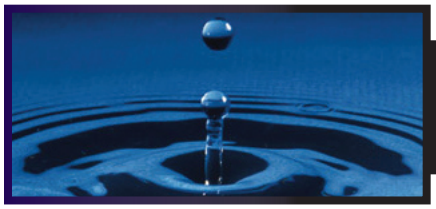


Liquid Flow Meter for Very Low Flow Rates

Model 109 Series Micro-Liquid Thermal Mass FLO-SENSORS

STANDARD LIQUID

APPLICATION IDEAS

Monitoring sample input or output rates for analysis equipment
Chemical injection or dosing verification
Leak testing

PRODUCT DESCRIPTION

The Model 109 Micro FLO-SENSOR will precisely measure flow rates of virtually any fluid, as low as 0.05 mL/minute or as high as 10 mL/minute. Repeatable results are achieved by utilizing a patented thermal mass flow sensor, designed for use with liquid applications. This proven design provides reliable results for extremely low flow rates.

Stainless steel tube fittings provide easy connection and connect to all stainless steel wetted parts. This allows the 109 to be used with most fluids, including acids, solvents, and other corrosive chemicals. A pressure rating of 500 psig maximum allows for installation in higher-pressure systems.

The superior design of the thermal mass sensors and electronic technology used in the Model 109 results in its compact size. The footprint of the unit measures only 4.75 x 2.05 inches (without fittings), allowing the unit to be integrated into many existing OEM systems.

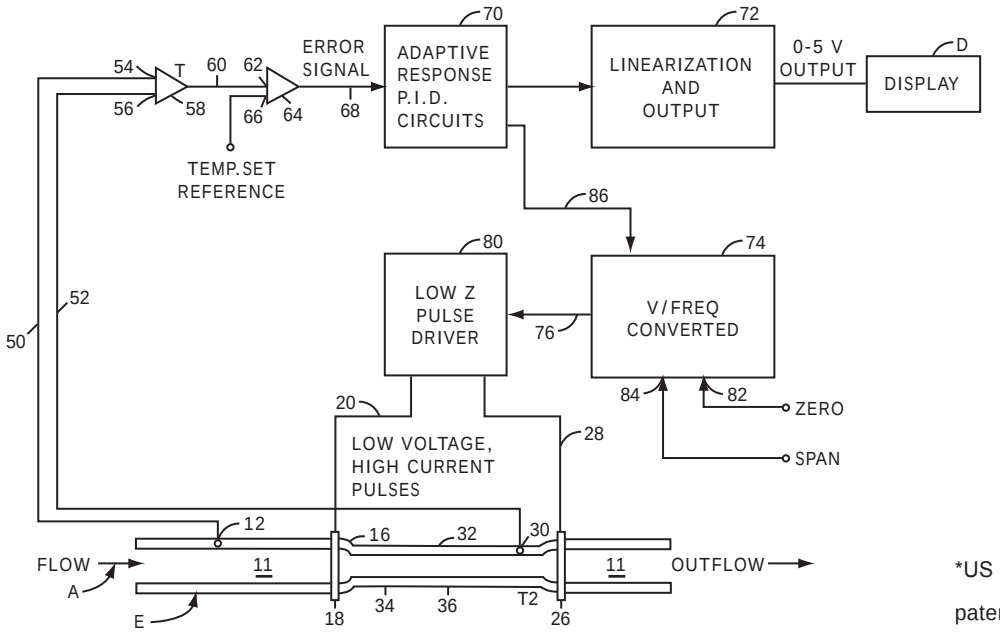
This advanced Micro FLO-SENSOR is capable of measuring changes in flow as small as ±0.005 mL/minute. It features very quick response times for real-time flow measurement.

PRINCIPLE OF OPERATION

Thermal mass meters feature fast response, virtually zero maintenance, and precise measurement - all very important qualities among today's variety of applications. In the world of liquid flow measurement, they allow precision monitoring of microliter per minute flow rates.

McMillan Liquid Thermal Mass products utilize this thermal sensing technology. Flow passes through a small tube. This tube has two coils, one downstream from the other. As fluid passes through the sensing tube, a small temperature rise is introduced through the sensing coils. Smart electronics detect the amount of current needed to maintain a constant temperature differential, and this is proportional to flow rate. McMillan's patented* system insures that the zero remains stable and the sensor is extremely repeatable over a wide range of ambient and liquid temperatures. The diagram below illustrates the sensing system design.

Flow rates as low as 0.05 mL/minute (50 µL/minute) and up to 10 mL/minute are possible. A linearized analog output signal is provided that corresponds to flow rate.



SENSING SYSTEM DIAGRAM

*US Patents 6,736,005 & 7,000,464. Other patents pending.

FEATURES AND OPTIONS

FLOW RANGES
Flow ranges from 0.05-0.50 mL/minute up to 1-10 mL/minute (deionized water) are available. Consult the factory for custom requirements.

POWER
Units require 12 VDC power.

SIGNAL OUTPUT
Either a 0-10 VDC or 0-5 VDC output may be selected. For custom applications, multiple simultaneous outputs may be configured.

ACCURACY/LINEARITY
All models have a standard accuracy specification of ±1.0% F.S. accuracy (including linearity).

FLUID CONNECTIONS
All units have tube fittings installed. A choice of sizes is available.

ELECTRICAL CONNECTIONS
A 7-pin integrated connector is supplied for all power and signal connections. Optional cable assemblies are recommended for simple connections. Cable assemblies come standard with the mating connector on one end and pigtail leads on the other.

WETTED MATERIALS
Wetted materials are detailed in the specifications.

CALIBRATION FLUIDS
Units may be calibrated for virtually any fluid. Several standard fluid correction factors may be available – contact the factory for details.

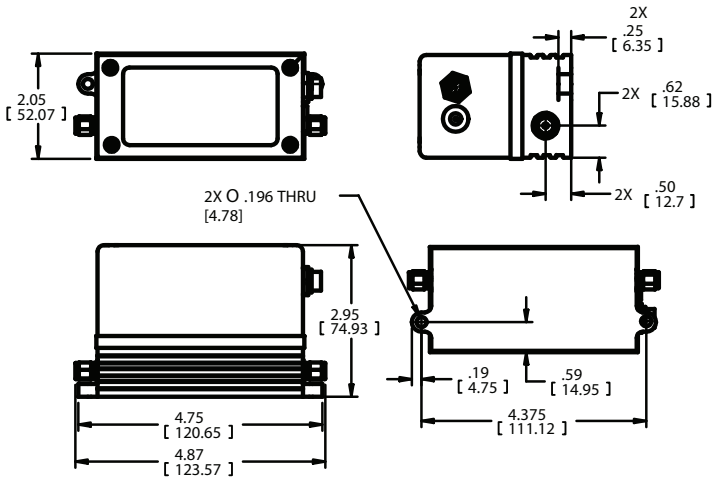
ORDERING INFORMATION

Form part number: 109 - (Flow Range) - (Signal) - (Fittings) - (Cable).	Code
109 Thermal Mass Liquid FLO-SENSOR	109
Flow Range (mL/minute of deionized water)	
0.05 – 0.50	005
0.10 – 1.00	010
0.50 – 5.0	050
1.0 – 10.0	100
Signal	
0-5 VDC Signal	D
0-10 VDC Signal	K
Fittings	
1/16” stainless steel compression tube	S1
1/8” stainless steel compression tube	S2
Mating Cable (connects to integrated connector)	
None (not recommended)	C0
PVC-jacketed, 6 feet long (1.85 m)	CP6
PVC-jacketed, 12 feet long (3.7 m)	CP12
Options	
High Pressure Operation (500 psig maximum)	HP

ACCESSORIES

Power Adapters	
115VAC Power Adapter for 109	109-PS-08
230VAC Power Adapter for 109	109-PS-18
Displays	
(Order Separately, More Information Available)	
210R Rate Display, 3½ digit, 5-30 VDC Power	210R
250 Multi-Function Display, 115 VAC Power	250
250E Multi-Function Display, 230 VAC Power	250E

DIMENSIONS



Dimensions shown for Model 109 unit with 1/16”” stainless steel (S1) and are similar for other fittings. All measurements shown in inches [mm].

McMillan LAB/OEM

SPECIFICATIONS

	Model 109
Accuracy (including linearity)	±1.0% Full Scale*
Repeatability	±1.0% Full Scale*
Pressure Rating	500 psig (34 bar), higher pressures may be available
Pressure Sensitivity	Standard Units: 100 psig (6.8 bar) “HP” Units: 500 psig (34 bar) Higher pressures may be available
Pressure Drop	No more than 0.075 psid (5 mbar)
Temperature Rating	Operating Range: 5 to 50ºC Storage Range: 0 to 70ºC
Temperature Sensitivity	±0.01% F.S.* or less per ºC
Wetted Materials	304 Stainless Steel 316 Stainless Steel Standard Units: PTFE “HP” Units: Graphite/Vespel®
Non-wetted Materials	Aluminum ABS plastic Nylon Polyester
Recommended Filtration	100 microns or less
Compatible Liquids	Any liquid compatible with wetted materials and suitable for measurement technology
0-5 VDC Output Signal	Load must be at least 2.5 Kohms
0-10 VDC Output Signal	Load must be at least 5 Kohms
Warm-Up Time	Less than 5 minutes
Power	12 VDC @ 5 watts (12-15 VDC)
Electrical Connections	Integrated 7-pin power/signal connector
Response Time	Typically 5 seconds or less after flow rate change
Settling Time	Typically 10-30 seconds for 90% of final value Up to 90 seconds for ±1.0% FS final value
Reliability	100,000 Hours MTBF (testing ongoing)
Ratings	IP67 (NEMA 4)

*Specifications from 10-100% of rated flow. Linearity is best fit straight line. All calibrations performed with deionized water unless otherwise stated on calibration certificate.

McMillan Company
P.O. Box 1340
Georgetown, Texas 78627

Toll-Free: 800.861.0231 (U.S.A. only)
Direct: 512.863.0231
Fax: 512.863.0671

Email: sales@mcmflow.com
Website: www.mcmflow.com

McMillan LAB/OEM

Vespel - Reg TM DuPont

Bulletin 109-S002

Specifications subject to change without notice.

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