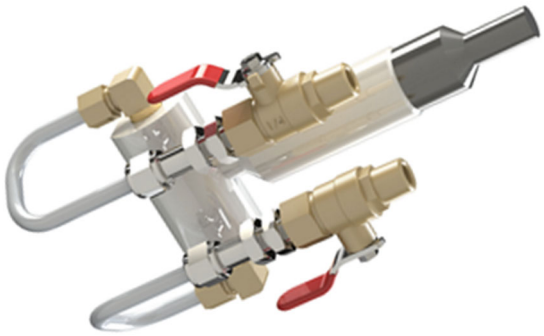
# *ELECTRONIC TRANSDUCER*



## *SPECIFICATIONS*

| | |
|---|---|
| **Accuracy RSS[1]:** | ±0.5% FS (at constant temp) |
| **Non-Linearity, BFSL:** | ±0.20% FS |
| **Hysteresis:** | 0.5% FS |
| **Non-Repeatability:** | ±0.05% FS |
| **Thermal Effects °F (°C):** | Compensated 14 to 140 (-10 to 60) |
| **Zero Shift %FS/°F (%/°C):** | < ±0.02 (< ±0.04) |
| **Span Shift %FS/°F (%/°C):** | < ±0.02 (< ±0.04) |
| **Line Pressure Effect:** | Zero shift approx. ±0.004% FS/psig line pressure |
| **Resolution:** | Infinite, limited only by output noise level (0.02% FS) |
| **Static Acceleration Effect:** | 2% FS/g (most sensitive axis) |
| **Natural Frequency:** | > 500 Hz (gaseous media) |
| **Response Time:** | 30 to 50 milliseconds |
| **Maximum Working Pressure:** | 250 psig |

| | | | |
|---|---|---|---|
| **Circuit** | 2-wire | **Operating Temperature °F(C)** | -4 to 185 (-20 to 85) |
| **Output at Zero Pressure** | 4mA (1V with filter) | **Storage Temperature °F(°C)** | -22 to 185 (-30 to 85) |
| **Output at Full Range Pressure[2]** | 20mA (5V with filter) 0-16 Bar (0-01.8"WC) | **Vibration** | 5g from 5Hz to 500Hz |
| | | **Acceleration** | 10g maximum |
| **Full Scale Output** | 16mA (4V with filter) | **Shock** | 50g Operating |
| **External Load** | 0 to 1000 Ω | **Case** | Stainless Steel / Aluminum |
| **Minimum Supply Voltage (Vdc)** | 12+0.02 x (Resistance of receiver plus line) | **Pressure Fittings[3]** | 1/4" – 18 NPT internal |
| | | **Electrical Connection** | Flying Leads |
| **Maximum Supply Voltage (Vdc)** | 30+0.004 x (Resistance of receiver plus line) | | |

## *DESCRIPTION*

Griswold Controls' high output, low differential pressure transducer (DPT) is designed for wet-to-wet differential pressure measurements of liquids or gases. It contains a fast-response capacitance sensor, and signal conditioning electronic circuitry necessary for providing a highly accurate, linear analog output proportional to pressure. The electronic circuit linearizes output vs. pressure, standardizes the output (zero and gain) and compensates for thermal effects on the sensor.

Transducer is suitable for gases or liquids compatible with 17-4 PH stainless steel, 300 series stainless steel, Buna N o-rings. All parts exposed to pressure media are stainless steel and elastomer seals.

## *APPLICATIONS*

- General Process Control
- Used to monitor flow on chilled and hot water HVAC systems.
- Provides flow feedback to Building Automation Controllers that monitor and regulate Energy Management Systems.
- Provides flow feedback for modulated pump systems.
- Monitors flow and provides alarm capability for evaporator and condenser water loops on central chiller plants.

## *FEATURES*

- Analog (4–20mA/1–5Vdc or 2-10 Vdc) signal output capability with 2-1/2" – 20" QuickSet and Metering Stations.
- NEMA 4/IP65 rated package withstands environmental effects.
- Bolt-on mounting kit for upgrading standard QuickSet and Metering Stations.
- Isolation Ball Valves are provided for start-up pressure isolation and transducer serviceability.

## *NOTES*

[1] RSS consists of Non-Linearity, Non-Repeatability and Hysteresis

[2] Calibrated at factory at 24Vdc.

[3] With 1/4" NPT External fittings installed, does not include cavity volume of 1/4" NPT External fittings



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## MODEL NUMBER SELECTION

T D 1 ___

Insert S=Standard (2-1/2”-20”),
P=Phone Compatible (2-1/2”-20”)
M=Phone Compatible (1/2”-2”)

## OPERATION

The Electronic Transducer is designed to measure flow using a Differential Pressure Transducer (DPT) that senses a pressure drop across a Griswold Controls venturi valve (Quickset or Metering Station). The DPT is very sensitive and will tend to pick up minor pressure oscillations that exist in typical hydronic systems. These oscillations in pressure are generally produced by the pump impeller. The DPT is a true 2-wire 4-20mA transducer converts the signal to 1-5Vdc or 2-10 Vdc depending on which resistor is used.

The DPT unit is threaded into the 1/4" NPT ports on the venturi valve. The high port on DPT (marked HIGH) connects to the high port on the venturi valve which is on the inlet of the valve. Valves are marked with an arrow to determine flow direction.

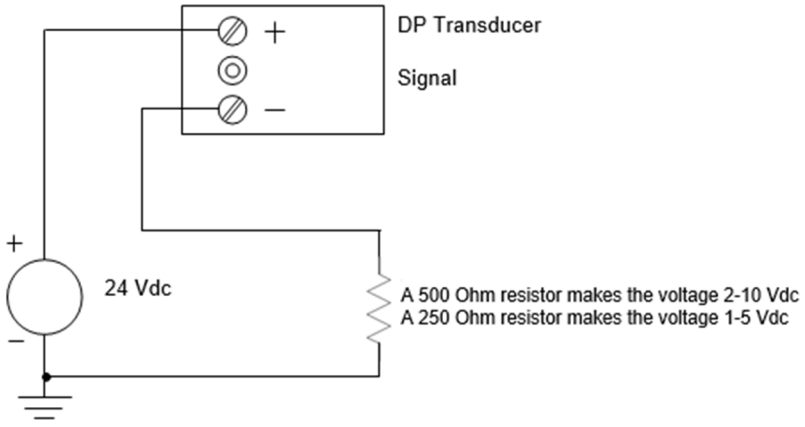
Air must be bled from the DPT. Three screws on the side of the DPT must be loosened approximately 1-1/2 to 2 turns and allowed to leak until all air is removed. This should take no longer than 1 minute.

Two quarter-turn isolation ball valves are provided on the high and low pressure ports to allow for pressure isolation during startup and serviceability during normal operation.

If the Phone option is used download the Griswold Controls app from the app store.

## WIRING DIAGRAM

WARNING! Improper connection of 24V supply can permanently damage the Transducer.





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## FLOW CHARACTERISTICS

| Valve Size | Flow Constants (Fc) – Straight Pipe | Flow Constants (Fc) – Piped at Elbow | Flow Constants (Fc) – Piped at Control Valve |
|---|---|---|---|
| 2-1/2 | 8.70 | 8.70 | 8.70 |
| 3 | 14.70 | 14.70 | 15.60 |
| 4 | 26.00 | 26.00 | 27.30 |
| 5 | 37.00 | 36.00 | 41.00 |
| 6 | 62.00 | 64.00 | 66.00 |
| 8 | 118.00 | 120.00 | 115.00 |
| 10 | 161.00 | 171.00 | 164.00 |
| 12 | 278.00 | 261.00 | 259.00 |
| 14 | 343.00 | 348.00 | 349.00 |
| 16 | 553.00 | 548.00 | 516.00 |
| 18 | 741.00 | 763.00 | 770.00 |

## PRESSURE DIFFERENTIAL – FLOW RELATIONSHIP

$$Q = Cv\sqrt{\frac{\Delta P}{SG}}$$ (equation 1.0) Where ΔP is in PSID and SG is the Specific Gravity

$$Q = Fc\sqrt{\frac{\Delta P}{SG}}$$ (equation 2.0) Where ΔP has been converted into inches of water column

## CURRENT - PRESSURE DIFFERENTIAL RELATIONSHIP

$\Delta P = Ai + B$

Where:

- $i$ is the signal current in milliamps (mA)
- ΔP is the differential pressure in inches of water column

A = 25.115 and B = -100.45

Therefore:
$\Delta P = 25.115i - 100.45$ (equation 3.0)

## CURRENT - FLOW RATE RELATIONSHIP

Substituting equation 3.0 into equation 2.0 and simplifying results in the following equation:

$$Q = Fc\sqrt{\frac{|25.115i - 100.45|}{SG}}$$ (equation 4.0) Where $4 \le i \le 20$

Equation 4.0 demonstrates the relationship between signal current (mA) and flow rate (GPM) where $i$ ranges from 4 to 20 mA. In the real world, current can drop below 4 mA Therefore the absolute value of $|25.115i - 100.45|$ is taken to avoid computation of the square root of a negative number. Computer control systems that use equation 4.0 should assume that flow equals zero if $i$ is less than or equal to 4 mA.



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## VOLTAGE - PRESSURE DIFFERENTIAL RELATIONSHIP

$\Delta P = AV + B$

Where:

- $V$ is the signal current in Volts
- $\Delta P$ is the differential pressure in inches of water column

A = 100.27 and B = -100.27

Therefore:
$\Delta P = 100.27V - 100.27$ (equation 5.0) Where $\Delta P$ (Inches W.C.

Substituting eq. 5.0 into eq. 2.0 and simplifying results in the following equation:

$$Q = \mathrm{Fc}\sqrt{\frac{|100.27(V-1)|}{\mathrm{SG}}}$$ (equation. 6.0) Where $1 \leq V \leq 5$

Equation 6.0 demonstrates the relationship between signal Volts (V) and flow rate (GPM) where $V$ ranges from 1 to 5 Volts. In the real world, voltage can drop below 1 V, hence the absolute value of $|100.27V\text{-}1|$ is taken to avoid computation of the square root of a negative number. Furthermore, any computer program that uses equation 6.0 should assume that flow equals zero if $V$ is less than or equal to1 V.



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