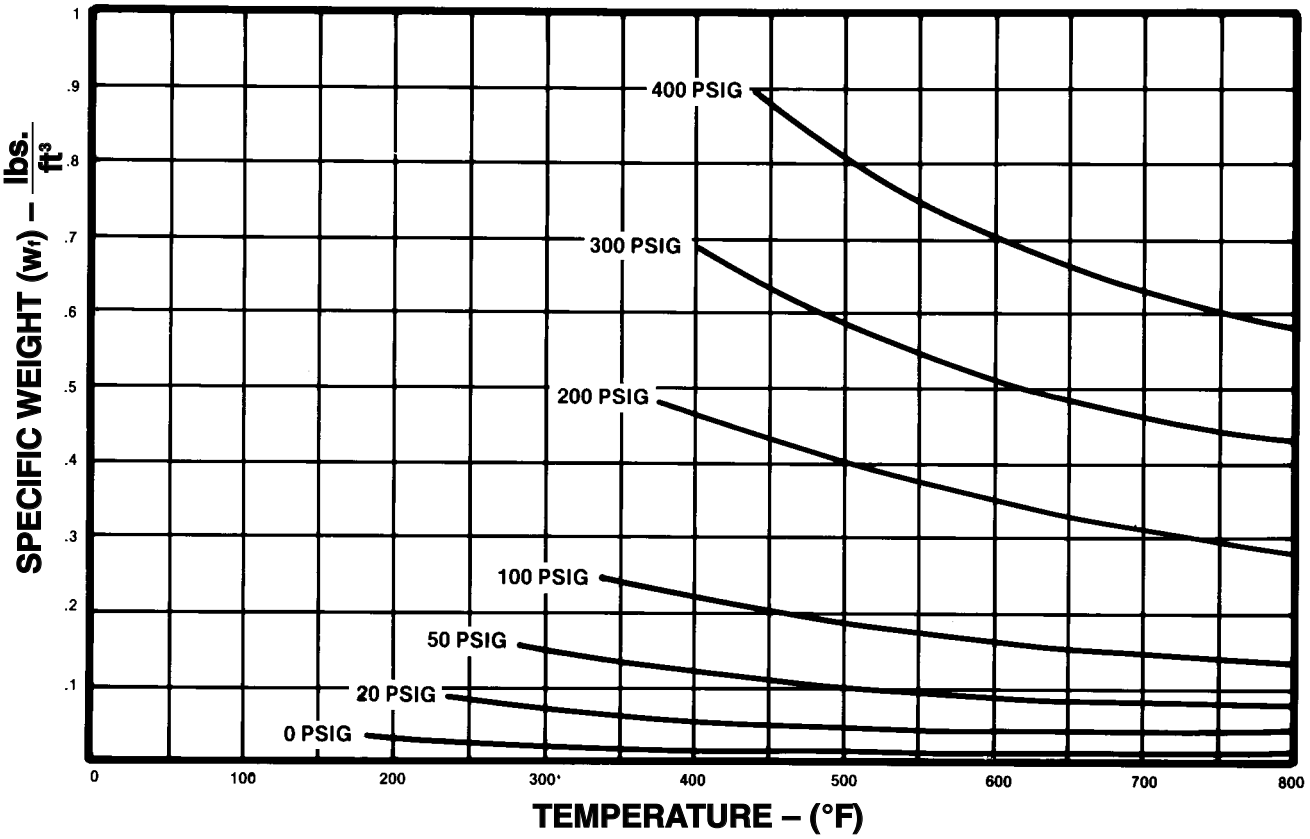
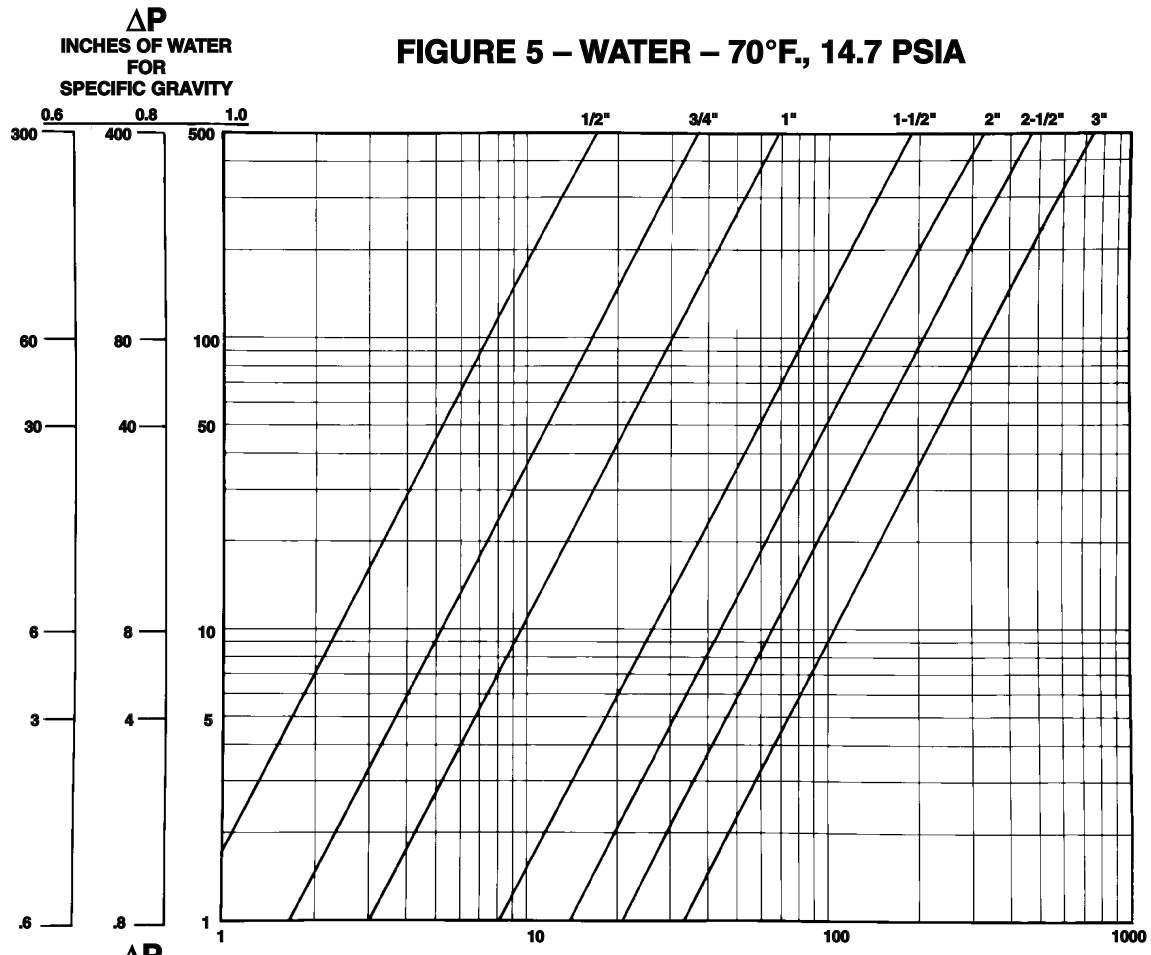


FIGURE 5 – WATER – 70°F., 14.7 PSIA



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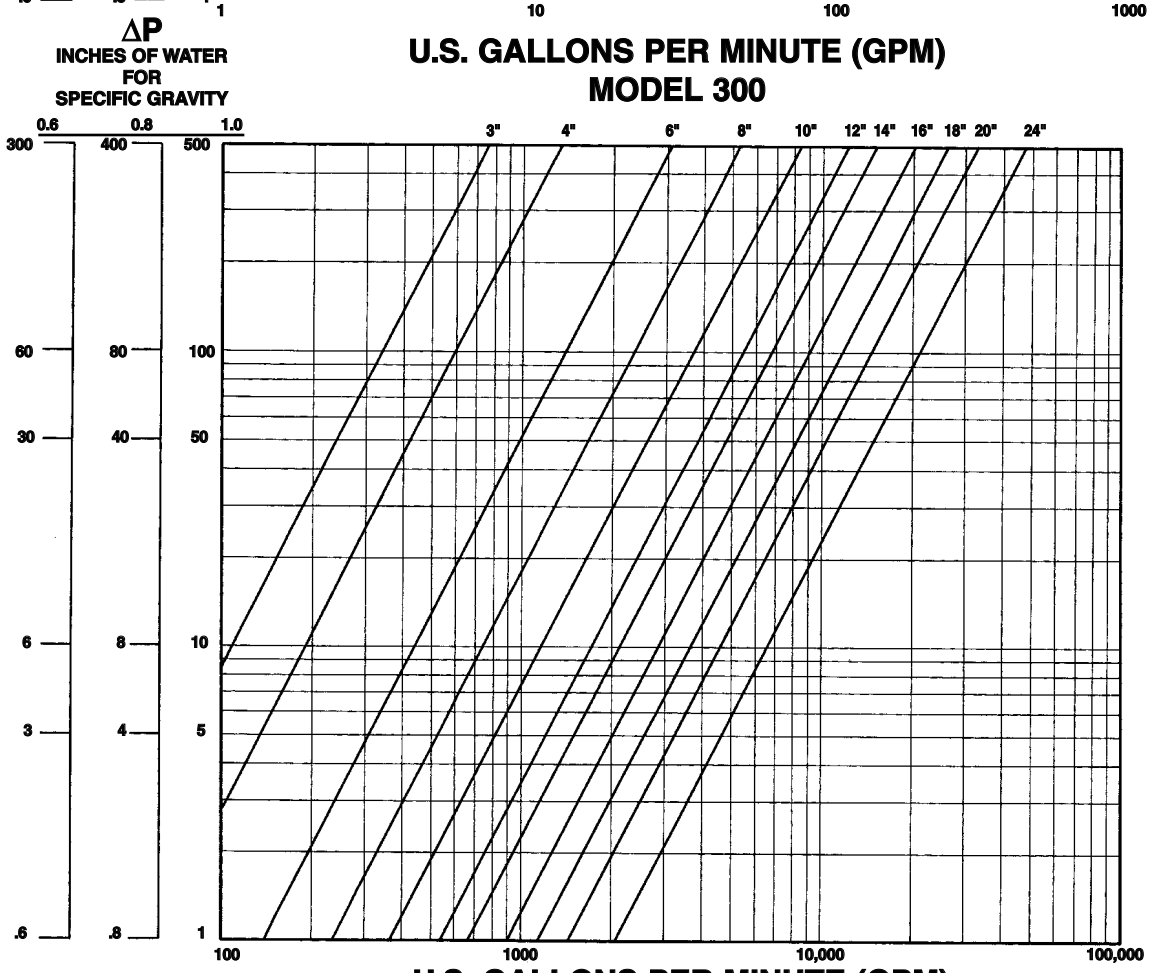
MODEL 300



NOTES:
1) THIS CHART SHOULD ONLY BE USED TO CHECK FOR BASIC SIZE OR SYSTEM FEASIBILITY.
2) DATA BASED ON SCHEDULE 40 PIPE THRU 12". ABOVE 12" DATA IS BASED ON STANDARD SCHEDULE.

MODELS 301, 307, 311, 321, 331, 341, 351, 361, 371, 381 & 391

FIGURE 12

DELTA TUBE APPLICATION DATA WORKSHEET

(ADDITIONAL FORMS AVAILABLE FROM LOCAL REPRESENTATIVE)

FORM NO. DAD/98

GENERAL INFORMATION

1	Tag or Identification No.		
2	Application		
3	Pipe I.D. & O.D. or Pipe Size & Schedule **(Specify Units)**		
4	Pipe Material	4a	Pipe Orientation: Vertical ☐ Horizontal ☐ Other ☐
5	Process Fluid		
6	System Design Temp. **(Specify Units)**	6a	System Design Press. **(Specify Units)**

IMPORTANT: Provide pressures & temperatures @ each flow rate for desired Δ P calculations

LIQUID		UNITS	MAXIMUM	NORMAL	MINIMUM
7	Flow Rate **(Specify Units)**				
8	Pressure @ Flow Conditions Gauge ☐ Absolute ☐				
9	Temperature @ Flow Conditions **(Specify Units)**				
10	Specific Gravity or Specific Weight @ Flow Coniditions **(Specify Units)**				
11	Absolute Viscosity				

GAS		UNITS	MAXIMUM	NORMAL	MINIMUM
7	Flow Rate **(Specify Units)**				
8	Pressure @ Flow Conditions Gauge ☐ Absolute ☐				
9	Temperature @ Flow Conditions **(Specify Units)**				
10	Specific Gravity or Specific Weight @ Flow Coniditions **(Specify Units)**				
11	Absolute Viscosity				

STEAM		UNITS	MAXIMUM	NORMAL	MINIMUM
7	Flow Rate **(Specify Units)**				
8	Pressure @ Flow Conditions Gauge ☐ Absolute ☐				
9	Temperature @ Flow Conditions **(Specify Units)**				
10	Specific Weight @ Flow Coniditions **(Specify Units)**				
11	Absolute Viscosity				
12	Degrees Superheat				
13	Moisture or Liquid Content	%			
14	Saturated Yes ☐ No ☐				

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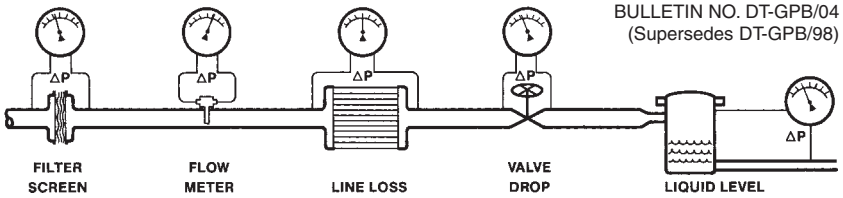
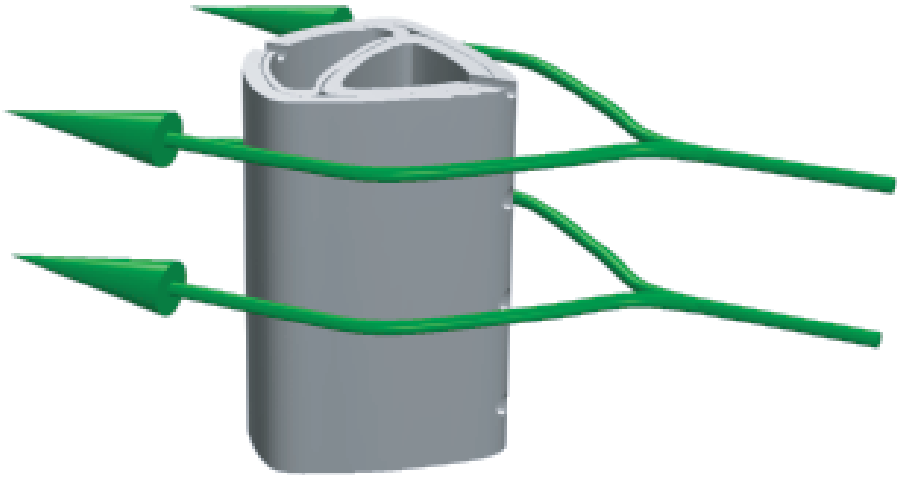
BULLETIN NO. DT-GPB/04
(Supersedes DT-GPB/98)



Delta tube®

THE SHAPE OF TOMORROW IS HERE TODAY IN THE NEW "TEAR-DROP" SHAPED AVERAGING PITOT TUBES IN BOTH 1/2" AND 1" FLOW ELEMENTS.



- "Tear-Drop" Shaped Flow Elements Compare Favorably To "Other" Shapes Offered In The Field.
- Flow Elements Feature An Anti-Blowout Ring For Safe Field Operation.
- Offered With Both 1/4" FNPT and 1/2" FNPT Instrument Connections.
- Accuracy up to +/- 1.0% Of Actual Flow, Repeat Accuracy +/- 0.1%.
- Suitable For Use In The Measurement Of Liquids, Gases, Or Steam.
- Designed For Use With Differential Pressure Gauges, Transmitters, Totalizers, And Chart Recorders.
- Easy, Cost-efficient Installation and Operation.
- Custom Application Design And Manufacture Readily Available.

300

301/302

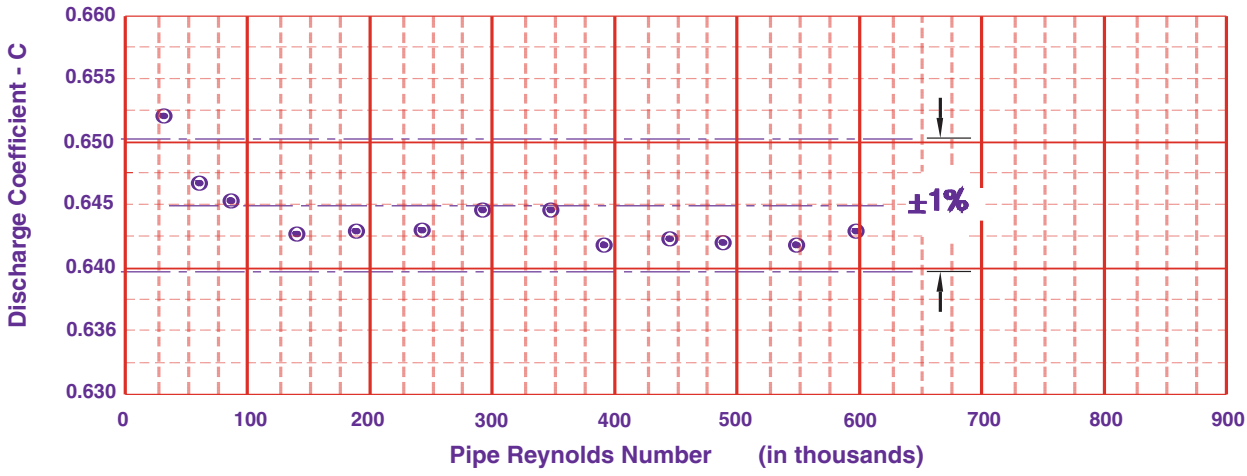
306

The Model 300 Series Inline Delta Tube Flow Element may be used for the measurement of flow in pipe lines from 1/2" NPS through 3" NPS. The Model 300 Series utilizes two averaging flow elements of equal area to sense stagnation (RAM) and static differential pressure providing minimum permanent pressure loss. This flow element can be supplied with your choice of plain, threaded, or flanged end connections in a wide variety of materials.

The Model 301 Series (1/2" Diameter) and Model 302 (1" Diameter) Flow Element Insertion - Type Sensors may be used for the measurement of flow in pipe lines from 3.0" through 36.0" (larger line sizes can be supplied upon request). These flow elements utilize a unique “tear-drop” shaped averaging pitot tube with anti-blowout protection. They provide low permanent pressure loss sensitivity to misalignment with respect to flow accuracy.

The Models 306, 307, 308 Series Delta Air or Delta Duct Insert-Type Flow Element Sensors are designed for the measurement of flow in air and other ducts. They may be installed in round or rectangular ducts from 6.0" (15.0 cm) through 144.0" (370 cm). These flow elements utilize the “tear-drop” shaped averaging pitot tube which provides low permanent pressure loss and low sensitivity to misalignment with respect to flow accuracy.

MODEL 301 FLOW ELEMENT IN A 3" SCHEDULE 40 PIPE*



* Test performed by Alden Research Laboratory Inc.

321

341

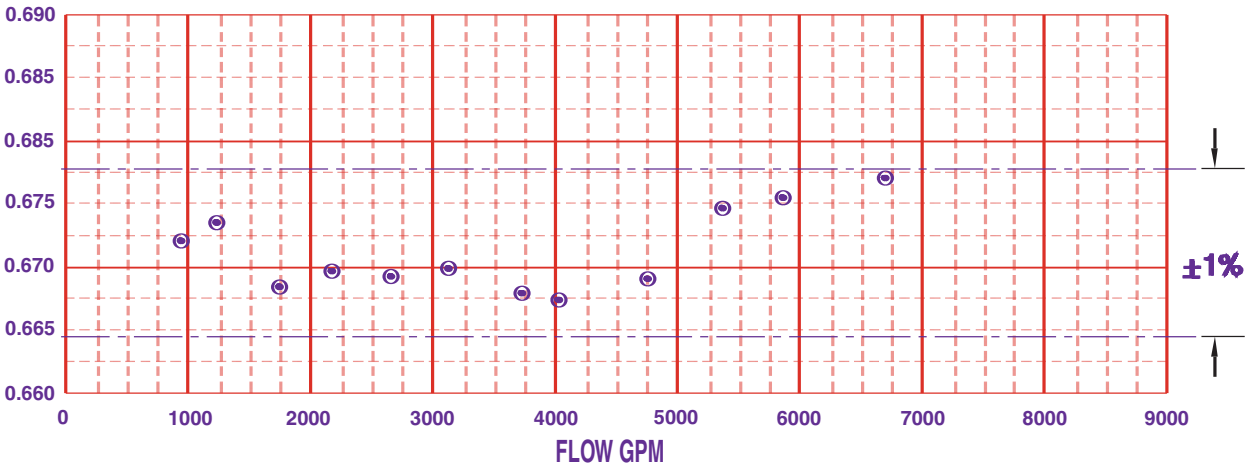
301 with Steam Kit

The Models 311, 312, 321, 322, 323, 331, 332 Delta Tap Insertion-Type Flow Elements are designed for insertion and removal in a pressurized system. The Delta Tap Series can be installed and provide flow measurement information without the necessity of system shutdown.

The Models 341 thru 381, 342 thru 382, and 343 thru 383 Delta Tube Flanged Flow Elements are designed for measurement of flow in pipe lines from 14" (35.5 cm) through 60" (152.4 cm). They are available with 150# flanges as standard and optionally with class 300# thru 2500# flanges in ANSI or Metric.

Delta Tubes and Delta Taps can be optionally supplied with Steam Kits which conform to ASME code for pressure piping (ANSI/ASME B31.1). The twofold purpose of the steam kit allows for safe isolation and shut-off of the instrumentation and provides for establishing a constant condensate head on the instrumentation, so that maximum accuracy may be maintained.

MODEL 302 FLOW ELEMENT IN A 12" STANDARD PIPE*



* Test performed by Alden Research Laboratory Inc.

FIGURE 12

DELTA TUBE APPLICATION DATA WORKSHEET

(ADDITIONAL FORMS AVAILABLE FROM LOCAL REPRESENTATIVE)

FORM NO. DAD/98

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1	Tag or Identification No.		
2	Application		
3	Pipe I.D. & O.D. or Pipe Size & Schedule **(Specify Units)**		
4	Pipe Material	4a	Pipe Orientation: Vertical ☐ Horizontal ☐ Other ☐
5	Process Fluid		
6	System Design Temp. **(Specify Units)**	6a	System Design Press. **(Specify Units)**

IMPORTANT: Provide pressures & temperatures @ each flow rate for desired Δ P calculations

LIQUID		UNITS	MAXIMUM	NORMAL	MINIMUM
7	Flow Rate **(Specify Units)**				
8	Pressure @ Flow Conditions Gauge ☐ Absolute ☐				
9	Temperature @ Flow Conditions **(Specify Units)**				
10	Specific Gravity or Specific Weight @ Flow Conditions **(Specify Units)**				
11	Absolute Viscosity				

GAS		UNITS	MAXIMUM	NORMAL	MINIMUM
7	Flow Rate **(Specify Units)**				
8	Pressure @ Flow Conditions Gauge ☐ Absolute ☐				
9	Temperature @ Flow Conditions **(Specify Units)**				
10	Specific Gravity or Specific Weight @ Flow Conditions **(Specify Units)**				
11	Absolute Viscosity				

STEAM		UNITS	MAXIMUM	NORMAL	MINIMUM
7	Flow Rate **(Specify Units)**				
8	Pressure @ Flow Conditions Gauge ☐ Absolute ☐				
9	Temperature @ Flow Conditions **(Specify Units)**				
10	Specific Weight @ Flow Conditions **(Specify Units)**				
11	Absolute Viscosity				
12	Degrees Superheat				
13	Moisture or Liquid Content	%			
14	Saturated Yes ☐ No ☐				

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