

KING-GAGE®

Differential Pressure Transmitter

Tank Liquid Level

Inventory Monitoring

Process Integration

D/P Module™

- Use to Integrate Pneumatic Systems with PLCs
- Better Than $\pm 0.02\%$ 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.

10 – 42 Vdc Operation

D/P Module is designed to operate over a broad voltage range. This transmitter can be used with power supplies ranging from 10-42 Vdc (depending upon load requirements of loop). Load capacity can be up to 1,500 Ohms @ 40 Vdc. Output current limiting and continuous no-load operating capacity ensures reliability in even the most demanding applications.

Adjustable Ranges

All transmitter ranges are adjustable to $\pm 40\%$ of nominal span. This permits ranging of the device to ensure full scale output for process control operations. Pressure ranges of 0-5 through 0-50 psid are available. Overall repeatability is within $\pm 0.02\%$ of calibrated span providing superior performance compared to other compact two-wire transmitters.



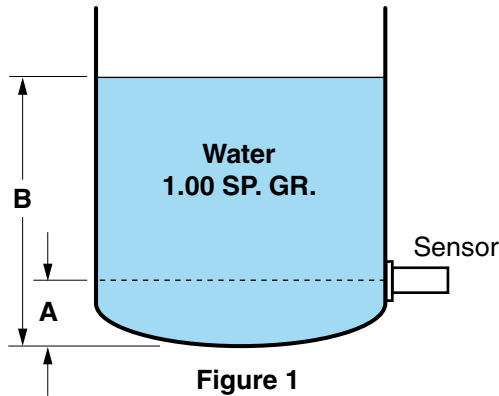
**Model 5900 D/P Module
4-20 mA Transmitter**

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.



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

C = 1.00 (Specific Gravity)

B = 382" (Full Tank)

A = 30" (Reserve)

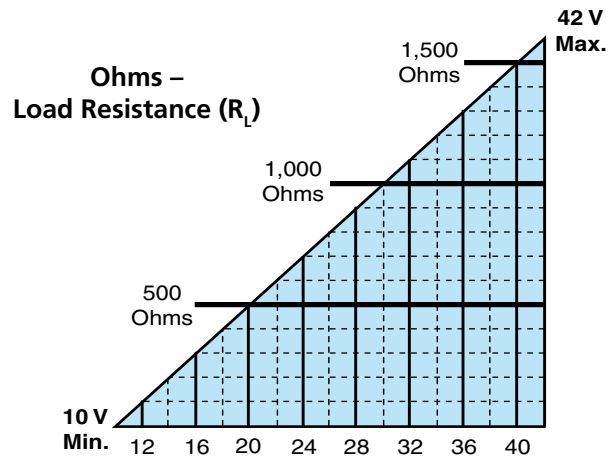
$$\frac{(382 - 30) \times 1.00}{27.6807} = 12.72 \text{ psid}$$

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

Voltage/Load Capacity Ratings

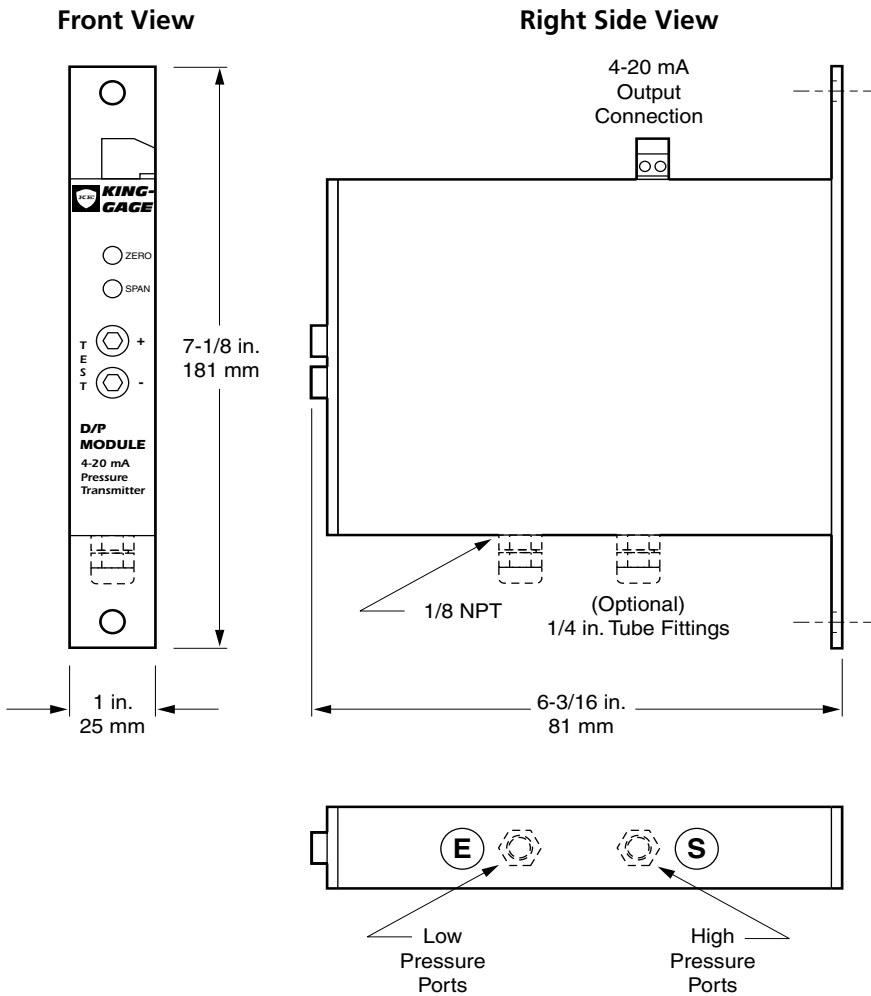
The KING-GAGE D/P Module requires a source of DC power for operation. The minimum excitation voltage necessary for the D/P Module is 10 Vdc. Any receiving components (meters, data recorders, programmable controllers, etc.) installed in the process loop circuit must be taken into account when determining 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.



$$\text{Max. Load Capacity} = \frac{(\text{Power Supply Voltage} - 10 \text{ Volts})}{.02} \text{ (Ohms)}$$

Dimensions: D/P Module



Specifications

Output

4-20 mA (mAdc)

Accuracy

± 0.20% FS (± 0.10% FS, typical)
 – Includes non-linearity, hysteresis and non-repeatability

Repeatability

± 0.02% of calibrated span

Operating Limit (Max. Pressure)

300% nominal pressure overrange

Compensated Temperature Range

32° F to 120° F/0° to 54° C

Thermal Effects

Over compensated Temperature Range:

- **Sensitivity** - span shift
 - Less than .007% per deg. F (.011% per deg. C)
- **Zero** - span shift
 - Less than .007% per deg. F (.011% per deg. C)

Temperature Range (Environmental)

- -40° F to 180° F/-40° C to 82° C – Operating
- -60° F to 185° F/-51° C to 85° C – Storage

Power Supply Voltage

10-42 Vdc (unregulated)

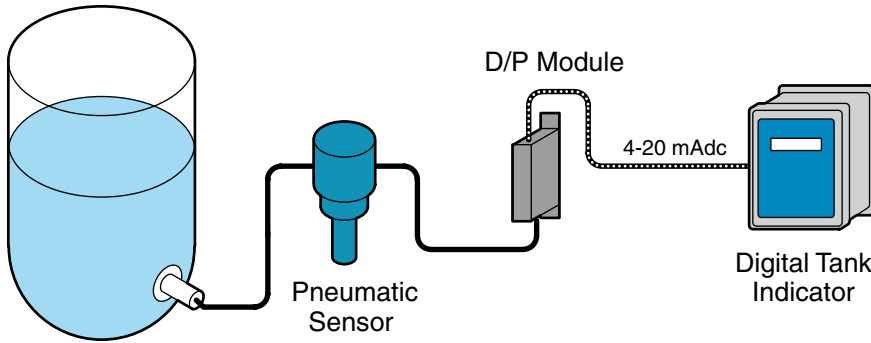
Power Supply Stability

(Effect on FSO) less than 0.005% of span change in output per volt change at input terminals

Span Adjustment Range

Approximately ± 40% of nominal ranges as listed below:

Nominal Range	Lower Span Limits 4-20 mA Output	Upper Span Limits 4-20 mA Output
0-5 psid (0-138" water)	0-3.00 psid (0-83" water)	0-6.50 psid (0-180" water)
0-10 psid (0-277" water)	0-6.51 psid (0-180" water)	0-12.00 psid (0-332" water)
0-15 psid (0-415" water)	0-12.01 psid (0-332" water)	0-19.50 psid (0-581" water)
0-30 psid (0-830" water)	0-19.51 psid (0-581" water)	0-36.00 psid (0-997" water)
0-50 psid 0-1,384" water)	0-36.01 psid (0-997" water)	0-70.00 psid (0-1,937" water)



Tank Gauging Applications

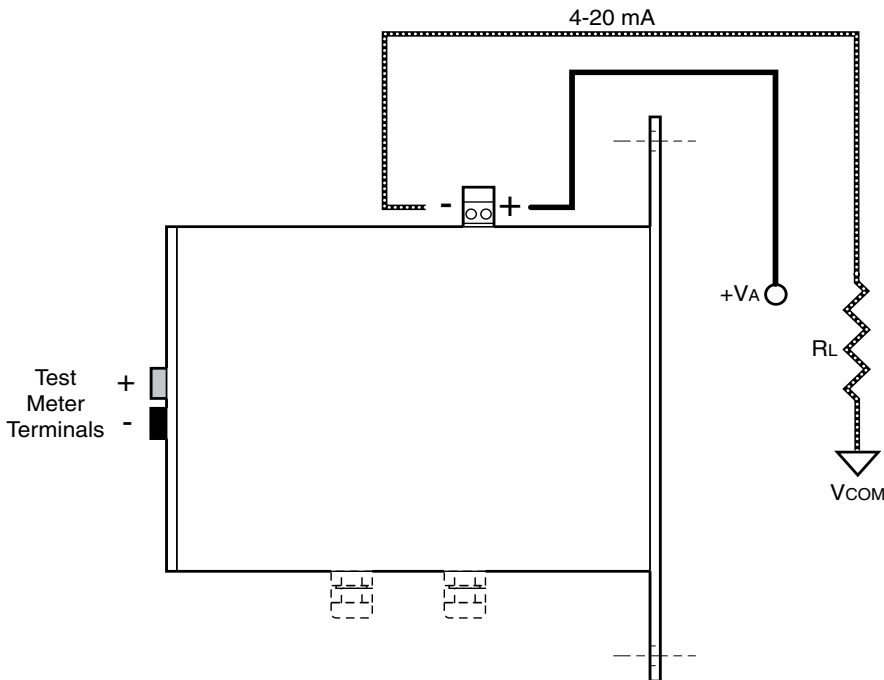
Acting on the force balance principle, a pneumatic sensor generates air pressure equivalent to the hydrostatic force created by liquid depth. This pneumatic pressure is directed into the D/P Module. Pressure is converted to an electronic 4-20 mAdc output proportional to liquid depth. Twisted pair cabling 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).



3201 South State, Ann Arbor, Michigan 48108 U.S.A.
PO Box 1228, Ann Arbor, Michigan 48106-1228
Phone: 734-662-5691 ■ FAX: 734-662-6652
www.king-gage.com

© KING-GAGE and the KE emblem are registered trademarks of King Engineering Corp.

© 2008 King Engineering Corporation.
All rights reserved.