KING-GAGE®

Differential Pressure Transmitter

Tank Liquid Level
Inventory Monitoring
Process Integration

D/P Module™

- **Use to integrate pneumatic systems with PLCs**
- **Better than ±0.02% span repeatability**
- **Front panel zero/span adjust and meter terminals**

D/P Module Transmitter features a piezoresistive sensing element for reliable accuracy and repeatability. Compact, self-contained design installs easily while conserving space. This two-wire transmitter provides a proportional 4–20 mA output compatible with typical process instrumentation and analog I/O devices.

Pressure to mA Conversion

D/P Module is a pneumatic-to-current transmitter that can accept differential pressure (D/P) inputs. Its precision transducer is especially suited to hydrostatic tank level and other critical pressure measurements. These units are typically used to convert the output of pneumatic sensors into an electrical signal. This also permits retrofitting of older air-operated systems for integration with newer PLC process control systems.

14–40 Vdc Operation

D/P Module is designed to operate over a broad voltage range. This transmitter can be used with power supplies ranging from 14–40 Vdc (depending upon load requirements of loop). Load capacity can be up to 1,400 Ohms @ 40 Vdc. Output current limiting and continuous no-load operating capacity ensures reliability in even the most demanding applications.

Adjustable Ranges

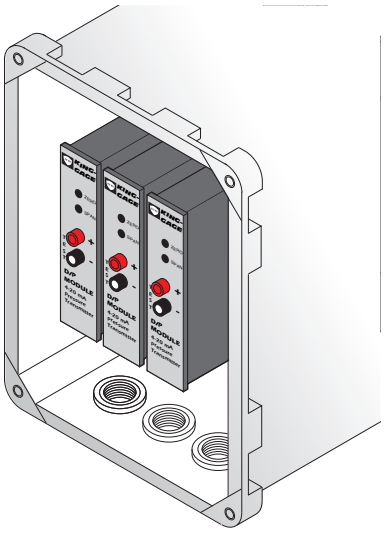
Transmitter span accommodates a 3:1 turndown ratio* to match the application pressure range (i.e., tank depth). Pressure ranges of 0–5 through 0–50 psid are available. Overall repeatability is within ±0.02% of calibrated span providing superior performance compared to other compact two-wire transmitters.

Model 5900 D/P Module
4–20 mA Transmitter

* 3:1 turndown ratio is applicable to 0–10 and 0–30 nominal range, refer to specifications for detailed span adjustment available on specific range models.

Mounting

This transmitter module is intended for control consoles or instrument enclosures. It is a compact surface mount package requiring no additional manifold or cage assembly. This permits both economical and flexible mounting applications, especially where space is at a premium.



Examples of Pressure Range Calculations

A typical tank gauging application is illustrated in Figure 1. The "reserve" represents the distance from the lowest point on the bottom of the tank to the installed sensor. "Full" is the level of contents at which the tank is filled to capacity (or may be some point below the tank top, as desired). The liquid contents in the tank is water @ 1.00 specific gravity.

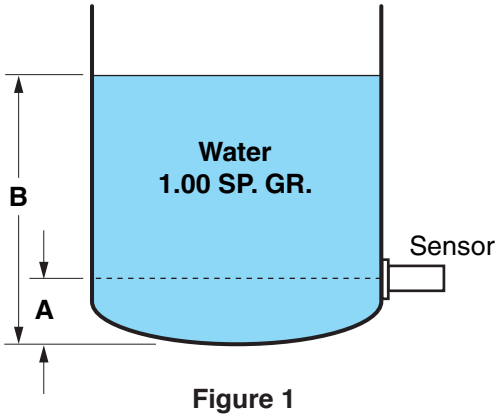


Figure 1

$$\frac{(\mathbf{B} - \mathbf{A}) \times \mathbf{C}}{27.6807} = \text{pressure}$$

C = 1.00 (Specific Gravity)

B = 382" (Full Tank)

A = 30" (Reserve)

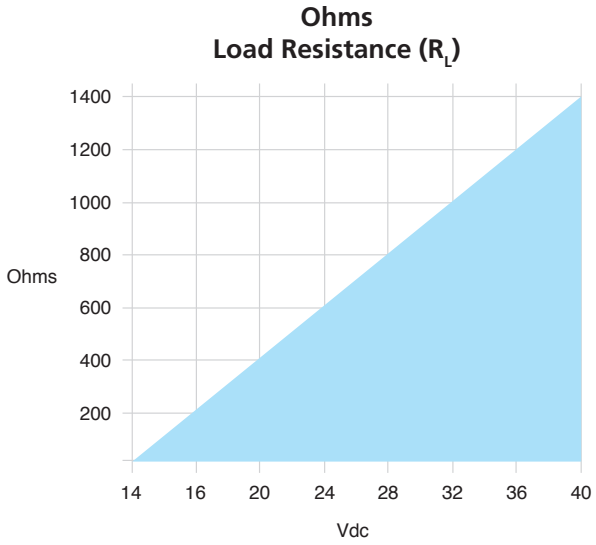
$$\frac{(382 - 30) \times 1.00}{27.6807} = 12.72 \text{ psid}$$

$$(382 - 30) \times 1.00 = 352\text{" water}$$

Voltage/Load Capacity Ratings

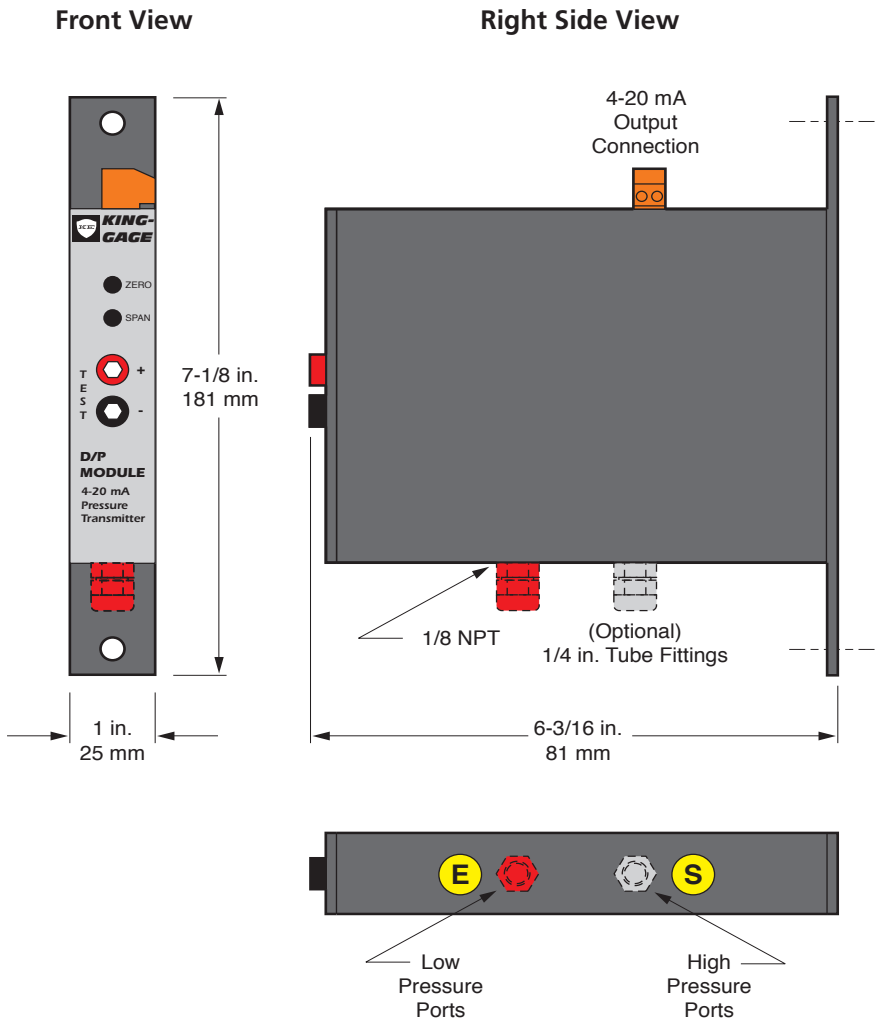
The KING-GAGE D/P Module requires a source of DC power for operation. The minimum excitation voltage necessary for the D/P Module is 14 Vdc. Any receiving components (meters, data recorders, programmable controllers, etc.) installed in the process loop circuit must be taken into account when determining the required power supply voltage. The internal resistance of each device added together represents the total "load" residing on the circuit loop.

The equation and chart represent the relationship between power supply voltage and load capacity (expressed in ohms) of the output signal from the D/P Module.



$$\frac{(\text{Power Supply Voltage} - 12)}{.02} = \text{Max. Load Capacity (Ohms)}$$

Dimensions: D/P Module



Specifications

Output
4–20 milliamperes (mAdc)

Accuracy
±0.2% F.S. (±0.10% F.S., typical) includes non-linearity, hysteresis, and non-repeatability

Repeatability
±0.02% of calibrated span

Temperature Range
0° to 180°F/-18° to 82°C (operating range)

Compensated Temperature Range
32° to 120°F/0° to 54°C

Thermal Effects
(over compensated temperature range)

less than .007% °F (.011% °C) span shift—sensitivity

less than .007% °F (.011% °C) span shift—zero

Power Supply Voltage
14–40 Vdc (unregulated)

Power Supply Stability
(effect on FSO) less than .005% of span change in output per volt change at input terminals

Burst Pressure
200 psi

Span Adjustments

Transmitter turndown ratio is 3:1 for the 0–15, 0–30, 0–50 psid nominal ranges.

Nominal	*Minimum*	*Range of Adjustment*
0–5 psid	0–3 psid	0–83 in. thru 0–138 in. water/0–2.1 m thru 0–3.5 m water
0–10 psid	0–3 psid	0–83 in. thru 0–277 in. water/0–2.1 m thru 0–7.0 m water
0–15 psid	0–3 psid	0–83 in. thru 0–415 in. water/0–2.1 m thru 0–10.5 m water
0–30 psid	0–10 psid	0–277 in. thru 0–830 in. water/0–7.0 m thru 0–21.0 m water
0–50 psid	0–15 psid	0–415 in. thru 0–1384 in. water/0–10.5 m thru 0–35.1 m water

IMPORTANT! Accuracy, linearity, and non-repeatability values are based on nominal range.

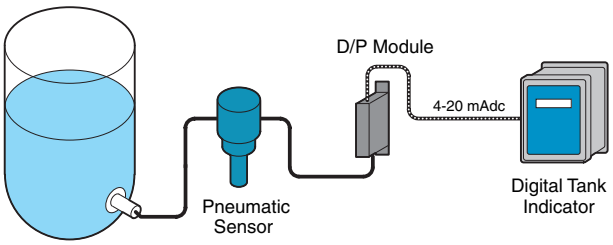
Operating Limit (Maximum Pressure)

Pressure above 300% nominal range (overrange) will result in damage to the transmitter (200% may cause a shift in calibration). Burst pressure is 200 psi and will cause catastrophic and physical failure of the pressure element.

Tank Gauging Applications

Acting on the force balance principle, a pneumatic sensor generates air pressure equivalent to the hydrostatic force created by liquid depth. This pneumatic pressure is directed into the D/P Module. Pressure is converted to an electronic 4–20 mAdc output proportional to liquid depth. Twisted pair cabling is used to form the signal loop through which the remote indicator receives the transmitter output.

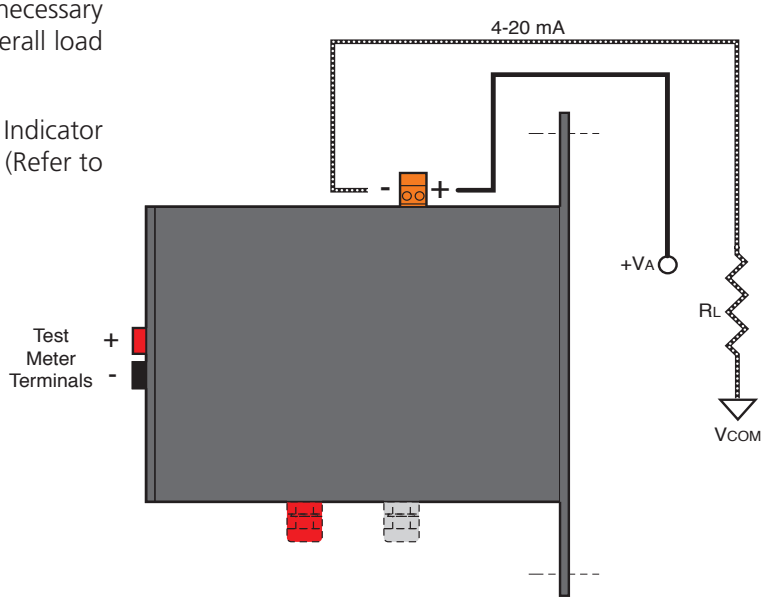
The KING-GAGE Digital Indicator shown in the system view correlates the milliamp signal to actual volume or weight in the tank. This is determined using a pressure vs. capacity listing corresponding to the actual tank dimensions.



Transmitter Signal Loop

As is typical of two-wire transmitters, electrical power to the signal loop is supplied through twisted pair cabling. +V is provided by either the receiving device or from a separate DC power supply installed in the loop. The actual voltage necessary to operation of the system will depend upon the overall load resistance of the loop.

In most gauging applications, a KING-GAGE Digital Indicator provides 24 Vdc excitation to power the transmitter. (Refer to system illustration above).



Model No. Designations

5900 - 1 - 2

Fittings
1 = none (1/8" NPT connection)
4 = Swagelok 1/4" tube × 1/8" NPT (compatible with copper or poly tubing)

Range
0 = 0–5 psid/0–0.3 bar
1 = 0–10 psid/0–0.69 bar
2 = 0–15 psid/0–1.03 bar
3 = 0–30 psid/0–2.06 bar
4 = 0–50 psid/0–3.44 bar

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