

LIQUID FLOW METERS FOR PRECISION APPLICATIONS

S Series
Microturbine Flow Meters



APPLICATION IDEAS

- Monitoring input flow to an analyzer
- Verifying flow in a coolant loop
- Checking fuel consumption on a furnace or engine
- Dispensing chemicals in a laboratory

Product Description

McMillan S Series flow meters are capable of measuring extremely low liquid flow rates from 13 mL/min up to 10 L/min with a full scale accuracy of $\pm 1.0\%$ or better. A wide variety of fluids may be measured. Repeatable results are achieved using a Pelton-type microturbine wheel. This proven design has been providing precision results since 1988 and has developed a well-deserved reputation for continuous operational service or many years without failure.

Because of the compact size and affordable cost of these products, the S Series flow meters are suitable for a wide variety of industrial, commercial, laboratory and OEM applications. Some sample applications include measurement of hydrocarbon fluids, fuels, light oils, solvents, coolant, pesticides, acids, alkalis, and deionized water.

Several body types are available, including both plastic and metal. NIST Traceable certificates are available on all models. A backlit LCD display is integrated into each unit and is programmed to read in mL/min and L/min.

Principle of Operation

McMillan's microturbine wheel technology utilizes the Pelton turbine wheel concept. This design allows for the use of a miniature turbine wheel to measure flow. The wheel is supported by a very small sapphire shaft held in position by two maintenance-free bearings. Due to the light weight of both the wheel and the shaft, the microturbine wheel is virtually suspended in the flow path. This suspension effect relieves friction on the shaft and bearings, eliminating wear.

As flow passes through the device, it is directed onto the very small teeth of the wheel using a high precision nozzle (see the blue arrows in Figures 1). 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.

The microturbine wheel has alternating white and black sections evenly spaced on it's surface. As the wheel rotates (as shown with green arrows), an infrared beam (as shown with red arrows) is reflected off each white section and directed to a phototransistor which detects each reflected beam and converts them into measured pulses.

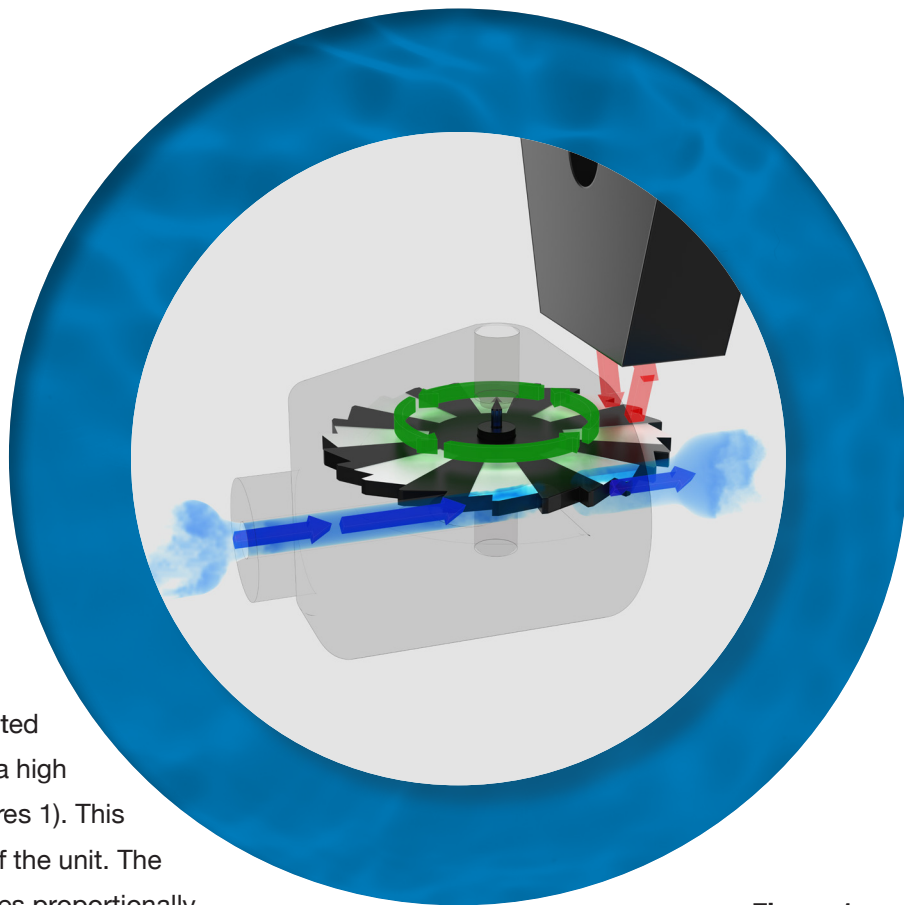


Figure 1
Representation of microturbine technology

Features

FLOW RANGES

Flow ranges from 13 – 100 mL/min up to 1.0 – 10.0 L/min are available.

POWER

Units may be specified to operate with either 12 VDC or 24 VDC power. Various power adapters are also available for use with 12 VDC versions.

SIGNAL OUTPUTS

An analog 0-5 VDC output is provided on all units. Pulse output included with “T” suffix models.

ACCURACY / LINEARITY

All models have a standard accuracy specification of $\pm 1\%$ full scale (including linearity). An improved accuracy specification of $\pm 0.5\%$ is available. NIST traceable calibration certificates are standard for improved accuracy (“H”) models and optional for standard units.

ELECTRICAL CONNECTIONS

Units have an integrated 4-pin male connector. To complete connections, either a cable assembly or power adapter should be ordered.

FLUID CONNECTIONS

All units have compression type tube fittings as standard. See the Fitting Availability Codes Chart located on page 5 for fittings options.

WETTED MATERIALS

The wetted materials vary depending on the model number. See the specifications for further details. FKM O-Rings are fitted as standard.

INTEGRATED DISPLAY

A flow rate display is integrated into each unit and is programmed to read in mL/min for ranges 3-6, and L/min for flow ranges 7-9.



MODEL S111



MODEL S112



MODEL S114

Specifications

Except where noted, all specifications apply to operation at 25 °C

	MODEL S111	MODEL S112	MODEL S114
Accuracy (Including linearity)	Standard ± 1.0% full scale “H” suffix ± 0.5% full scale *		
Repeatability	± 2.0% of full scale		
Pressure Rating	100 psig [6.9 barg]	500 psig [34.5 barg]	
Temperature Rating	Operating Range: 41 to 131 °F [5 to 55 °C] Storage Range: 32 to 158 °F [0 to 70 °C]		
Temperature Sensitivity	± 0.2% full scale or less per °C		
Wetted Materials	Body: PPS 316 Stainless Epoxy Glass Sapphire	Body: Brass PPS 316 Stainless Epoxy Glass Sapphire	Body: 316 Stainless Steel PPS Epoxy Glass Sapphire
O-Ring Material	Standard: FKM		
Fitting Material	Acetal	Brass	Stainless Steel
Recommended Filtration	25 microns or less		
Compatible Fluids	Low viscosity (< 10 cSt) Translucent or Transparent Minimum amount of entrained air		
0-5 VDC Output Signal	Standard • Non-Isolated, 2500 ohm minimum load		
Pulse Output Signal	7.5 VDC peak buffered Square Wave Typically 0-400 Hz		
Integrated Display	128x32 pixel backlit LCD		
Power	“D” Suffix: 12 VDC @ 75 mA (12-15 VDC) “B” Suffix: 24 VDC @ 40 mA (22-25 VDC) “T” Suffix: 12 VDC @ 75 mA (12-15 VDC)		
Response Time	Typically < 1 second for 97% of final value		
Reliability	100,000 Hours MTBF (testing ongoing)		
Response Time	CE Approved 89/336/EEC (EN 55011 & EN 50082-1) 73/23/EEC Low Voltage Directive		
Ratings	IP 10 (NEMA 1)		

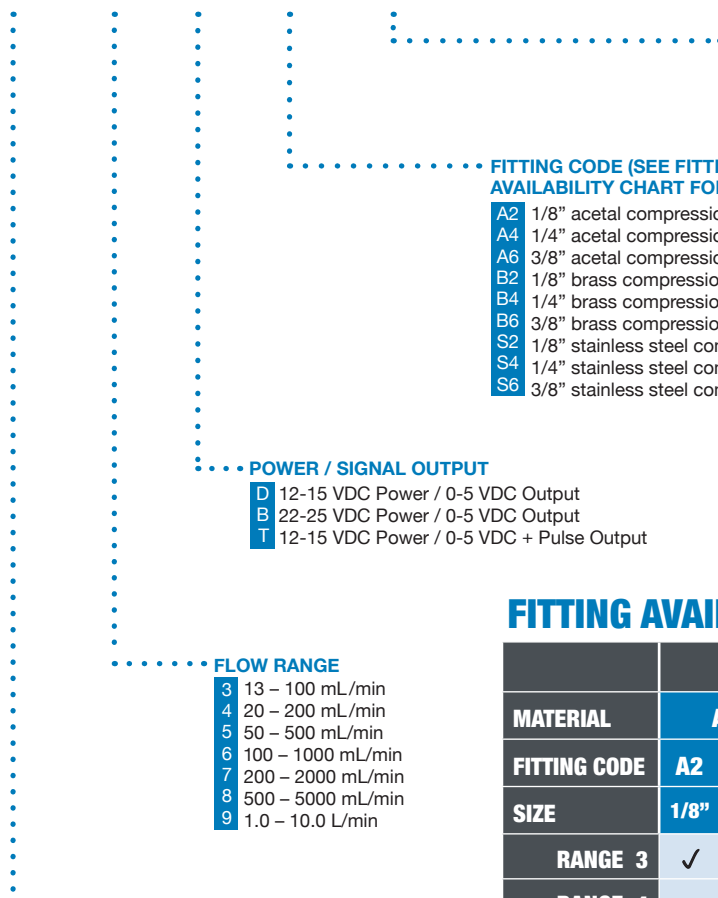
* “H” suffix available on ranges 3-8 only. Includes NIST traceability.

Ordering Information

Form part number as follows:

(Base Model) - (Flow Range)(Power/Signal) - (Fitting Code) - (Options)

S - - - - -



FITTING AVAILABILITY CHART

	S111			S112			S114		
MATERIAL	ACETAL			BRASS			316L SS		
FITTING CODE	A2	A4	A6	B2	B4	B6	S2	S4	S6
SIZE	1/8"	1/4"	3/8"	1/8"	1/4"	3/8"	1/8"	1/4"	3/8"
RANGE 3	✓	✓		✓	✓		✓	✓	
RANGE 4		✓			✓			✓	
RANGE 5		✓			✓			✓	
RANGE 6		✓	✓		✓	✓		✓	✓
RANGE 7		✓	✓		✓	✓		✓	✓
RANGE 8			✓			✓			✓
RANGE 9			✓			✓			✓

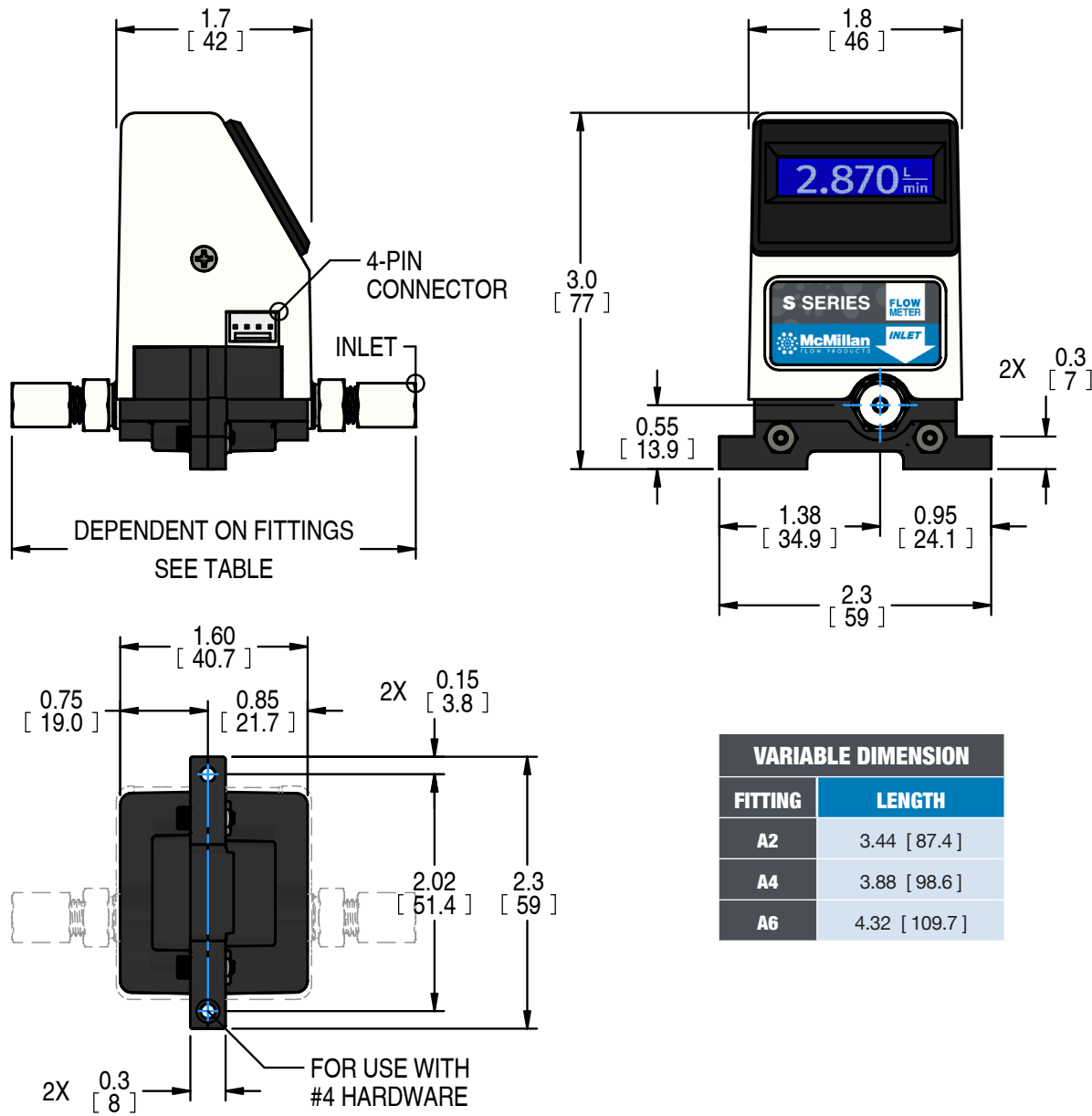
EXAMPLE

S112-7B-B4-H would provide a S112 Brass microturbine flow meter with integrated display rated for 200 – 2,000 mL/min, with power input at 24 VDC and output signals of 0-5 VDC, 1/4" brass compression tube fittings, and improved accuracy of ± 0.5% with included NIST Certificate.

Dimensions

Basic unit configurations are shown. Contact factory or an authorized representative for dimensions of units not shown.
All dimensions shown in inches [mm] unless otherwise noted.

MODEL S111

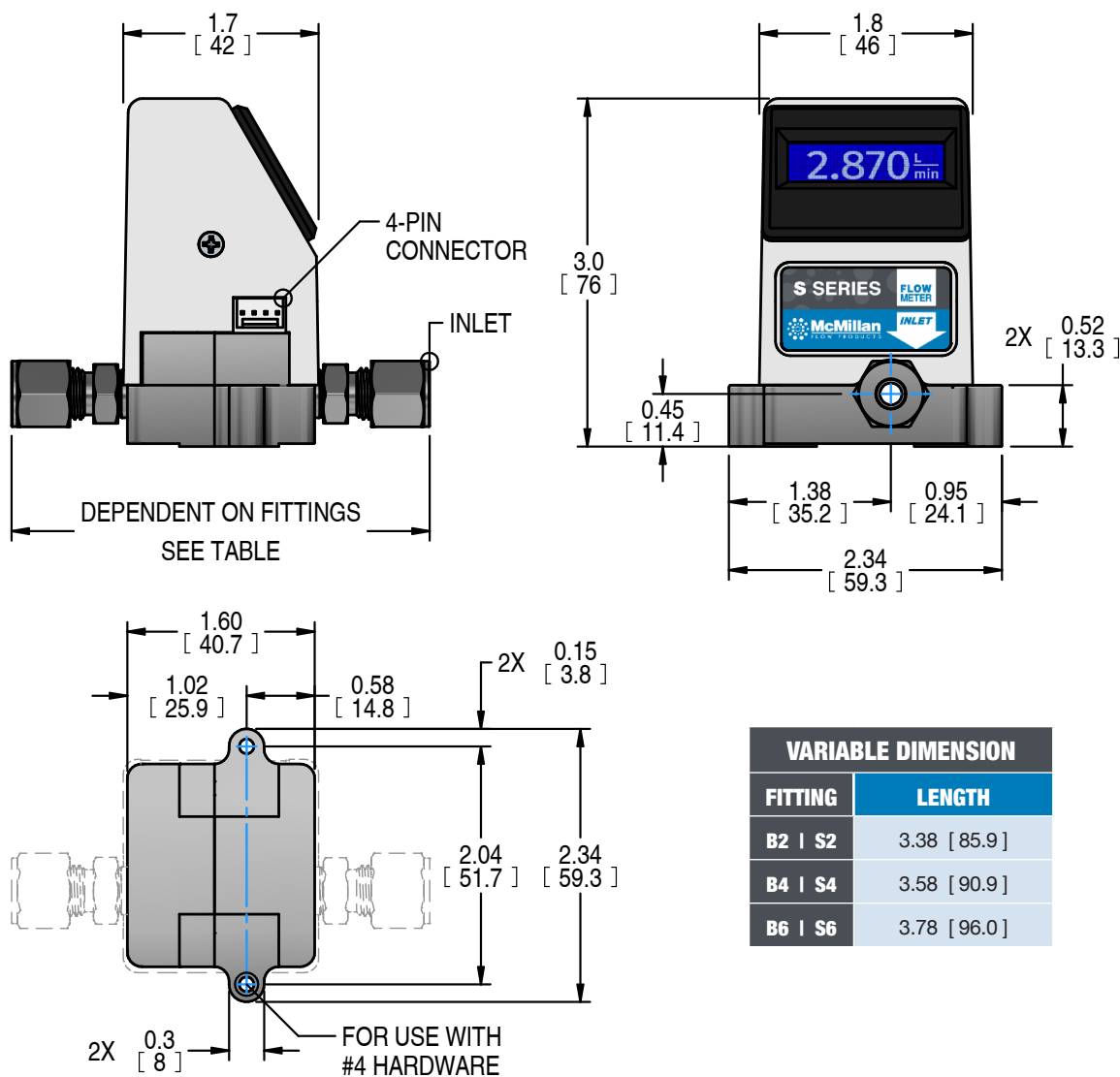


VARIABLE DIMENSION	
FITTING	LENGTH
A2	3.44 [87.4]
A4	3.88 [98.6]
A6	4.32 [109.7]

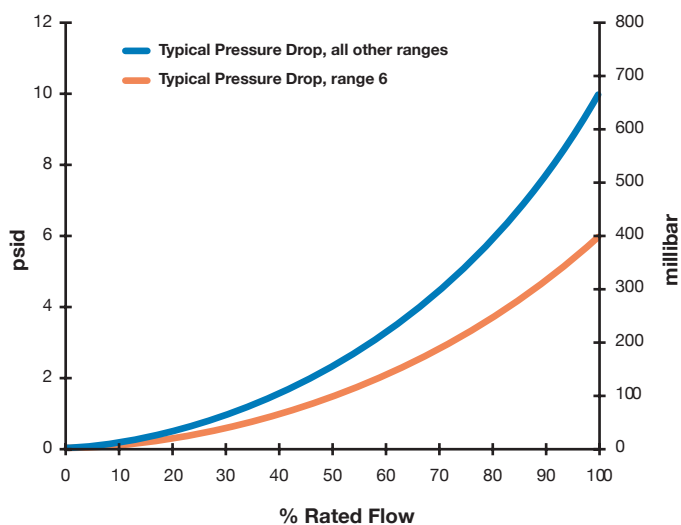
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MODEL S112 | S114



Pressure Drop



Optional Accessories

CODE	DESCRIPTION
100-17T	Mating cable with pigtail leads, 12/24 VDC power required, 3ft [92 cm]
110-00-08T	115VAC Power Adapter (for 12 VDC models only)
110-00-18T	230VAC Power Adapter (for 12 VDC models only)
110-00-17	Base plate that allows S111 flow meter to stand on bench or table

Related Products



10X Series Flow Sensors

Microturbine flow sensors
for liquids and gases



IRIDIUM Flow Controllers

Modular flow controller platform
for liquid applications



OSMIUM Flow Switch

Thermal flow switch
for liquid applications



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