

## McMillan Flow Meters - *Cost-effective, reliable, accurate measurement of gas and liquid flow.*

Thermal mass meters feature fast response, virtually zero maintenance, and precise measurement - all very important qualities among today's variety of applications.

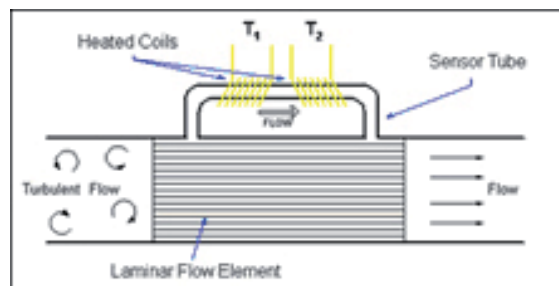
McMillan Gas Thermal Mass products utilize this thermal sensing technology. Flow enters the unit, and a portion of the flow is redirected into a small tube. This tube has two coils, one downstream from the other. Each coil is heated, and, as the gas passes through the tube, the smart electronics sense the amount of heat transferred from one coil to the other.

McMillan Company's patented\* system insures that the zero remains stable and the sensor is extremely repeatable. The diagrams shown illustrate both the principle of operation and a cutaway of a FLO-CONTROLLER (FLO-SENSORS AND METERS are very similar, but without integrated valve).

The output of the thermal mass flow sensor is directly related to the specific heat characteristic of the

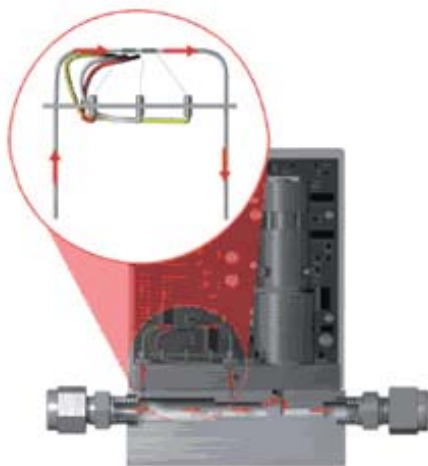
gas being measured. Therefore, if a unit is calibrated for air, it is a relatively simple calculation to figure the calibration for nitrogen or some other similar gas. This advantage offers flexibility not found on many other types of flow sensors.

### Sensing Element Diagram:



### «« Flo-Controller Cutaway

If the product is a FLO-CONTROLLER, flow will then pass into the proportional solenoid valve. This valve is controlled by the active servo electronics, which compare a set point (either internal or provided by the customer) to the actual flow rate provided by the flow sensor and adjust the valve accordingly.



$$Q1 / Q2 = K1 / K2$$

*Q1 is flow rate of new gas*  
*Q2 is flow rate of calibration gas*  
*K1 is K factor of new gas*  
*K2 is K factor of calibration gas*  
 $Q1 = (K1 / K2) Q2$

\*US Patents 6,038,921 & 6,240,776. Other patents pending.



## Gas Micro Turbine Products

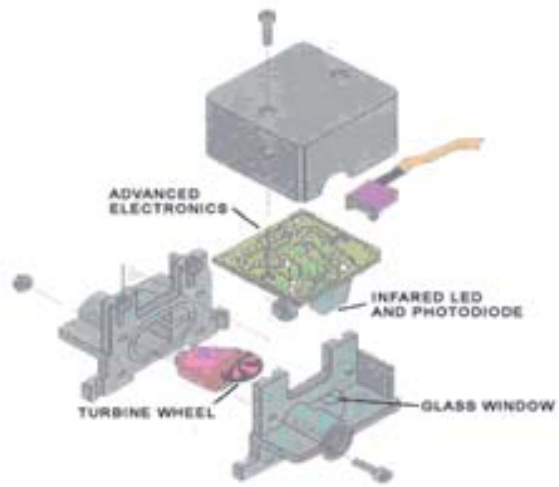
McMillan's patented\* micro turbine wheel technology utilizes the Pelton turbine wheel concept. This design allows for use of a miniature turbine wheel similar in size to a U.S. dime (16 mm diameter, 0.75 mm thick). The wheel is supported on a very small sapphire shaft, held in position by two sapphire bearings. Due to the light weight of both the wheel and the shaft, the micro turbine wheel spins virtually friction-free and responds to even minor changes in gas flow rate.

The micro turbine wheel has alternating white and black sections evenly spaced on one surface of the wheel. As the wheel rotates, an infrared beam is reflected off each white section and is directed to a

phototransistor, which detects each reflected beam and converts them into pulses. As the wheel spins faster, pulse rate increases. When the wheel stops (under zero flow conditions), no pulses are generated. Consequently, zero drift is not possible and zero adjustments are never required. Processing circuitry provides analog outputs that are linearly proportional to the flow rate.

### ***Micro Turbine Cutaway »»»***

*As flow passes through the micro turbine sensor, it is directed onto the very small teeth of the wheel using a precision-machined nozzle. This nozzle is sized according to the flow range of the unit. The rotational speed of the turbine wheel increases proportionally to the volumetric flow rate.*



\* US Patents 4,467,660; DE 19680105 T1; GB 2302175B; GB 2332064B; Japan 1770103.  
Other patents pending.

**To view the full line of McMillan products, visit [www.etaassociates.com/mcmillan.html](http://www.etaassociates.com/mcmillan.html)  
Use McMillan's on-line configuration tool to enter information about your application and receive recommendations for the appropriate McMillan product.**

## **H2scan - Accurate, interference-free measurement of Hydrogen**

H2scan recently introduced a series of new hydrogen specific leak detection and measuring equipment with proprietary "Chip on a flex" technology. This patented approach enabled H2scan to design a unique process system with a standard ½-inch head, with improved temperature management. The new

products are not affected by moisture and the process monitor has a protective coating over the sensor dye that allows for operation in high concentrations of CO and Sulfur.

**ETA Associates**

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## Key Features

### Sensor capable of operation in non-oxygen environment

#### Protection from humidity and condensation

- Operation in saturated water vapor
- Withstand up to 95% RH environments
- Repeatable performance in humid air and humid N<sub>2</sub> backgrounds

### Sensor capable of detecting Hydrogen in harsh background gases (carbon monoxide, sulfur, chlorine, ammonia, no cross-sensitive to methane and other combustible gases):

- Petrochemical production
- Hydrogen production
- Chlorine manufacturing
- Flare gas monitoring

### Sensor capable of operation up to 100°C process gas streams:

- Less expensive intergration
- Access to more process streams and environments
- 2x higher temperature than closest competition for process applications

### Typical process control applications

- In-line monitor of H<sub>2</sub> feed concentrations
- In-line monitor of process gas H<sub>2</sub> concentrations
- In-line monitor of feed to stack gas, H<sub>2</sub> concentrations
- In-line monitor of recycle gas H<sub>2</sub> concentrations
- In-line monitor of stack gas (vent) H<sub>2</sub> concentrations
- Real-time back-up H<sub>2</sub> monitor to GC/GC - MS/MS
- Off-line monitor of H<sub>2</sub> in grab samples

**Email us at [ETA@ETAassociates.com](mailto:ETA@ETAassociates.com) with information about your hydrogen measurement parameters and we'll work with you to find the appropriate instrument for your application.**

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