

Mid-West[®] Instrument

Differential Pressure Gauges,
Switches, and Transmitters



- Piston Type Gauges
- Diaphragm Type Gauges
- Bellows Type Gauges
- Bourdon Tube Type Gauges
- Specialty Gauges

Why Mid-West Instrument?

Introduction:

Since 1958, Mid-West Instrument has been a leading manufacturer of differential pressure gauges, transmitters, and switches. Our company is family owned and operated from our facility located in Sterling Heights, MI.

As we have grown, so has our Global presence. You will find Mid-West® Instrument differential pressure gauges, switches, and transmitters in use on every continent!

Our facilities are climate-controlled state of the art factory complete with the latest CNC machine tool technology, test equipment, calibrations standards, Oxygen clean room, and third party certified quality system. This allows us to maintain precise tolerances and product quality. It also allows us to support 5-year warranties on most products.

The team at Mid-West® Instrument is supported in the heritage of innovation. We work creatively to solve application issues for customers and continuously improve our quality, processes, and efficiencies. This has led to our industry best lead times for both standard and customized products.

The Mid-West® Instrument team is ready to serve and address any application you may have.

Mid-West® Instrument differential pressure gauges, switches, or transmitters can be customized to the customer's exact specifications. This makes it easier and faster for customers to install our products. Our flexible manufacturing and commitment to develop custom designs has positioned us as the preferred supplier to the OEM market.

The entire team at Mid-West® Instrument is focused on customer service. Mid-West® is committed to getting the right product, shipped on time, when promised, and as ordered. Our core values for both customers and employees is "to tell you the truth, not just what you want to hear."



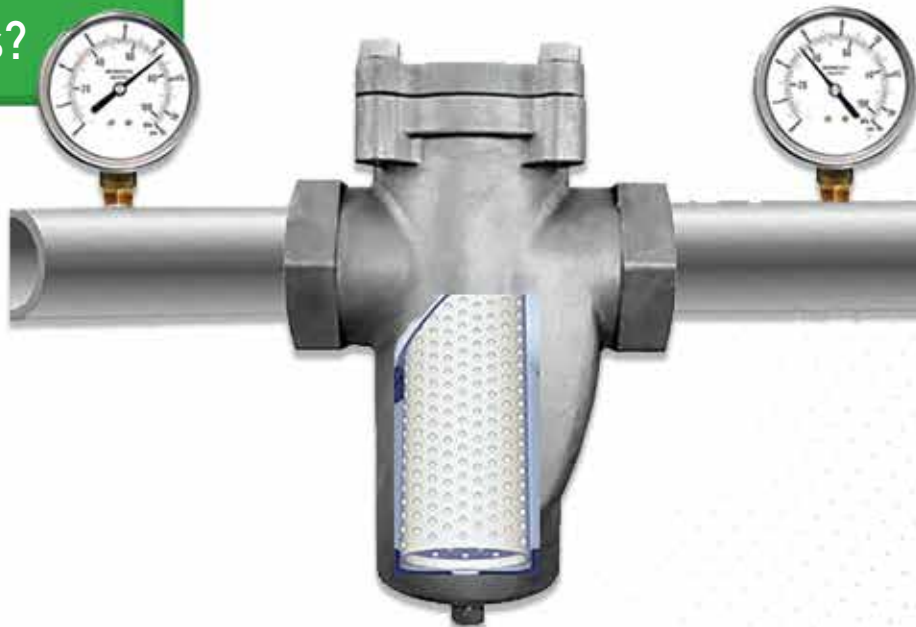
What to Expect:

- Knowledgeable customer service that can help select the best solution for your application.
- Highly customized products – Choice of gauge body materials, dial sizes, seals, and process connections. Over 30 million combinations available.
- Shortest lead times in the industry.
- In house test and certification lab.
- Oxygen clean service.
- UL, CSA, ATEX, IECEx, KOSHA certifications.
- 5 Year warranty on most products.



Why Differential Pressure Gauges?

In the world of process control there are four pillars of instrumentation: Pressure, Temperature, Level, and Flow. Instruments that measure these variables allow control systems and operators to monitor the movement and condition of liquids and gases. Differential pressure gauges are considered "specialty" gauges because they can be used to measure Pressure, Level and Flow, which means they can be used in a variety of applications.



The above image shows two gauges used to detect if a basket strainer needs to be cleaned. In this illustration, the operator has to subtract the pressure of one gauge from the other.

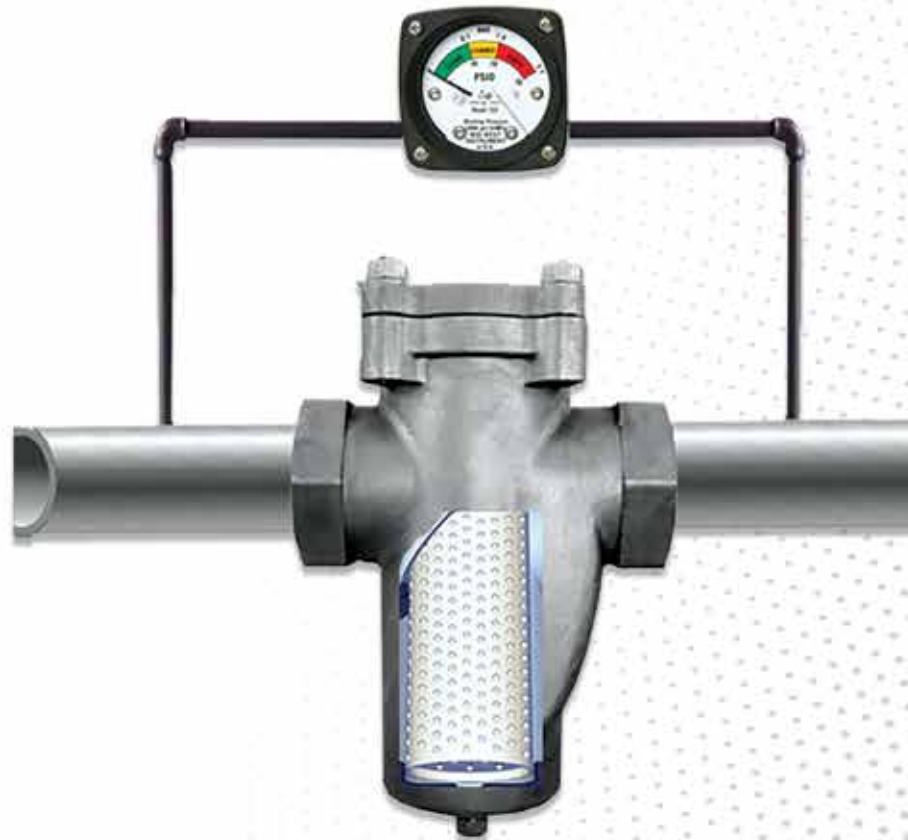
What is a Differential Pressure Gauge?

A line pressure gauge measures the pressure at only one point in a closed system. A differential pressure gauge measures two points of the system at the same time and displays the difference between those points on a single dial. A single differential gauge often replaces two separate line pressure gauges.

When using a differential pressure gauge instead of independent pressure gauges, you will:

- Have a lower error tolerance on the accuracy of the gauge.
- Can instantly measure the change in pressure without having to do any math.
- Immediately know if preventative maintenance is needed.

Viewing the difference of pressure on a single instrument greatly reduces operator errors, improves process efficiency, protects expensive equipment, and reduces maintenance downtime.



When using a differential pressure gauge in the same application, the operator can look at the gauge and read the exact differential pressure value. When using color coded dials, the operator can quickly to determine if the strainer needs to be cleaned.

Common Applications for Differential Pressure Gauges

Filtration is one of the most popular applications for DP gauges. Monitoring the pressure before and after a filter allows an operator to know when a filter is clogged and needs to be replaced. Clogged filters cause motors to work harder. This in turn increases energy costs, creates greater wear and tear on the equipment, and can increase maintenance costs.

Monitor filter clogging in the irrigation industry.

Water from canals is filtered before it is used for irrigation. A differential pressure gauge with an indicating switch detects when the filter is clogged and provides a switch output. Once the switch has been activated, a back flush starts which helps remove and drain the sediments from the filter ensuring proper flow from the pumps to the irrigation sprinkler system.

Self Cleaning Strainers.

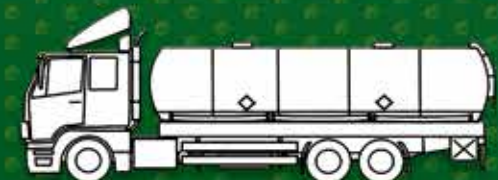
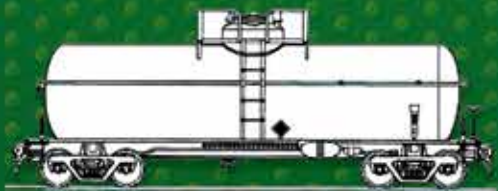
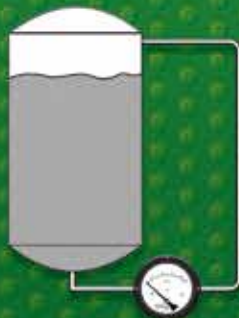
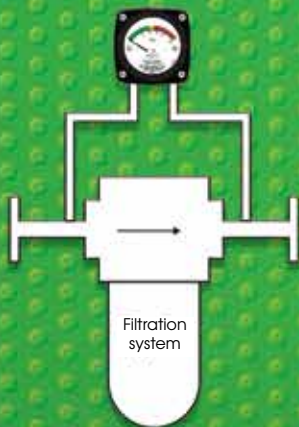
A Piston or diaphragm type differential pressure gauge with a switch is ideal for monitoring filter conditions. An adjustable switch can initiate a cleaning cycle to self-clean or backwash a filter automatically at a preset differential pressure.

Liquid Level.

Differential pressure gauges also measure liquid level. Like flow meters, there are many types of level instruments on the market. A DP gauge is a simple and relatively inexpensive solution to indicate the level of a liquid within a tank. In tank applications the high-pressure side of a DP gauge is ported to the bottom of a tank while the low-pressure side is mated to atmosphere or to the top of the tank depending on application. The DP gauge measures a column of liquid within the tank (liquid height) and displays the liquid level in differential pressure units of weight, volume, percentage, or full / empty.

Tanker Transport Cryo Tanks.

Differential pressure gauges can accurately measure the liquid level on mobile cryo tanks. Dials can be custom produced to show LIN/LOX/LOR, Inches H₂O, mm H₂O, cm H₂O and Co₂ just to name a few.



Pump Monitoring

All pumps perform best when they are at, or very close to their Best Efficiency Point (BEP) as defined by the pump manufacture. This is typically 70-85% of the differential pressure between the suction and discharge. A differential pressure gauge with an integrated transmitter can alert operators to issues like cavitation, loss of flow, mechanical failure, vibration issues, excessive noise, bearing and sealing wear, etc.

Flow Rates

Differential pressure flowmeters use Bernoulli's equation to measure the flow of fluid in a pipe. By introducing a constriction in the pipe a pressure drop is created across the flowmeter. As the flow increases, the difference in pressure also increases.

There are several types of instruments available to measure flow. As the pipe diameter increases, the cost for flow meters increases drastically. DP flow meters are especially attractive for larger pipes because of they offer cost savings and high accuracy.

Reverse Flow Detection

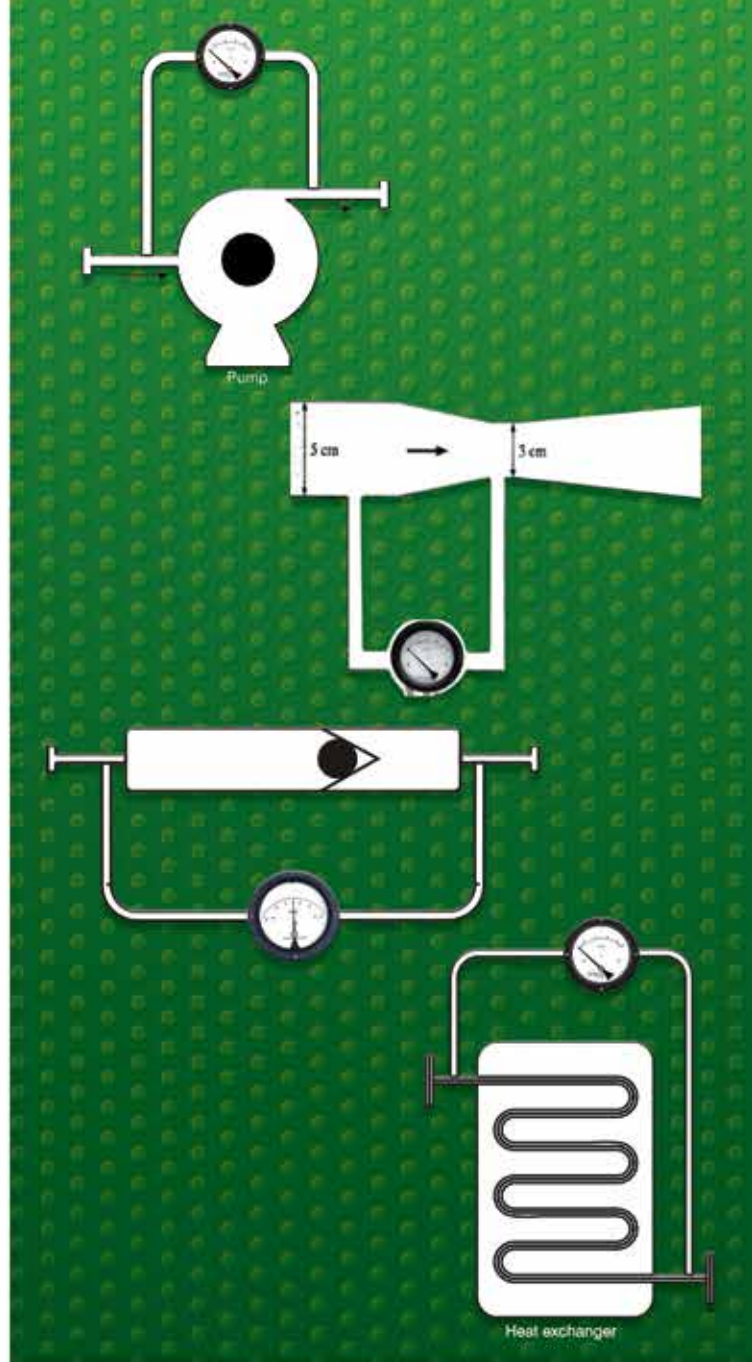
Reverse flow condition can be detected with the use of a differential pressure instrument. In applications where change in direction of flow is to be detected, a center zero instrument can indicate flow direction as well as measure flow. If the fluid in the line is not flowing, the pointer will remain at zero position and will deflect in either direction depending on the direction of the flow. Additionally, a switch can be added to alarm for a reverse flow condition.

Heat Exchangers and HVAC Systems

Similar to filter applications, heat exchangers can experience high maintenance costs when they are not performing at optimal levels. Scale deposits inside of the heat exchanger increases the pressure and reduces the efficiency of the device. A differential pressure gauges can monitor the pressure and alert the operator when preventative maintenance is needed.

Other Common Applications

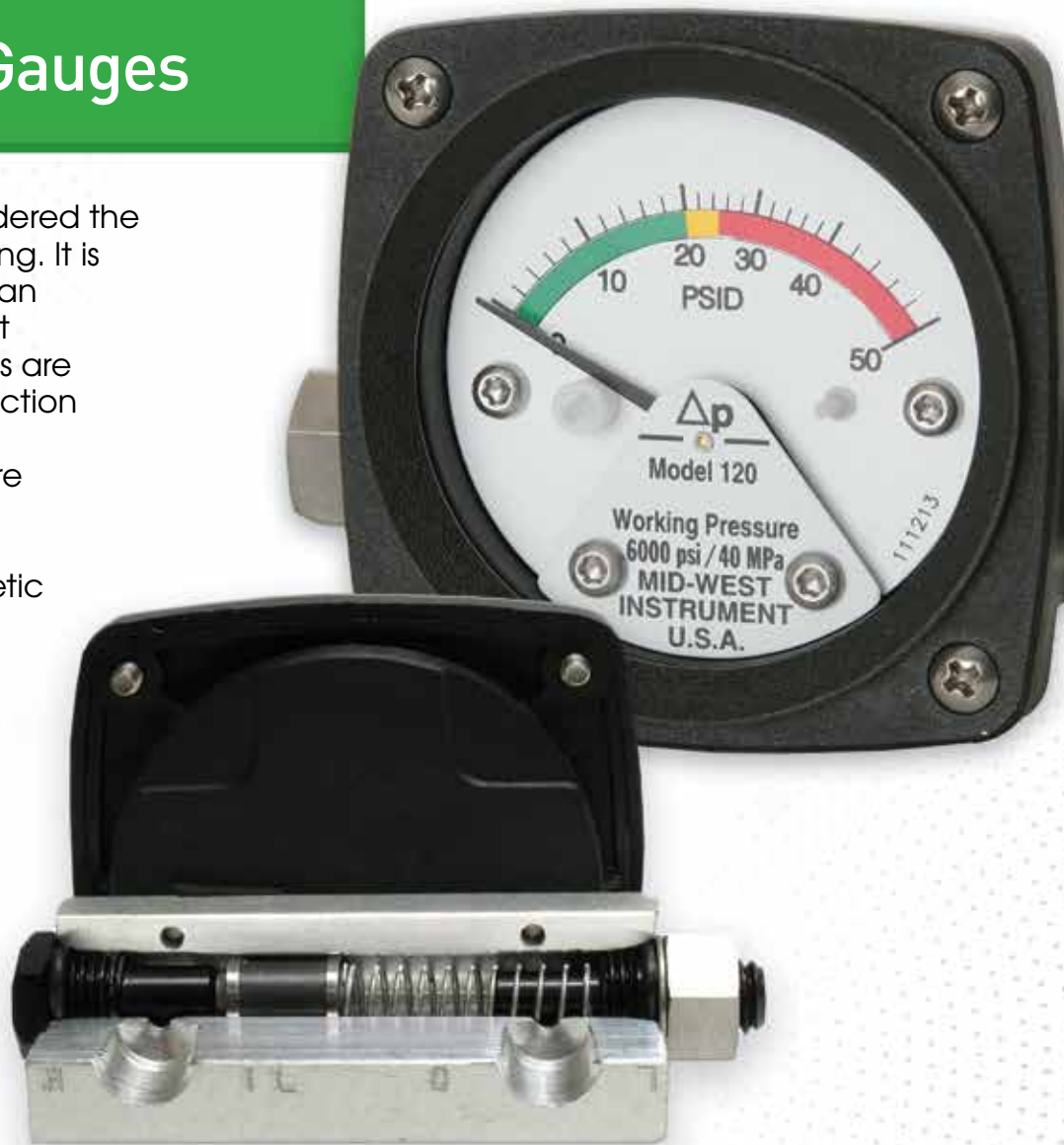
- Compressed Air
- Filter and Strainer Monitoring
- Filter monitoring for Gases
- Heat Exchanger Pressure Drop Monitoring
- Hydraulic Filter Monitoring
- Pressurized Tank Level Monitoring
- Pump Performance Monitoring
- Pump Performance Testing
- Refrigerant
- Square Root Graduations for Direct Reading Flow Rates
- Stationary Tanks – Horizontal and Vertical
- Tanker Transport / Over the road trailers for materials such as LOX, CO₂, Ammonia, Nitrogen Helium, Nitrogen, Hydrogen and Argon
- Valves, Chillers etc., and for local flow indication and control
- Water Treatment and Air Conditioning Systems



Piston Type Gauges

The piston type gauge is considered the workhorse of our product offering. It is an economical product that can withstand some of the toughest applications. The piston gauges are designed with overrange protection and can withstand higher line pressures. Piston gauges feature +/- 3-2-3 % and 5% accuracy.

The piston gauge has a magnetic piston and range spring in the bore of a gauge body. The difference in pressure between the high and low ports pushes the piston against the range spring. The movement of the magnetic piston can drive indicating pointers, reed switches or transmitters.



Featured Product Highlights

Rugged construction and compact design for some of the toughest applications.

- Safe working pressures up to 10,000 psi
- 0-5 PSID to 0-400 psid
- Economical product line to keep your install costs low.
- Designed with over-range protection to max pressure.
- Weatherproof rated to NEMA 4X/IP65.
- Operating Temp. -40° F to +200° F (-40°C to +93°C)
- UL, CSA, ATEX, IECEx, KOSHA certifications.
- 5 Year Warranty

We Can Make It Your Way

Mid-West can customize every gauge to make your installation quick and easy. Some of our component selections include:

- Aluminum, and stainless-steel body options.
- Selection of internal seal polymers to match your process fluid.
- Choice of 2.5", 3.5", 4.5" or 6" dials.
- Variety of thread options to match your process connections.
- Private labeled dials—We can print your logo on the dial.
- Switch, relay, and transmitter options.

Diaphragm Type Gauges



The diaphragm type gauge is very versatile making it the ideal choice for many applications. The diaphragm forms a tight barrier between the high and low ports which allows the gauge to measure pressure differences between dissimilar process fluids. Diaphragm gauges work well with higher temperatures and “dirty” fluids. Diaphragm gauges feature +/- 3-2-3% and 5% accuracy.

The diaphragm type gauge uses a pliable membrane that flexes in response to a change in pressure. As the diaphragm moves, it slides an internal magnet which causes an external magnet to rotate the dial to show your change in pressure. The diaphragm isolates the high and low-pressure ports so there is no pressure bypass. This allows for very sensitive measurement of air, gas and liquids.

Featured Product Highlights

- Total separation of high and low by a convoluted elastomer diaphragm.
- Diaphragm design allows use of dissimilar fluids on high and low side of gauge.
- Suitable for use with “dirty” liquids or gases.
- Safe working pressure up to 3,000 psi
- 0-5 inch H₂O to 0-100 psid
- Over-range protection to full rated working pressure.
- Can be used with vacuum or pressure applications
- Weatherproof rated to NEMA 4X/IP65.
- Operating Temp. -40° F to +200° F (-40°C to +93°C)
- UL, CSA, ATEX, IECEx, KOSHA certifications.
- 5 Year Warranty

We Can Make It Your Way

Mid-West can customize every gauge to make your installation quick and easy. Some of our component selections include:

- Glass Reinforced Engineered Plastic, Aluminum, 316L Stainless Steel, Aluminum Bronze, Monel, and Brass body options.
- Selection of internal seal polymers to match your process fluid.
- Choice of DP ranges and scales: Inches H₂O, psid, mbar, and kPa
- Choice of 2.5”, 3.5”, 4.5” or 6” dials.
- Variety of thread options to match your process connections.



Bellows Type Gauges



Bellows gauges are precision instruments that offer high accuracy readings of $\pm 0.5\%$ or 1% full scale. Their high sensitivity makes them ideal for low differential applications.



A bellows is a flexible element that expands and contracts when pressure is applied. It operates similar to an accordion. When a bellows is used in a differential pressure gauge, the expansion or contraction of the bellows moves mechanical linkages in the gauge body, which moves the pointer on the dial to display the difference in pressure. Mid-West bellows type gauges feature bi-directional relief valves to provide over-range protection.

Featured Product Highlights

- Sensitive instrument for low differential applications.
- High accuracy instrument. $\pm 1\%$ or $\pm 0.5\%$ full scale accuracy
- Safe working pressure up to 6,000 psi
- 0-10 "H₂O to 0-800" H₂O differential pressure.
- Weather Resistant & Corrosion Resistant Gauge Front
- NEMA 4X
- 270° Dial Arc
- Shatter Resistant Lens
- Over-Range Protection, High over Low and Low over High
- 5 Year Warranty

We Can Make It Your Way

Mid-West can customize every gauge to make your installation quick and easy. Some of our component selections include:

- Aluminum, 316L Stainless Steel, Carbon Steel, and Brass body options
- Snap acting mechanical or locked-logic alarm controls.
- Selection of internal seal polymers to match your process fluid.
- Choice of DP ranges and scales: Inches H₂O, psid, mbar, and kPa
- 4.5" and 6" dials to choose from.
- Variety of thread options to match your process connections.

Bourdon Tube Type Gauges



The Bourdon-tube gauge, invented about 1850, is still one of the most widely used instruments for measuring the pressure of liquids and gases of all kinds, including steam, water, and air because of its ability to accommodate extremely high pressures. The device consists of a flattened circular tube coiled into a circular arc. One end of the tube is open to the fluid to be measured; the other end is sealed and coupled to the pointer spindle. As pressure increases inside the tube, the tube tends to straighten, thus turning the pointer on the dial.

Differential pressure Bourdon tube gauges have a high pressure chamber that encapsulates the Bourdon Tube Assembly. The instrument measures the difference in pressure between the process fluid that is in the tube to the pressure in the chamber. The difference is accurately displayed on the dial.

Featured Product Highlights

- High accuracy instrument. +/- 1% or +/- 0.5% full scale accuracy
- Safe working pressure to 6,000 psi
- 0-15 psid to 0-6000 psid
- NEMA 4X
- Weather Resistant & Corrosion Resistant Gauge Front
- 270° Dial Arc
- Shatter Resistant Lens
- Over-Range Protection, High over Low and Low over High
- 5 Year Warranty



We Can Make It Your Way

Mid-West can customize every gauge to make your installation quick and easy. Some of our component selections include:

- Aluminum, brass, carbon steel, and stainless steel body options.
- Locked-Logic alarm controls
- Variety of thread options to match your process connections.
- Private labeled dials - We can print your logo on the dial



Specialty Gauges

Hazardous Locations

Mid-West Instrument has large variety of products for hazardous location applications. Our products may carry one or more certifications from CSA, UL, ATEX, IECEx, or KOSHA. Products are compliant to the LVD and RoHS Directives. Hazardous locations certifications apply to the entire assembly / design and not just the use of a "Certified Enclosure".



Cryo Tank Applications

Diaphragm and Bellows type differential pressure instruments calibrated in weight or volume are effectively used in cryogenic tank level monitoring. Tanks can be stationary (vertical or horizontal) or they can be used in tanker transport vehicles. Mid-West cryogenic instrumentation utilizes a "dry gauge" design where there is no internal liquid fill. This prevents any leaking or fouling of the tank system and no damage or accuracy issues due to liquid fill expansion when exposed to temperature shocks in cryogenic applications.



OEM Filter Indicators

Mid-West produces a vast number of economical OEM indicators. Our indicators offer rugged construction, safe working pressure up to 3,000 psi, and 0-3.5 psid to 0-100 psid. These easy to read indicators work extremely well with filter and strainer applications. We are happy to work with your engineering team to develop the perfect indicator for your application.





Precision Flow Test Kits

Whether you are looking for a high accuracy portable test kit for flow indication and leak detection, or a more rugged medium accuracy portable test kit, Mid-West Instrument has designed and manufactures the RIGHT flow test kit for your budget and your application.

Accessories

Mid-West Instrument specializes in providing the perfect solution. Our line of accessories ensure that your gauge is ready for fast and easy installation. Our accessory line includes 3 & 5 valve differential pressure manifolds, adjustable pulsation dampeners, non-adjustable snubbers, "gauge minder" pressure limiting valves, swivel adapters, and diaphragm /chemical seals.

Adjustable and non-adjustable pulsation dampeners (also called snubbers) protect gauges from line surges, shock waves and fluid hammer.



Swivel gauge adapters have been designed to provide 360° rotational movement enabling maximum positional orientation of installed gauges.



Pressure limiting valves block off excess pressure to the instrument, preventing calibration failure, internal damage, and "blow-out" from over-ranging – a principal cause of instrument failure.

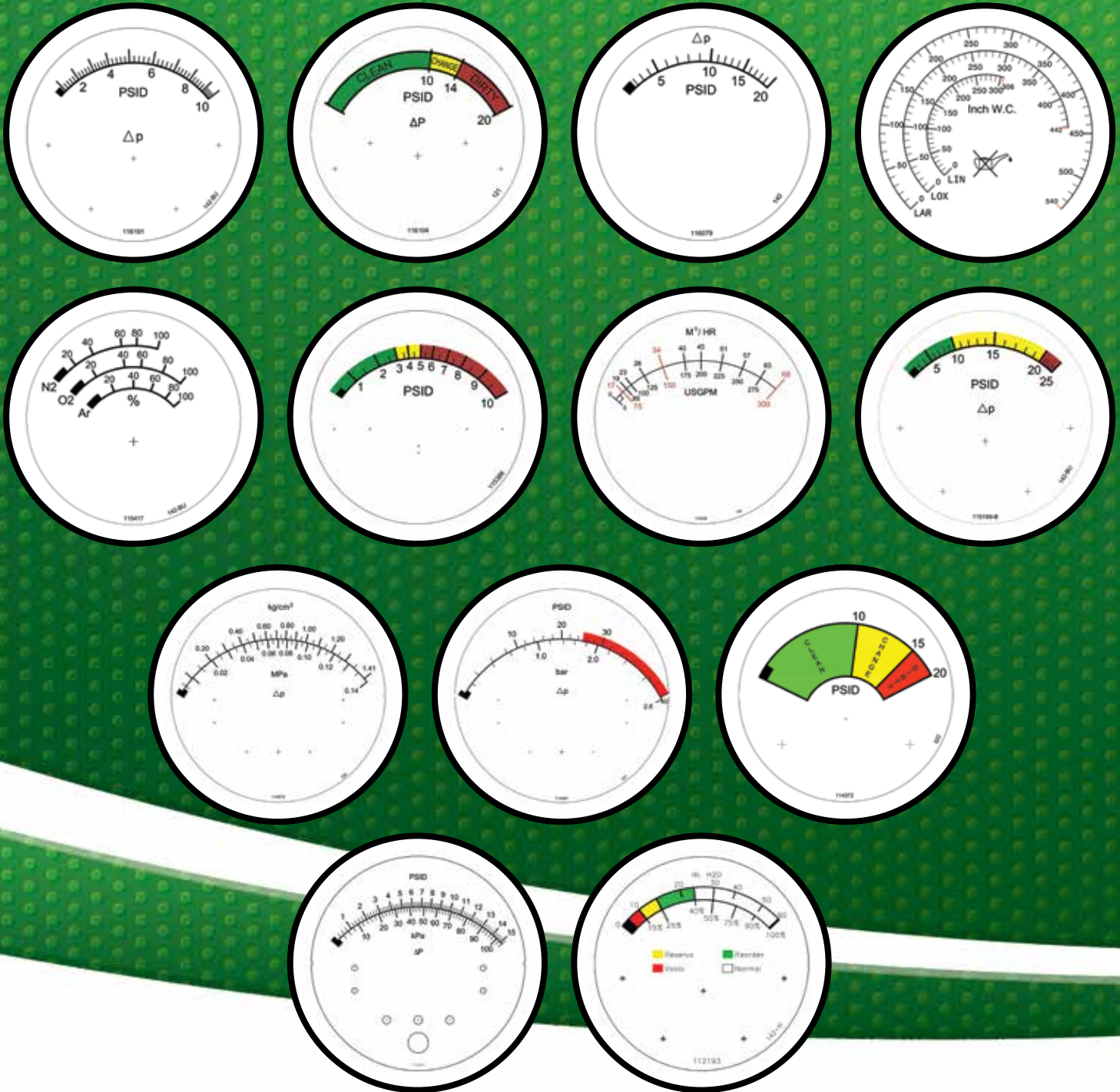


3 & 5 valve manifolds are designed for applications where direct mounting to an instrument is impractical or undesirable. Manual valves are used to isolate and equalize pressure from the process to the instrument for maintenance and calibration purposes.



Custom Printed Dials

Mid-West Instrument prints every gauge dial in house. This gives us the flexibility to work with you to develop custom dials that work best for your application. Customization may include a variety of scales, ranges, color breaks, legends, and more. Our full color equipment can also print your company logo on the dial keeping your name visible to your customers for repeat business.



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Mid-West Instrument
6500 Dobry Dr.
Sterling Heights, MI 48314
586-254-6500
www.midwestinstrument.com



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