



- ✓ Advanced microturbine design for repeatable results - with no particle shedding & no zero drift
- ✓ Compatible with solvents, deionized water, acids, alkalis, etc.
- ✓ Extremely compact size

DESCRIPTION

The Model 106 Flo-Sensor will precisely measure flow rates of virtually any low-viscosity fluid, as low as 15 mL/minute or as high as 10 L/minute (2.6 GPM). Repeatable results are achieved by utilizing a patented* Pelton-type microturbine wheel, designed for use with corrosive applications. This proven design does not generate any particles to contaminate your processes, but continues to provide precise results even after many years of service.

Standard installed tube compression fittings provide easy connection; flare fittings are optional. Electrical connections are made via the included 6 foot cable. Several power and signal configurations are available for a wide range of applications.

The superior design of the microturbine technology used in the Model 106 is shown in its compact size. For most of the flow rates, the footprint of the unit is nearly $\frac{1}{4}$ th the size of a comparable differential pressure flow sensor.

By limiting the wetted surfaces of the 106 to PTFE, Kal-Rez[®], and sapphire, it can be used to measure almost any low-viscosity fluid, including hydrofluoric and other acids, sodium hydroxide, solvents, deionized water, and other additives and reagents.

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COMMON APPLICATIONS

1. Flow rate monitoring to improve consumables management
2. Chemical delivery monitoring for Process control
3. High & low flow rate alarm systems
4. Injection & dispensing systems

PRINCIPLE OF OPERATION

McMillan's microturbine wheel technology utilizes the Pelton turbine wheel concept. This type of design allows usage of a sub-miniature microturbine wheel about the size of a quarter in both diameter and thickness. The turbine wheel is then supported on a very small sapphire shaft held in position by two sapphire bearings. Because of the very light weight of both the wheel and the shaft, the microturbine wheel virtually floats in the liquid. This flotation effect causes the turbine wheel to be suspended in the middle of the bearings and thus eliminates shaft and bearing wear.

As flow passes through the flow sensor, it is directed onto the teeth of the wheel using a precision-machined orifice, which is sized according to flow range. The flow is projected onto the wheel, spinning the wheel faster as flow increases. This speed increase is directly proportional to the increase in flow rate.

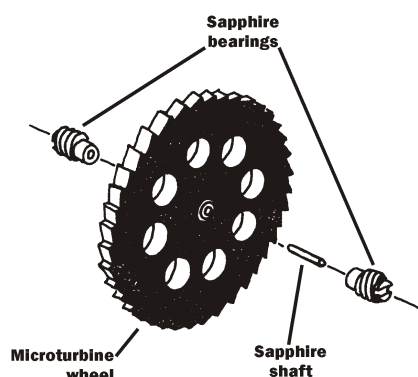


Figure 2. Assembly of microturbine wheel.

The microturbine wheel features 8 small holes, spaced evenly around the center of the wheel. As the wheel spins, an infrared beam is projected through a Teflon® window and onto the wheel. A sensor on the other side of the wheel detects each hole and translates those signals into pulses. Thus, as the wheel spins faster, more pulses are generated. When the wheel stops, no pulses are generated.

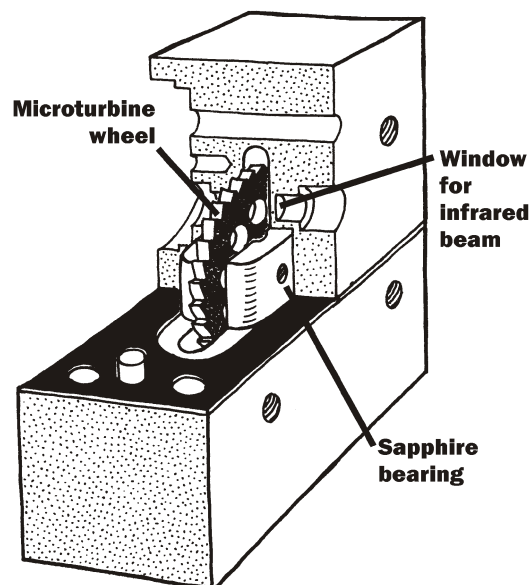


Figure 1. Cutaway of 106F sensor technology.

POWER AND SIGNAL CONFIGURATIONS

All 106 Flo-Sensors come standard with an integrated 6-foot long, 4 conductor, PVC-jacketed cable. This cable provides both power and signal connections. Seven configurations are available - see the ordering information chart on page 5 for your options. See specifications on page 3 for details on the various outputs. Select your output when ordering by adding the appropriate configuration suffix (i.e., 106-3B, or 106-3K).

Output must be selected when ordering; outputs are not field selectable. A calibration certificate is included with each unit showing actual indicated outputs vs. several flow rates.

By combining the A configuration suffix (pulse output, 12-15VDC) with the optional Model 251 Multi-Function Display, full scale accuracies of $\pm 0.5\%$ or better are possible. Since all Model 106 sensors feature $\pm 0.2\%$ Full Scale repeatability, the precision of a 106/251 system is ideal for your critical flow measurement applications. The Model 251 plugs into a standard wall outlet (order the 251 for USA applications and the 251E for Europe) and provides 12-15 VDC power for the 106.

Other displays and output options are available - contact McMillan for more information.

DETAILED SPECIFICATIONS

Accuracy/Linearity: For $\pm 0.5\%$ Full Scale accuracy/linearity, use the Model 106 (A suffix) with the optional Model 251 Multi-Function Display.

106 with pulse output (A, E suffix): $\pm 3\%$ Full Scale*, typical.

106 with analog output (B, C, D, J or K suffix): $\pm 1\%$ Full Scale*, typical.

Repeatability: $\pm 0.2\%$ Full Scale*

Power Requirements: 106 (A suffix): 12-15 VDC, 50 mA

106 (B, J suffix): 22-25VDC, 55 mA

106 (C suffix): 22-25VDC, 75 mA

106 (E suffix): 22-25VDC, 50 mA

106 (D, K suffix): 12-15VDC, 55 mA

Pressure Rating: Normal working pressure should not exceed 60 psig (4 bar)

Over pressure limit is 100 psig (6.8 bar)

Temperature Rating: Operating range: 5 to 55°C (5 to 85°C for models with "HT" suffix)

Storage range: 0 to 70°C

Temperature Sensitivity: $\pm 0.2\%$ Full Scale* or less per °C

Wetted Materials: PTFE, sapphire, Kal-Rez®

Non-wetted Materials: PTFE, Ryton®, Viton®, aluminum (PTFE coated on models with "TX" suffix), stainless steel, PVC-jacketed cable

Recommended Filtration: 25 microns or less

Compatible Fluids: Most low viscosity liquids - best performance with liquids < 10 centistokes

Outputs: 106 with pulse output (A, E suffix): Opto-isolated passive pulse -- bidirectional

BOSFET. Isolation is 2500 volts. Pulse rate is proportional to flow rate (zero pulses at zero flow). Lowest flow range (15-100 mL/minute) produces typically 0-200 Hz, while higher flow ranges typically produce 0-500 Hz. Pulse height selectable using external voltage source.

106 with 0-5VDC output (B, D suffix): Analog voltage output -- 0-5VDC. Voltage level is proportional to flow rate (zero VDC at zero flow). Load connected to output should not be less than 2500 ohms. Output not isolated from ground.

106 with 4-20 mA output (C suffix): Analog current output -- 4-20 mA. Current level is proportional to flow rate (4 mA at zero flow). Current loop should not exceed 500 ohms. Output is not isolated from ground.

106 with 0-10 VDC output (J, K suffix): Analog voltage output -- 0-10 VDC. Voltage level is proportional to flow rate (zero VDC at zero flow). Load connected to output should not be less than 5000 ohms. Output not isolated from ground.

Flow Connections: PFA tube fittings standard. For flow rates below 500 mLpm, 1/8" fittings are standard. For flow rates from 500 to 2000 mLpm, 1/4" fittings are standard. For flow rates above 2000 mLpm, 3/8" fittings are standard. Flare fittings are available at additional cost.

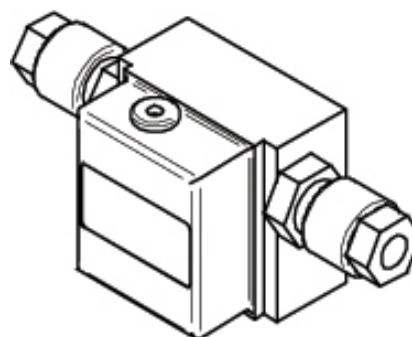
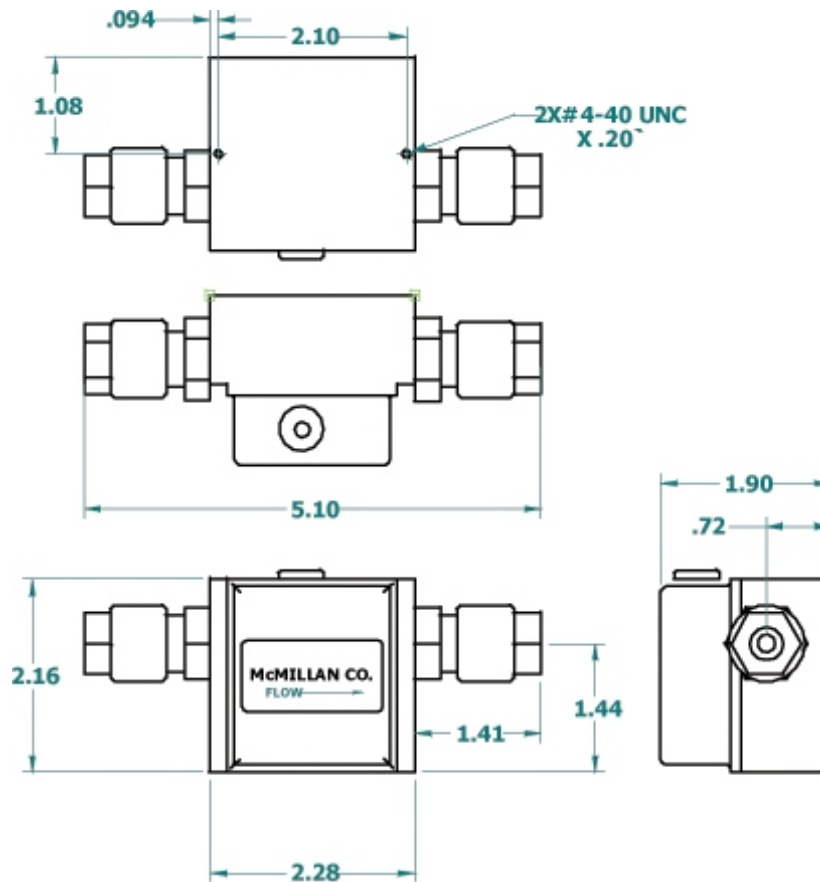
Electrical Connections: Integrated, shielded 6-ft, 4-conductor cable (PVC jacket), terminated with tinned pigtail leads. Other lengths & connection options available.

Reliability: Units installed as recommended by the manufacturer can be expected to remain in service at least 50,000 hours before maintenance. Longer MTBF may be experienced in many applications.

*Full Scale is from 10% to 100% of rated flow (20 to 100% of rated flow for range 3). Linearity is best fit straight line. All calibrations performed with deionized water.

DIMENSIONS

Unit shown with 3/8" fittings. Other fittings may have slightly different dimensions.



ORDERING INFORMATION

1. Select a range:

Model Number	Flow Range*	Max. Pressure Drop**	Standard Fittings
106-3	15-100 mL/minute	12 psi	1/8" tube
106-4	20-200 mL/minute	10 psi	1/4" tube
106-5	50-500 mL/minute	10 psi	1/4" tube
106-6	100-1000 mL/minute	6 psi	1/4" tube
106-7	200-2000 mL/minute	10 psi	1/4" tube
106-8	500-5000 mL/minute	10 psi	3/8" tube
106-9	1.0-10.0 L/minute	10 psi	3/8" tube
106-5G	1.0-10.0 GPH	12 psi	1/4" tube
106-8G	10-100 GPH	12 psi	3/8" tube

2. Select a signal and power configuration:

Configuration Suffix	Power Requirement	Output
A	12-15 VDC	Pulse (Passive MOSFET)
B	22-25 VDC	Non-isolated 0-5 VDC
C	15-25 VDC	Non-isolated 4-20 mA
D	12-15 VDC	Non-isolated 0-5VDC
E	22-25 VDC	Pulse (Passive MOSFET)
J	22-25 VDC	Non-isolated 0-10 VDC
K	12-15 VDC	Non-isolated 0-10 VDC

3. Create your part number:

Add the configuration suffix from step #2 to your model number from step #1.

Example #1: To order a flow sensor that measures from 400-5000 mL/minute, uses 24VDC power, and provides a pulse output, order a **106-8-E** (Model 106-8 + E suffix).

Example #2: To order a flow sensor that measures from 1-10 GPH, uses 12VDC power, and provides a 0-10 VDC output, order a **106-5G-K** (Model 106-5G + K suffix).

4. Order options & accessories:

1/4" Flare Fittings: Order suffix "F4" for PFA 1/4" flare fittings (use with ranges 1 L/minute and below).

3/8" Flare Fittings: Order suffix "F6" for PFA 3/8" flare fittings.

Custom Cable Lengths: Custom cable lengths (6 feet standard) & connector options are available. Call for details.

Model 251 Multi-Function Display: 8-digit "smart" display that allows 9-point linearization of flow sensor signal to achieve $\pm 0.5\%$ full scale or better linearity/accuracy. Alarm and setpoint relay options. *Use with suffix A.*

MSB-5 Output Device: Provides isolated 4-20 mA output. Requires 24VDC power. *Use with suffix A.*

High Temperature Operation: Order suffix "HT" for fluid temperatures up to 85°C.

PTFE Coating: Order suffix "TX" to receive all exterior metal parts coated in PTFE for greater chemical resistance.

FEP-Jacketed Cable: Order suffix "TC" to receive a unit with a FEP-jacketed cable instead of PVC.

*All units calibrated using deionized water. Ranges shown indicate recommended measurement range for deionized water applications.

** Maximum pressure drop occurs at maximum (100%) rated flow. At 50% of rated flow, the actual pressure drop will only be 25% of maximum pressure drop. At 25% of rated flow, the actual pressure drop will only be 6.25% of maximum pressure drop.

OTHER RELATED PRODUCTS

**Model 251
Multi-Function Display**

Check out our website
for more information!



- **Completely programmable flow rate and total flow display, perfect for use with the Model 106**
- **Program up to 9 calibration points to achieve precise linearization!**
- **Option cards add alarm & analog outputs, more**
- **Achieve $\pm 0.5\%$ full scale linearity/accuracy when combined with the Model 106(A suffix)**

**Model 401 PTFE
Liquid Flow Controller**

Call for details today!



Valve Unit

Control Unit

- **The world's first automatic microprocessor-controlled PTFE liquid flow controller**
- **A flow sensor and automatic needle valve combined**
- **Improve processes by maintaining steady flow rates**