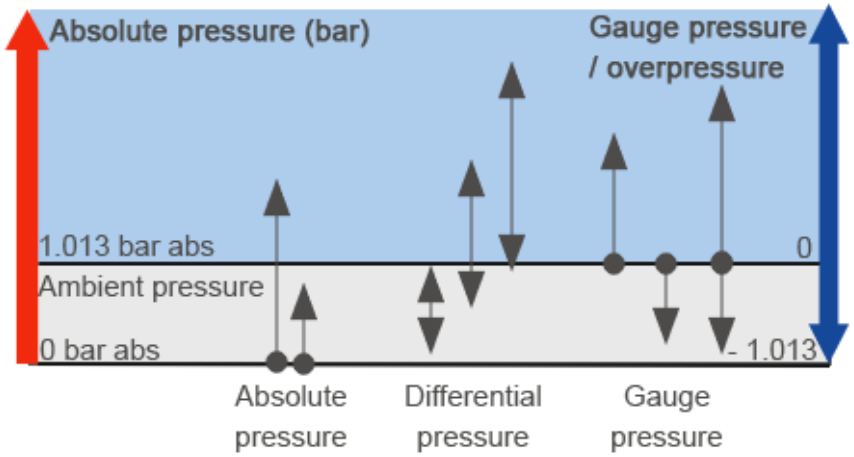
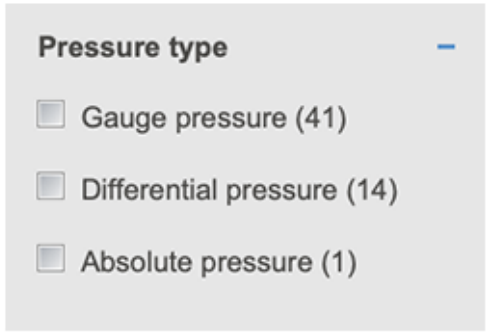
WIKA

Introduction to Differential Pressure Measurement

Types of Pressure

■ Gauge pressure	Most widely used type of pressure	⇨ Models 1, 2, 3, 4, 6
■ Differential pressure	Special applications, e.g. filter monitoring	⇨ Model 7
■ Absolute pressure	Not dependent upon ambient pressure, e.g. vacuum technology	⇨ Model 5





Pressure Basics

Design of measurement solutions with spring-elastic principles

Gauge pressure

Bourdon tube pressure gauges

high range of pressures can be measured (0.6-6,000
high accuracy possible

moderately priced

liquid and gaseous media

Diaphragm pressure gauges

lowest pressure ranges from 16 mbar
high overload safety

aggressive media

viscous media

Capsule pressure gauges

lowest pressure ranges

gaseous, dry media

Absolute pressure measurement

Measurement independent of natural atmospheric pressure

Differential pressure measurement

Measuring the differences of two pressures

Monitoring of filters, pumps, compressors

Overview of Selected Focus Products

Model 1
Industrial Gauges

Model 111.10

Model 2
Copper alloy

Model 213.53

Model 2
Process gauges

Model 232.50

Model 3
Test gauges

Model 312.20

Model 4
Diaphragm pressure

Model 432.50

Model 5
Absolute pressure

Model 532.53

Model 6
Capsule pressure gauges

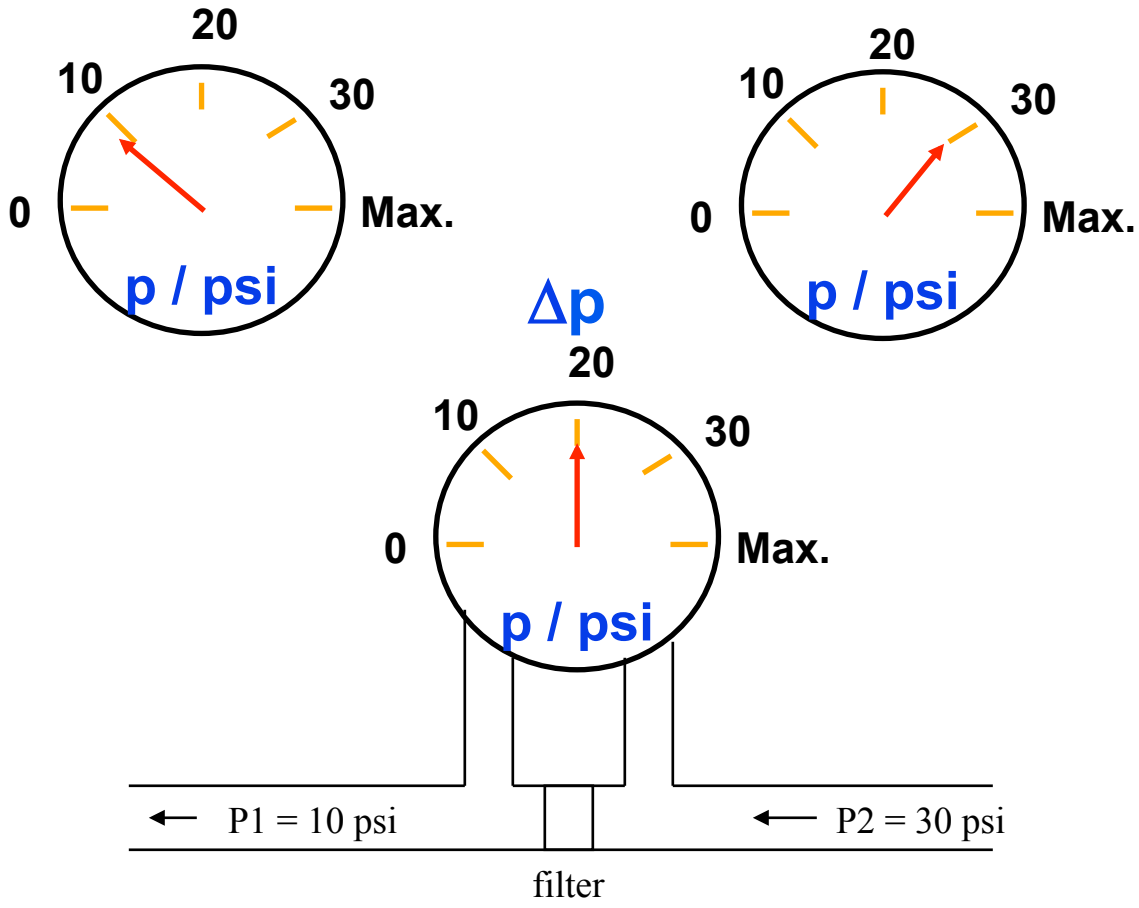
Model 632.50

Model 7
Differential pressure

Model 732.51

Definition / Basics

If the pressure difference between two pressures p1 and p2 is the required measurement, it is called the differential pressure Δp.



Differential Pressure Families

Selecting the Right DP Gauge

- Differential pressure range
- Maximum working pressure
- Wetted parts material
- Application (liquid level measurement)
- Pricing (DP gauges range from $40.00 to $6,000.00)
- Special requirements (O2 service, NACE etc.)
- Mounting of DP gauge
- Available options (switches, manifolds, output signal)

Definitions within Differential Pressure

Differential Pressure:

The pressure difference that the customer wants the scale to read. The dial needs to indicate a specific difference between two applied pressures.

Static Pressure / Working Pressure / Line Pressure / Maximum Pressure:

The maximum pressure at which a system is capable of operating for a sustained period of time. The static pressure applies to both sides of a DP Gauge at the same time.

Definitions within Differential Pressure

Overpressure:

The maximum difference of pressure that can be applied to either side of the gauge.

Do not mix up Overpressure with Differential Pressure:

Example:

- Differential Pressure: 0/5 psi (d)
- Max. Static Pressure: 600 psi (g)
- Max. Overpressure 100 psi (g)

The system operates within 600 psi on both sides. The customer wants to see a difference of 5 psi to indicate if an oil filter on a turbine is clogged. The difference on either side of the gauge may not exceed 100 psi.

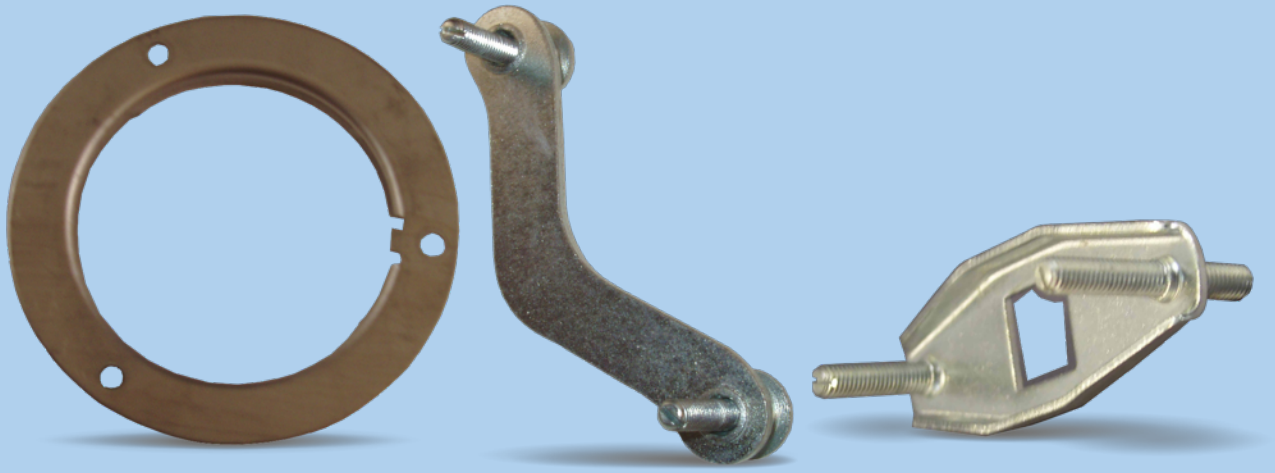
Critical Criteria within DP Measurement

Wetted Part Materials:

All the parts that come in contact with the measured media. This is very important because we do have DP gauges where the gauge internals such as the window, gaskets, pointer, dial, movement etc. come in contact with the media.

Mounting Brackets:

A DP gauge can be equipped with the typical mounting devices such as front flange and rear flange. Because of the size & weight of some of the DP gauges, they need to be supported by additional devices, such as surface mounting bracket, pipe mounting bracket, “C” bracket, “H” bracket, Barton Bracket.



Selection Criteria

Criteria	Notes
Differential Pressure	0.20”WC up to 15,000 psi
Max. Working Pressure	up to 15,000 psi
Max. Overpressure	up to 19,500 psi
Process Connection	Male, female, hose barb connections
Indication	Differential indication with one pointer, or duplex indication with two pointers
Units of Measurement	Pressure (IN.WC, psi, bar etc.), Flow (GPM), Content (pounds, kg, gallons etc.), Air Speed (Knots, Miles etc.)
Connection Location	Bottom, top/bottom, back, end-connections
Process Media	Some DP gauges can only handle gaseous media
Material Compatibility	In some gauges internal parts such as pointer, dial, movement, window, gaskets etc. could come in contact with the media
Manifold	Manifolds w/shut-off valves and equalizing valves are very common.
Mounting Brackets	Because of the size and weight of the gauges, special mounting brackets are required.
Electrical Options	Switch outputs and transmitter outputs

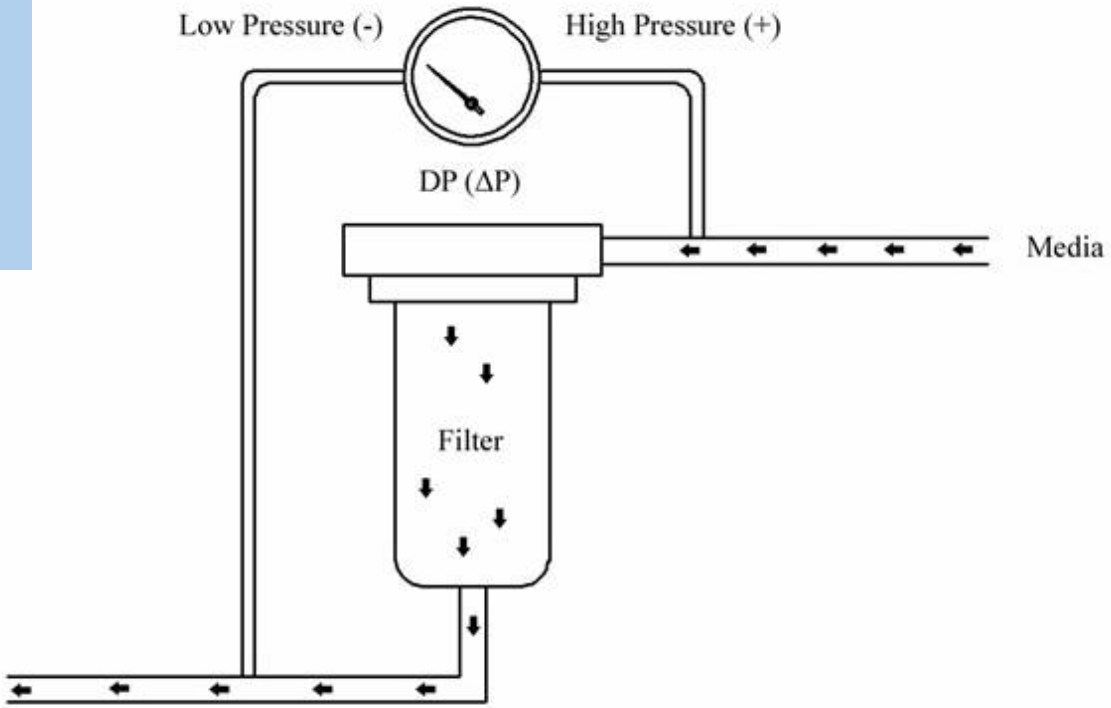
Applications

DP gauges suitable in this application:

700.04, 732.25, 732.51 (industrial oil filter applications, air filter monitoring in gas turbines, filter monitoring in water/waste water)

A2G-10, A2G-15, 716.11 (for very low pressure in air handling systems)

1. Filter Monitoring



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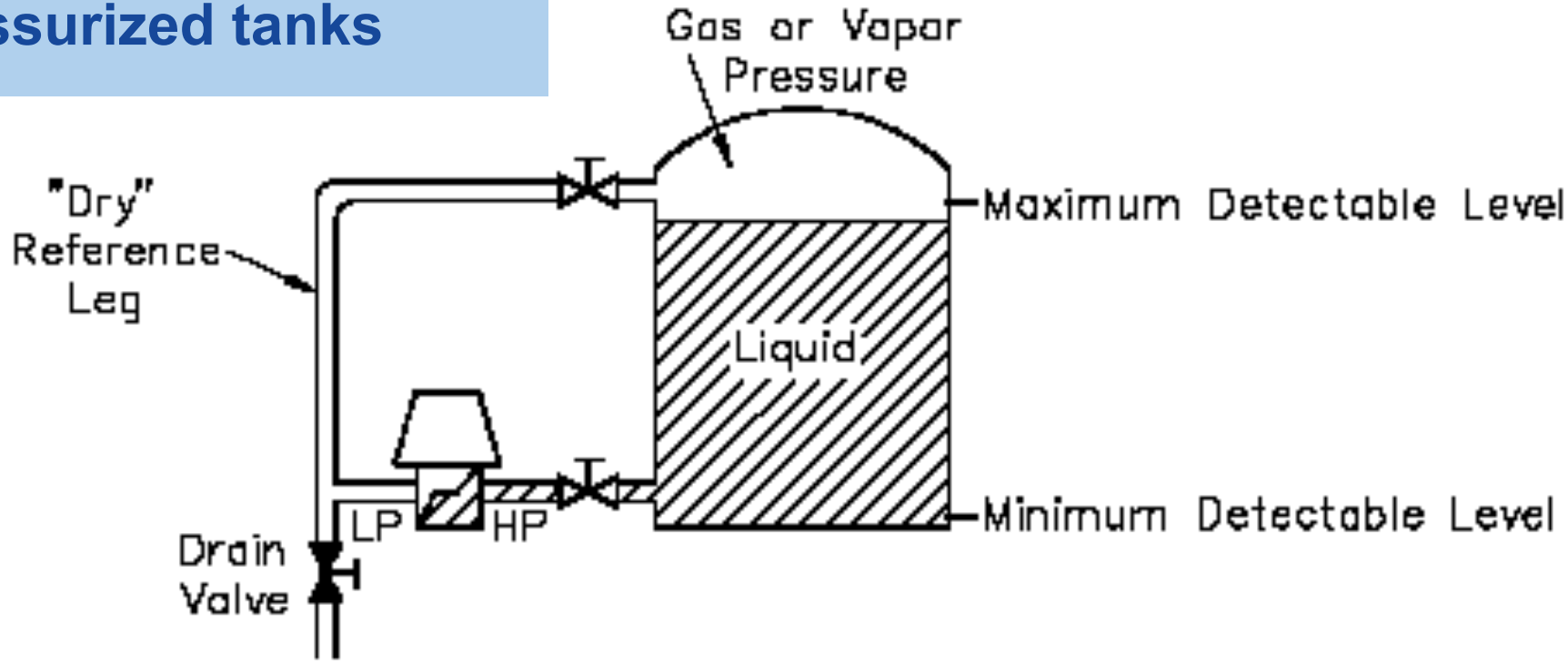
2. Liquid Level Measurement in Sealed and Pressurized tanks



Applications

Liquid Level Measurement

DP Gauges suitable in this application:

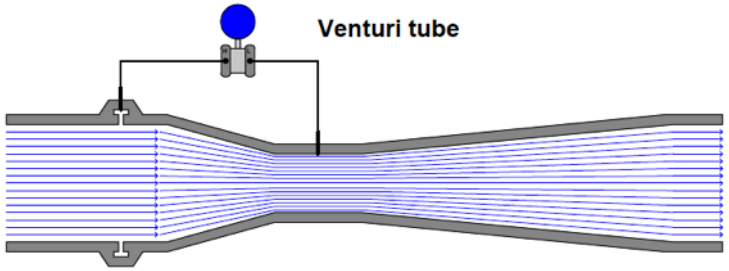
- 712.15
- 732.26
- 732.51
- 732.14

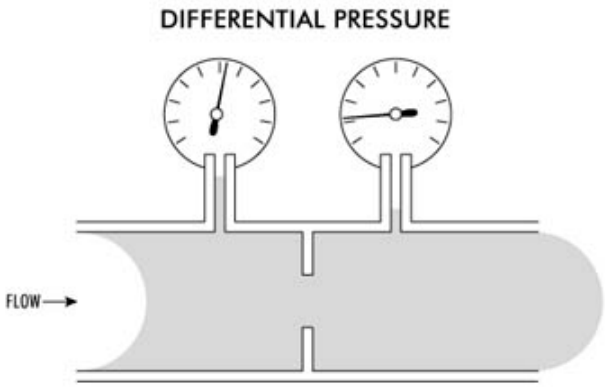
Applications

Flow Measurement

Differential Pressure Gauges can be used to measure the flow rate of a liquid inside a pipe. These so-called flow-meters included a constriction inside the pipe that creates a pressure drop. The differential pressure gauge measures the pressure before the constriction and after the constriction. These constrictions can be an orifice plate, venturi's or flow nozzles. Using a specific mathematical equation (Bernoulli's equation) the pressure drop across the constriction is proportional to the square of the flow rate.

Constriction: Venturi tube, orifice plate, flow nozzle etc.





Applications

Special Applications – Drill Head

A Bourdon Tube type DP gauge is used for measuring the output torque of positive displacement motors. The gauge measures the pressure drop of the hydraulic motor powering the gear box by simultaneously measuring pressure on the pressure and return side of your hydraulic motor during operation. By measuring the pressure drop the DP Gauge calculates the amount of torque that is generated by the hydraulic motor.

Manufacturers

Dwyer® Manufacturing Excellence Since 1931

Mid-West® Instrument

Orange Research

ITT Barton

CAMERON

Barton®

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Manufacturer

Manufacturer	DP Families	Models
Dwyer	Magnehelic Type, Capsule Type, Piston Type	9
Midwest Instrument	Piston Type, Piston Type w/diaphragm, Bellows Type, Bourdon Tube Type	20
Orange Research	Piston Type, Piston Type w/diaphragm	19
Barton Instruments	Bellows Type	11

Manufacturer	DP Families	Models
WIKA	Piston Type, Piston Type w/diaphragm, Magnehelic Type, Bourdon Tube Type, Single Diaphragm Type, Dual Diaphragm Type, Capsule Type, Compression Spring w/diaphragm	41

Thank You!