McMillan C•O•M•P•A•N•Y

Mass Flow Meters For OEM Gas Applications

Model 209 Series High Flow Mass FLO-SENSORS®

STANDARD GAS

APPLICATION IDEAS

Compressor or pump output monitoring

Rotameter replacement or upgrade

Precision gas injection, dosing and blending

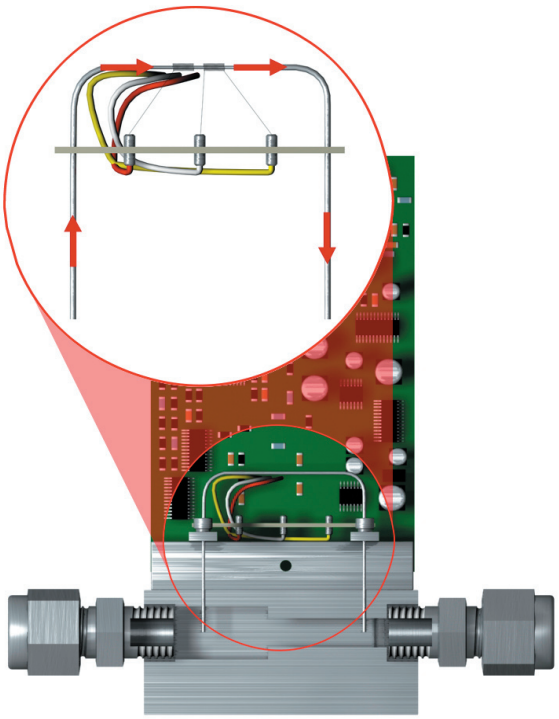
PRODUCT DESCRIPTION

McMillan Model 209 Series High Flow Mass FLO-SENSORS® are capable of measuring virtually any clean, dry gas as low as 4-20 Lpm or as high as 100-500 Lpm! Repeatable results are achieved using a patented thermal mass flow sensor design. This proven design minimizes zero drift while maintaining fast response and linear outputs.

Because of the compact size and economical cost of these products, the Model 209 Series FLO-SENSORS are suitable for a wide variety of industrial, commercial, laboratory and O.E.M. applications.

PRINCIPLE OF OPERATION

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



Model 50 Series Product cutaway shown above.
Model 209 flow path similar.

The McMillan Company Model 209 Series Mass FLO-SENSORS 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. The first coil introduces a small amount of heat into the gas stream. As the gas passes through the tube, the smart electronics sense the amount of heat transferred from one coil to the other. McMillan's patented* system insures that the zero remains stable and the sensor is extremely repeatable.

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.

McMillan LAB/OEM

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

FEATURES AND OPTIONS

FLOW RANGES
Flow ranges from 4-20 Lpm up to 100-500 Lpm are available. Consult the factory for custom requirements.

POWER
Units may be ordered to operate with either 12 VDC or 24 VDC power.

SIGNAL OUTPUT
Either a 4-20 mA, 0-10 VDC, or 0-5 VDC output may be selected. For custom applications, multiple simultaneous outputs may be configured.

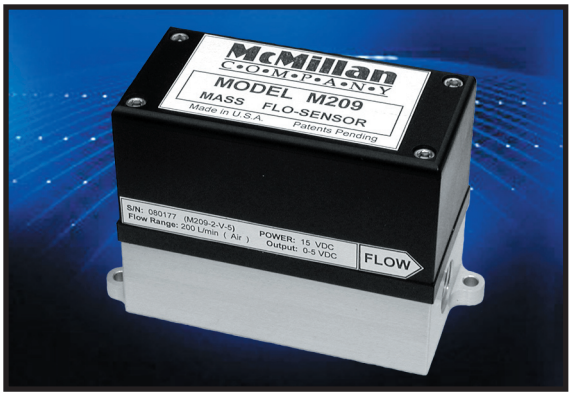
ACCURACY/LINEARITY
All models have a standard accuracy specification of ±1.5% F.S. accuracy (including linearity).

FLUID CONNECTIONS
All units have FNPT ports. Preinstalled tube fittings are optional.

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
All metal construction. Wetted materials are detailed in the specifications.

CALIBRATION GASES
Units may be calibrated for virtually any clean, dry gas. Several standard gas selections are available as indicated in Ordering Information. Consult factory for calibration for non-standard gases.



Model 209 FLO-SENSOR

SPECIFICATIONS

	Model 209
Accuracy (including linearity)	±1.5% Full Scale*
Repeatability	±0.50% Full Scale*
Pressure Rating	150 psig (10.3 bar)
Pressure Sensitivity	±0.02% F.S. or less per psi (per 69 mbar)
Pressure Drop	No more than 0.075 psid (5 mbar)
Temperature Rating	Operating Range: 0 to 50ºC Storage Range: 0 to 70ºC
Temperature Sensitivity	±0.15% F.S.* or less per ºC
Leak Integrity	1 x 10^{-4} sccs of He
Wetted Materials	Aluminum 304 Stainless Steel 316 Stainless Steel
O-Ring Material	Viton®
Fitting Material	Choose from acetal, brass, or stainless steel
Recommended Filtration	100 microns or less
Compatible gases	Clean, dry gases compatible with wetted materials
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
4-20 mA Output Signal	Load must not exceed 500 ohms
Warm-Up Time	Less than 5 minutes
Power	12 VDC models: 12 VDC @ 150 mA (12.5-15 VDC) 24 VDC models: 24 VDC @ 80 mA (22-25 VDC)
Electrical Connections	Integrated 7-pin power/signal connector
Settling Time	Typically <1 second for 97% of final value
Reliability	100,000 Hours MTBF (testing ongoing)
Certifications	CE Approved 89/336/EEC (EN 55011 & EN 50082-1) 73/23/EEC Low Voltage Directive
Ratings	IP67 (NEMA 4)

*Specifications from 20-100% of rated flow. Linearity is best fit straight line. All calibrations performed with air unless otherwise stated on calibration certificate.

ORDERING INFORMATION

Form part number: 209 - (Flow Range) - (Power/Signal) - (Fittings) - (Cable) - (Gas).	Code
209 Thermal Mass FLO-SENSOR®	209
Flow Range (Lpm of air)	
4-20	11
10-50	12
20-100	13
40-200	14
100-500	15
Power/Signal	
12.5-15.0 VDC Power, 0-5 VDC Signal	D
22.0-25.0 VDC Power, 0-5 VDC Signal	B
12.5-15.0 VDC Power, 0-10 VDC Signal	K
22.0-25.0 VDC Power, 0-10 VDC Signal	J
18.0-25.0 VDC Power, 4-20 mA Signal	C
Fittings (see Fitting Chart for available sizes based on flow range)	
⅜" FNPT	N6
¼" FNPT	N8
⅜" acetal compression tube	A6
½" acetal compression tube	A7
⅜" brass compression tube	B6
½" brass compression tube	B7
⅜" stainless steel compression tube	S6
½" stainless steel compression tube	S7
10 mm stainless steel compression tube	M10
12 mm stainless steel compression tube	M12
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
Gas	
Air	Standard
Nitrogen	G1
Oxygen	G2
Hydrogen	G3
Helium	G4
Argon	G5
CO2	G6
Other Single Gas (specify in item description)	G7
Other Gas Blend (specify gases and percentages)	G8

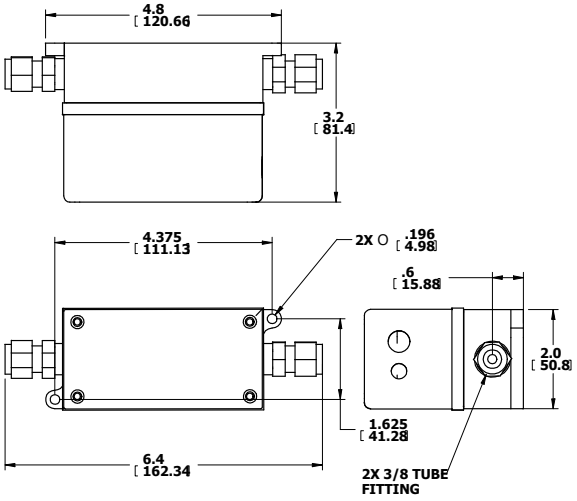
ACCESSORIES

Display	
(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

FITTING CHART

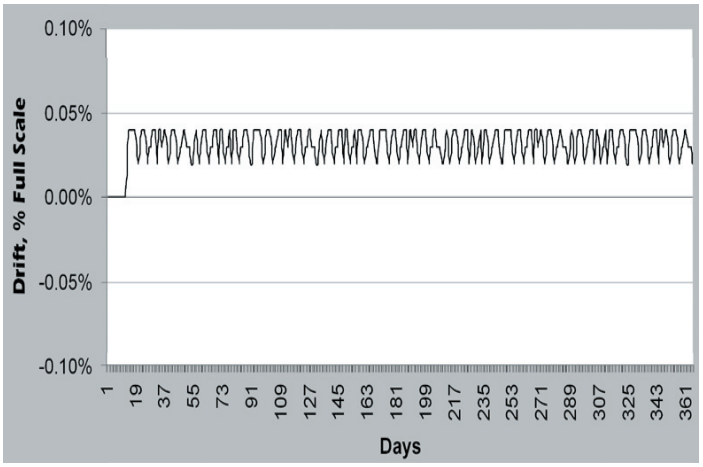
RANGE	N6	N8	A6	A7	B6	B7	S6	S7	M10	M12
11 (4-20 Lpm)	✓		✓	✓	✓	✓	✓	✓	✓	✓
12 (10-50 Lpm)	✓		✓	✓	✓	✓	✓	✓	✓	✓
13 (20-100 Lpm)	✓			✓		✓		✓		✓
14 (40-200 Lpm)	✓			✓		✓		✓		✓
15 (50-500 Lpm)		✓								

DIMENSIONS



Dimensions shown for Model 209 unit with ⅜" stainless steel (S6) and are similar for other models. Specific model dimensional drawings may be requested from the factory.

ZERO STABILITY



Tests run on a new, randomly chosen McMillan thermal mass FLO-SENSOR. Temperature controlled at 22ºC (±2ºC) during testing.

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McMillan LAB/OEM

Viton – Reg TM E.I. DuPont Dow Elastomers LLC

FLO-SENSOR – Reg TM McMillan Company

Bulletin 209-S002

Specifications subject to change without notice.

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