McMillan COMPANY

Mass Flow Controllers For Gas Applications

Model 80 Series Thermal Mass FLO-CONTROLLERS®

STANDARD GAS

APPLICATION IDEAS

Furnace flow control for temperature regulation

Online gas blending

Regulation of sample gas streams in analytical equipment

Precision gas injection and dosing

PRODUCT DESCRIPTION

McMillan Model 80 Series Mass FLO-CONTROLLERS® are capable of measuring and controlling virtually any clean, dry gas as low as 0-50 sccm or as high as 0-10 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 80 Series FLO-CONTROLLERS are suitable for a wide variety of industrial, commercial, laboratory and O.E.M. applications. Some sample applications include furnace flow control, online gas blending, regulation of sample gas streams, and precise gas injection systems.

PRINCIPLE OF OPERATION

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

The McMillan Company Model 80 Series Mass FLO-CONTROLLERS 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.

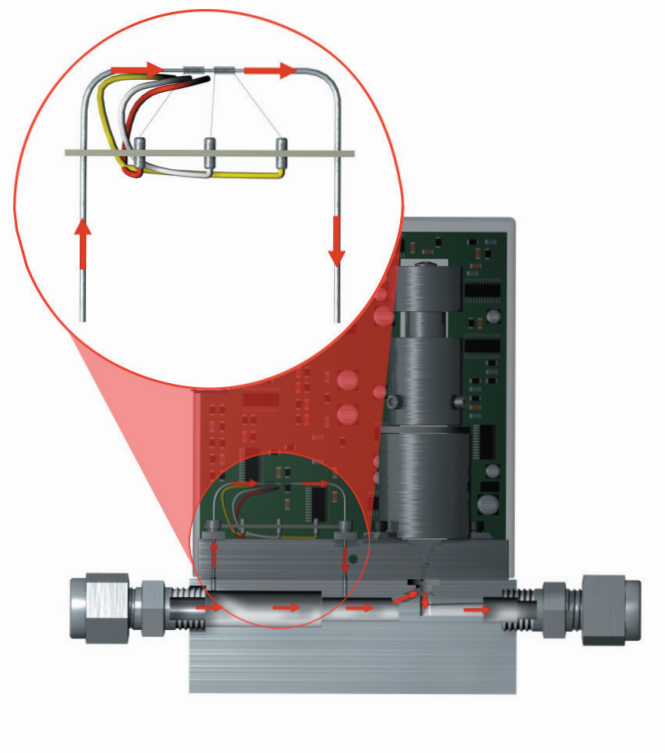


Figure 1. Cutaway of sensor technology.

Flow then passes into the proportional solenoid valve. This valve is controlled by the active servo electronics, which compare a setpoint (either internal or provided by the customer) to the actual flow rate provided by the flow sensor and adjust the valve accordingly.

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 0-50 sccm up to 0-10,000 sccm are available. Consult the factory for custom requirements.

POWER
Units may be ordered for either 12 VDC or 24 VDC power. Various power adapters are available for use with 12 VDC versions.

SIGNAL INPUTS & OUTPUTS
All command and output signals are 0-5 VDC. Models with integrated display (D suffix) feature user-selectable internal or external command signal options. Internal setpoint is set using integrated potentiometers while external is supplied with a remote 0-5 VDC source.

ACCURACY/LINEARITY
All models have a standard accuracy specification of ±1.5% F.S. accuracy (including linearity). NIST traceable calibration certificates are optional on all models.

FLUID CONNECTIONS
All units have compression-type tube fittings as standard. Non-standard fittings and sizes are available upon request.

ELECTRICAL CONNECTIONS
All units have a 36” (92 cm) output cable, terminated with either a 9-pin “D” connector, 15-pin “D” connector, or 6-pin PS/2 style connector. An optional mating cable assembly, terminated with pigtail leads, is recommended to facilitate wiring.

WETTED MATERIALS
All units feature metal construction. See specifications for detailed materials in gas path. Units with S suffix feature stainless steel construction; other models are constructed from aluminum.

DISPLAYS
For units with integrated displays, choose the D suffix. Units without integrated displays may be used with McMillan’s line of external remote displays. Please request additional information from factory on remote displays available.

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

MULTIPLE GASES
Units with displays (Model 80D and 80SD) can be configured at the factory to register flow of up to three different gases. The user selects which gas is flowing, using the front panel switches, and the FLO-CONTROLLER will automatically adjust the display and output signal accordingly. Some gas combinations may not be possible.

Model 80S MASS FLO-CONTROLLER

Model 80SD MASS FLO-CONTROLLER

SPECIFICATIONS

	Model 80	Model 80D	Model 80S	Model 80SD
Accuracy (including linearity)	Standard: ±1.5% F. S.*	Standard: ±1.5% F. S.* Second and third gases (suffix G9 & G10): ±3.0% F. S.*	Standard: ±1.5% F. S.*	Standard: ±1.5% F. S.* Second and third gases (suffix G9 & G10): ±3.0% F. S.*
Repeatability	±0.25% Full Scale*			
Pressure Rating	150 psig (10.3 bar)		500 psig (34.5 bar)	
Pressure Sensitivity	±0.02% F.S.* per psi (per 69 mbar)			
Typical Operating Differential Pressure	15-45 psid (1-3 bar)			
Temperature Rating	Operating Range: 5 to 55ºC Storage Range: 0 to 70ºC			
Temperature Sensitivity	±0.15% F.S.* or less per ºC			
Valve	Normally Closed Positive Shutoff Up to 60 psig (4 bar)			
Body Leak Integrity (not including fittings)	1 x 10^{-7} sccs of He			
Wetted Materials	Aluminum 304 Stainless Steel 316 Stainless Steel		303 Stainless Steel 304 Stainless Steel 316 Stainless Steel Epoxy	
O-Ring Material	Viton®			
Fitting Material	Choose from acetal, brass, or stainless steel			
Recommended Filtration	20 microns or less Optional inline filters available			
Compatible gases	Clean, dry gases compatible with wetted materials			
0-5 VDC Output Signal	Minimum 2.5 Kohm load			
External Command (Setpoint) Signal	Integrated 2 Mohm load			
Internal Command (Setpoint) Signal	Not Available	Front panel adjustable	Not Available	Front panel adjustable
Warm-Up Time	Less than 5 minutes			
Typical Power Consumption	Standard: 12 VDC @ 250 mA (12.5-15 VDC) “E” Suffix: 24 VDC @ 130 mA (22-25 VDC)			
Peak Power Consumption	Standard: 12 VDC @ 500 mA (12.5-15 VDC) “E” Suffix: 24 VDC @ 260 mA (22-25 VDC)			
Electrical Connections	Integrated 36” (92 cm) cable, terminated with: Standard: 6-pin Mini-DIN (PS/2 Style) D1 Option: 9-pin D-Sub male D2 Option: 15-pin D-Sub male			

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

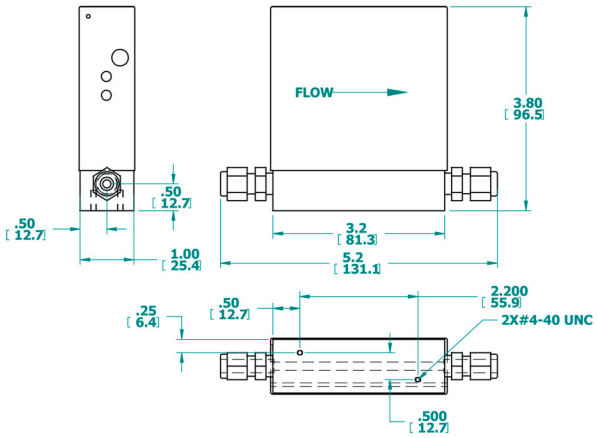
ORDERING INFORMATION

Form part number: (Model Code) - (Flow Range) - (Power) - (Fittings) - (Connector) - (Gas) - (Options). For standard options, no specification is necessary.	Code
80 Aluminum Mass FLO-CONTROLLER® 80D Aluminum Mass FLO-CONTROLLER® w/display 80S Stainless Steel Mass FLO-CONTROLLER® 80SD Stainless Steel Mass FLO-CONTROLLER® w/display	80 80D 80S 80SD
Flow Range (sccm of air)	
0-50	3
0-100	4
0-200	5
0-500	6
0-1,000	7
0-2,000	8
0-5,000	9
0-10,000	10
Power	
12.5-15.0 VDC	Standard
22.0-25.0 VDC	E
Fittings (see Fitting Chart, all fittings compression tube type unless indicated)	
⅛" acetal	A2
¼" acetal	A4
⅜" acetal	A6
⅛" brass	B2
¼" brass	B4
⅜" brass	B6
⅛" stainless steel	S2
¼" stainless steel	S4
⅜" stainless steel	S6
3 mm stainless steel	M3
6 mm stainless steel	M6
¼" VCR (utilizing 1/8" NPT threaded ports)	V4
¼" acetal barb (25 psig max)	AB
¼" stainless steel barb (25 psig max)	SB
Connector	
6-pin Mini-DIN (PS/2 type)	Standard
9-pin D-Sub	D1
15-pin D-Sub	D2
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 in item description)	G8
Calibrate for two gases (80D & 80SD only, specify 2 gases in description)	G9
Calibrate for three gases (80D & 80SD only, specify 3 gases in description)	G10
Options	
NIST-Traceable Calibration Certificate	NIST
Cables and Power Adapters (Order Separately, Required For Operation)	
6-pin Mating Cable with Pigtail Leads, 36" (92 cm) length, VDC Power Required	50-C-X
9-pin Mating Cable with Pigtail Leads, 36" (92 cm) length,VDC Power Required	50-C-X1
15-pin Mating Cable with Pigtail Leads, 36" (92 cm) length,VDC Power Required	50-C-X2
115VAC Power Adapter Package, Not for E Models, Requires Standard 6-pin Mini-DIN Connector	C-115VAC
230VAC Power Adapter Package, Not for E Models, Requires Standard 6-pin Mini-DIN Connector	C-230VAC
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
Filters (Order Separately)	
Aluminum Filter, Screws into Inlet Port of FLO-CONTROLLER, Ranges 3-8	90
Aluminum Filter, Screws into Inlet Port of FLO-CONTROLLER, Ranges 9-10	91

FITTING CHART

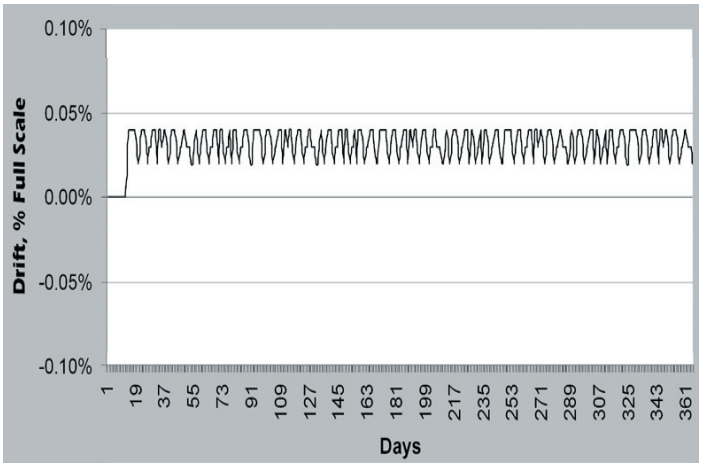
RANGE	A2	A4	A6	B2	B4	B6	S2	S4	S6	M3	M6	V4	AB	SB
3 (0-50 sccm)	✓	✓		✓	✓		✓	✓		✓		✓	✓	✓
4 (0-100 sccm)	✓	✓		✓	✓		✓	✓		✓		✓	✓	✓
5 (0-200 sccm)	✓	✓		✓	✓		✓	✓		✓		✓	✓	✓
6 (0-500 sccm)	✓	✓		✓	✓		✓	✓		✓	✓	✓	✓	✓
7 (0-1000 sccm)		✓	✓		✓	✓		✓	✓		✓	✓	✓	✓
8 (0-2000 sccm)		✓	✓		✓	✓		✓	✓		✓	✓	✓	✓
9 (0-5000 sccm)		✓	✓		✓	✓		✓	✓		✓	✓	✓	✓
10 (0-10000 sccm)			✓			✓			✓		✓			

DIMENSIONS



Dimensions shown for Model 80S unit with ¼" stainless steel (S4) fittings 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-CONTROLLER. Temperature controlled at 22ºC (±2ºC) during testing.

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McMillan LAB/OEM

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

FLO-CONTROLLER – Reg TM McMillan Company

Bulletin 80-S002

Specifications subject to change without notice.