LIQUID

McMillan FLOW PRODUCTS

COMPACT FLOW METERS FOR LIQUID APPLICATIONS

U70X Series
Microturbine Flow Sensors
Models U707 | U708

APPLICATION IDEAS

Analysis sample rate verification
Totalizing chemical injection streams
Test stand flow monitoring
Upgrading rotameters to monitor flow rate

Product Description

McMillan U70X Series Flow Sensors are capable of measuring extremely low flow rates. The models U707 and U708 both measure liquids as low as 13 mL/min and as high as 10 L/min. Full scale accuracies of ± 1.0% or better are available on analog output models.

A wide variety of liquids may be measured. Repeatable results are achieved using a patented 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 for many years without failure.

Because of the compact size and affordable cost of these products, the U70X Series Flow Sensors 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, coolants, pesticides, mild acids, alkalis, and deionized water. Several power and output configurations are available, including both pulse and analog outputs.

Principle of Operation

McMillan's microturbine wheel technology utilizes the Pelton turbine wheel concept. This design allows for use of a miniature turbine wheel to measure flow. The wheel is supported on 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 force on the shaft and bearings, eliminating wear.

As flow passes through the flow sensor, it is directed onto the very small teeth of the wheel using a precision-machined nozzle. (As shown with blue arrows in Figure 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.

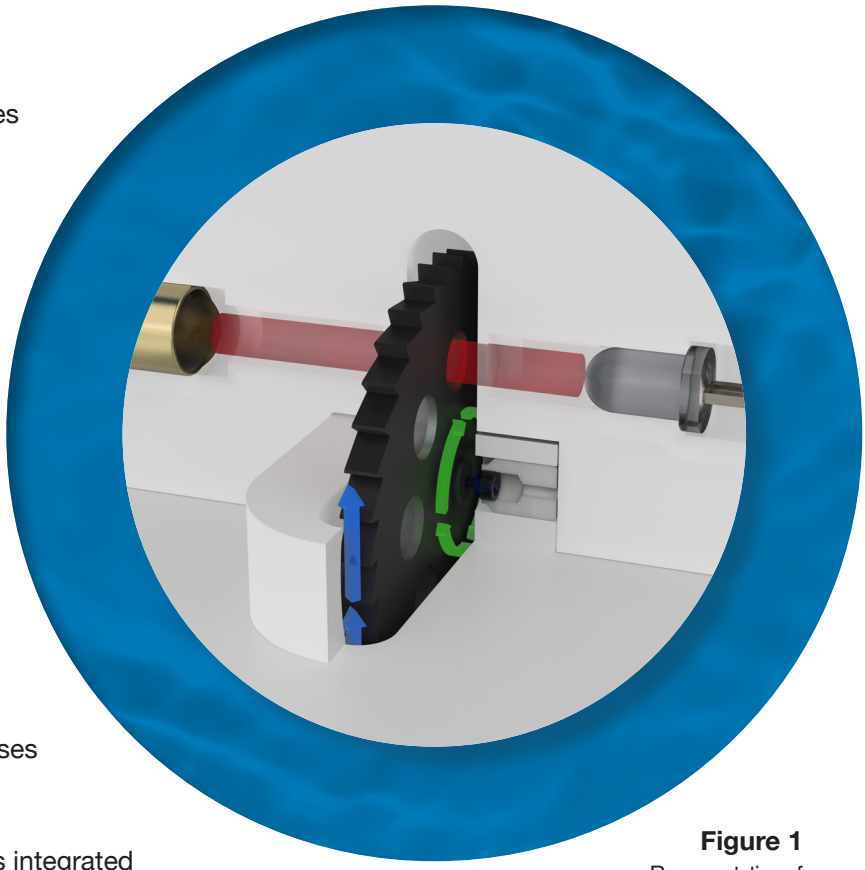


Figure 1
Representation of microturbine technology

The microturbine wheel has translucent sections integrated into the wheel. An infrared emitter (as shown with red in Figure 1) is located on one side of the wheel, and a sensor on the other. As the wheel rotates, (as shown with green arrows in Figure 1) the infrared beam is alternately interrupted and passed through, detecting wheel speed, and generating a pulse based on flow.

Increased flow causes the wheel to spin faster, increasing the pulse rate. When the wheel stops (under zero flow conditions), no pulses are generated. This eliminates the possibility of "zero drift" and the need for adjustments to the instrument's zero reading. Processing circuitry provides analog and/or pulse outputs that are linearly proportional to the flow rate.

Features and Options

FLOW RANGES
Flow ranges from 13 – 100 mL/m up to 1 – 10 L/m are available. Consult the factory or an authorized epresentative for custom requirements.

POWER
Most units may be specified to operate with either 12 VDC or 24 VDC power.

SIGNAL OUTPUTS
Model U707 has a pulse signal output and Model U708 has multiple analog options available; 0-5 VDC, 0-10 VDC, and 4-20 mA output.

ACCURACY/LINEARITY
Analog output models have an accuracy specification of ±1.0% full scale (including linearity). Pulse output models have an accuracy specification of ±3.0% full scale (including linearity).

FLUID CONNECTIONS
All units have PFA Male Flare connections as standard.

ELECTRICAL CONNECTIONS
All units come standard with a 7-Pin connector. Options available for a integrated FEP-jacketed cable terminated with pigtail leads.

WETTED MATERIALS
PTFE, FFKM, and Sapphire wetted parts ensure compatibility with chemicals commonly found in microelectronics manufacturing processes, including deionized water, CMP slurries, acids, solvents, and photoresist.

DISPLAYS
A variety of remote displays are available for use with the U70X Series Flow Sensors. McMillan also offers a comprehensive range of flow meters with integrated displays.

U707

U708


CUSTOM GANG OF U707

Specifications

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

	U707	U708
Accuracy (including linearity, best fit straight line)	± 3.0% full scale	± 1.0% full scale
Repeatability	± 0.2% full scale	
Pressure Rating	Working Pressure: 60 psig [4 barg]* Overpressure Limit: 85 psig [5.8 barg]	
Temperature Rating (Fluid)	41 to 131 ºF [5 to 55 ºC]	
Temperature Rating (Environment)	Operating Range: 41 to 131 ºF [5 to 55 ºC] Storage Range: 32 to 158 ºF [0 to 70 ºC]	
Temperature Sensitivity	± 0.2% full scale or less per ºC	
Wetted Materials	PTFE Sapphire FKM PFA	
Seal Material	FFKM	
Recommended Filtration	25 microns or less	
Compatible Media	Low viscosity (< 15 cSt), translucent or transparent, degassed	
Power Requirements	12-15 VDC Units: 12-15 VDC, 50 mA typical 15-25 VDC Units: 15-25 VDC, 75 mA typical 22-25 VDC Units: 22-25 VDC, 50 mA typical	
Electrical Connections	7-pin connector Nylon housing	
Pulse Output	Square-wave Collector output Pulls up to V+	N/A
0-5 VDC Output	N/A	Optional 0 VDC at zero flow 2.5 Kohm or greater load output Not isolated
0-10 VDC Output	N/A	Optional 0 VDC at zero flow 5 Kohm or greater output load Not isolated
4-20 mA Output Signal	N/A	Optional 4 mA at zero flow 500 ohm maximum loop resistance Not isolated
Zero Drift	None	
Warm-Up Time	None	
Response Time	Typically < 300 milliseconds for 97% of final value	Typically < 1 second for 97% of final value
Calibration Interval	Calibration should typically be verified once every 12 months	
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	IP53 (NEMA 2)	
Warranty	1 Year Limited	

* Other ranges may be available; Contact the factory or an authorized representative for additional information.

Ordering Information

Form part number as follows:

(Base Model) - (Flow Range) (Power/Signal) - (Cable/Connector) - (Fittings) - (Options)

U70__ – ___ ___ – ___ – ___ – ___

OPTIONS

FN	Add pair of PVDF Flare Nuts
Y	Epoxy-potted PC Board

FITTINGS (SEE FITTING AVAILABILITY CHART BELOW FOR AVAILABLE SIZES BASED ON FLOW RANGE)

F4	1/4" PFA Male Flare
F6	3/8" PFA Male Flare
F7	1/2" PFA Male Flare

CONNECTOR / CABLE LENGTH

C0	Unit Connector
CP6	Pigtail Leads, 6ft [1.85m]
CP12	Pigtail Leads, 12ft [3.7m]

POWER / SIGNAL OUTPUT

U707

A	12-15 VDC / Pulse
E	22-25 VDC / Pulse

U708

B	22-25 VDC / 0-5 VDC
C	15-25 VDC / 4-20 mA
D	12-15 VDC / 0-5 VDC
J	22-25 VDC / 0-10 VDC
K	12-15 VDC / 0-10 VDC

FLOW RANGE

3	13 – 100 mL/min*
4	20 – 200 mL/min
5	50 – 500 mL/min
6	100 – 1000 mL/min
7	200 – 2000 mL/min
8	500 – 5000 mL/min
9	1.0 – 10.0 L/min

MODEL

7	PTFE microturbine flow sensor for liquids, pulse output
8	PTFE microturbine flow sensor for liquids, analog output

FITTING AVAILABILITY

CODE	F4	F6	F7
SIZE	1/4"	3/8"	1/2"
RANGE 3	✓	✓	
RANGE 4	✓	✓	
RANGE 5	✓	✓	
RANGE 6	✓	✓	
RANGE 7		✓	
RANGE 8		✓	
RANGE 9		✓	✓

EXAMPLE

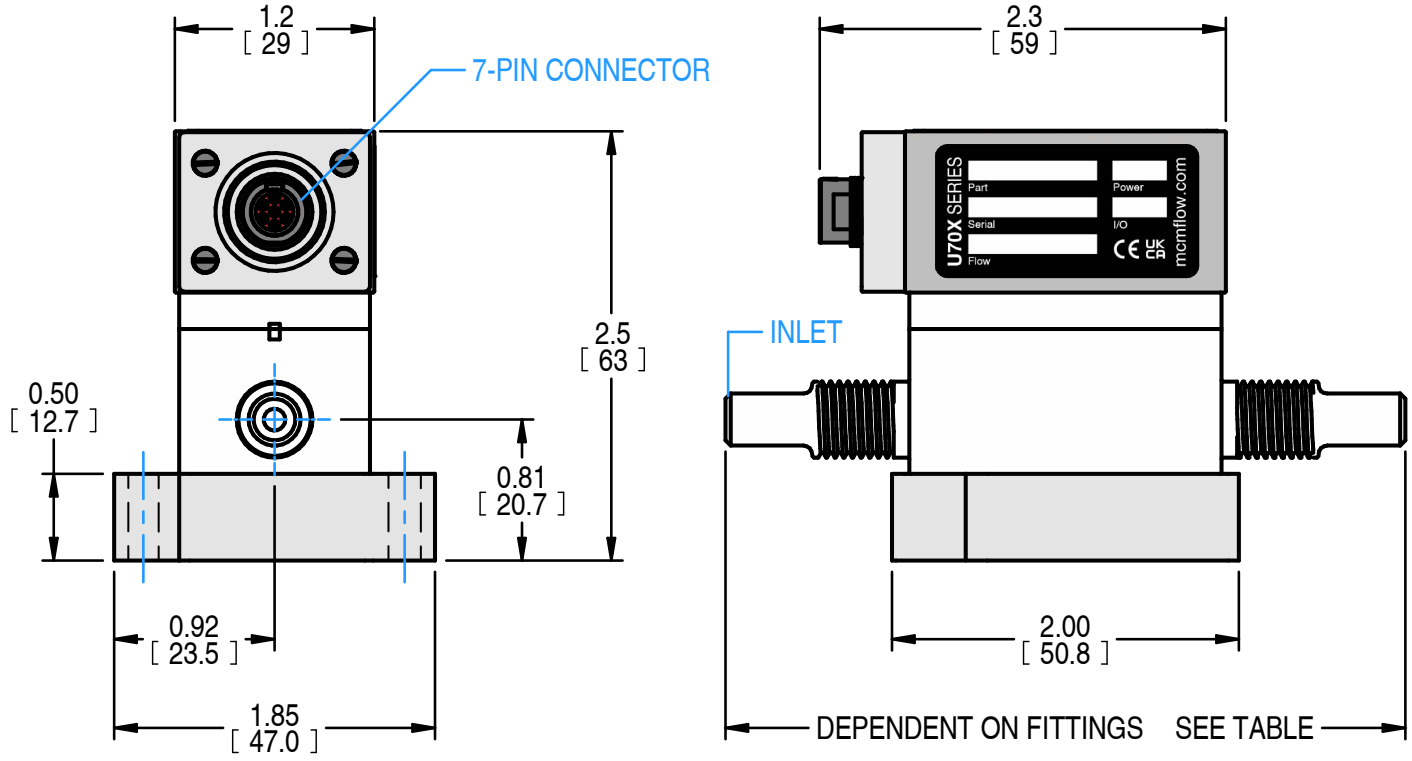
U707-5-A-CP6-F4 would provide a PTFE-bodied microturbine flow sensor that provides a pulse output signal, requires 12 VDC power, includes a 6 foot [1.85 m] cable terminated with pigtail leads, integrates 1/4" male flare fluid connections, and would measure flow rates from 50 – 500 mL/min of water (or similar fluid).

* Best performance at 20 – 100 mL/minute. Response below 20 mL/minute will vary depending on application.

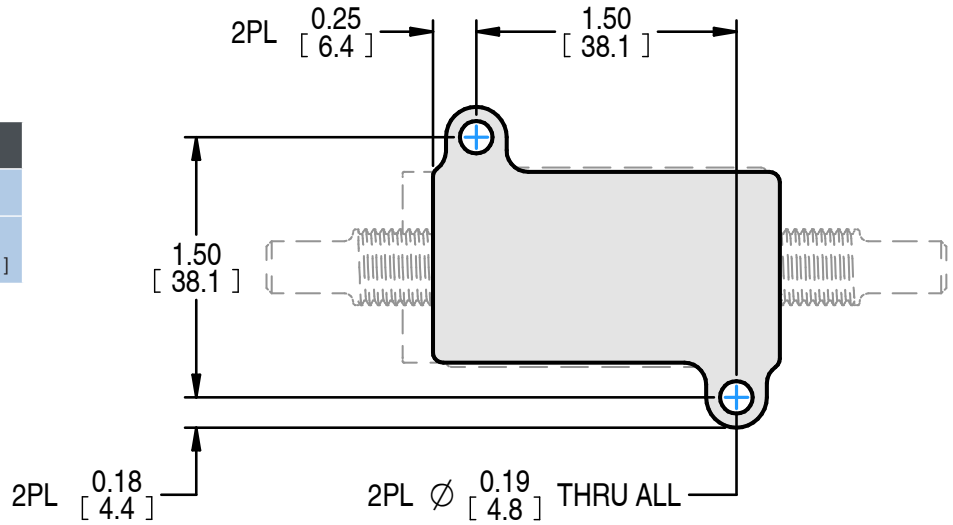
Dimensions

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

U707



OVERALL LENGTH TABLE			
FITTING	F4	F6	F7
LENGTH	3.9 [99.1]	4.1 [104.6]	4.1 [104.6]



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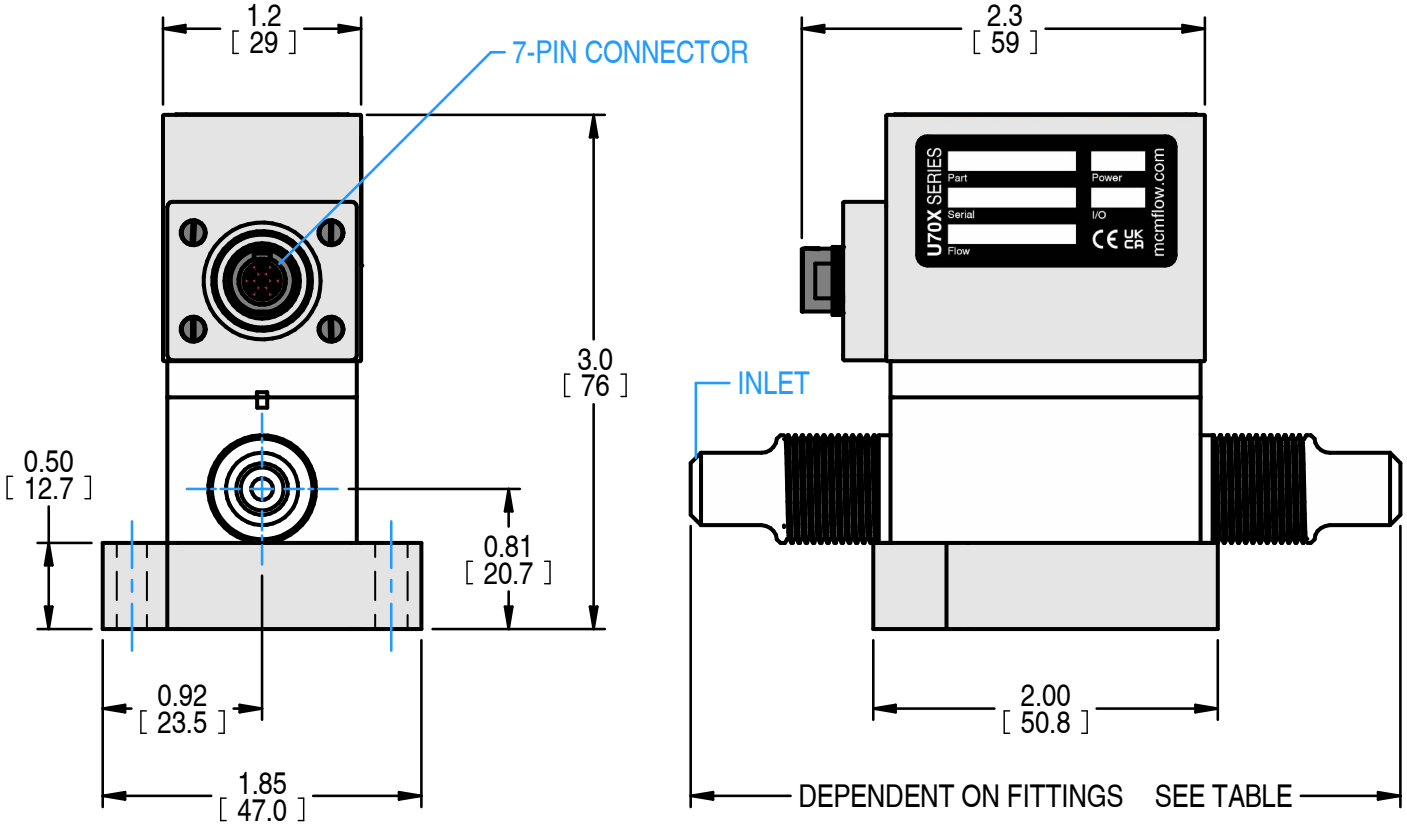
U708



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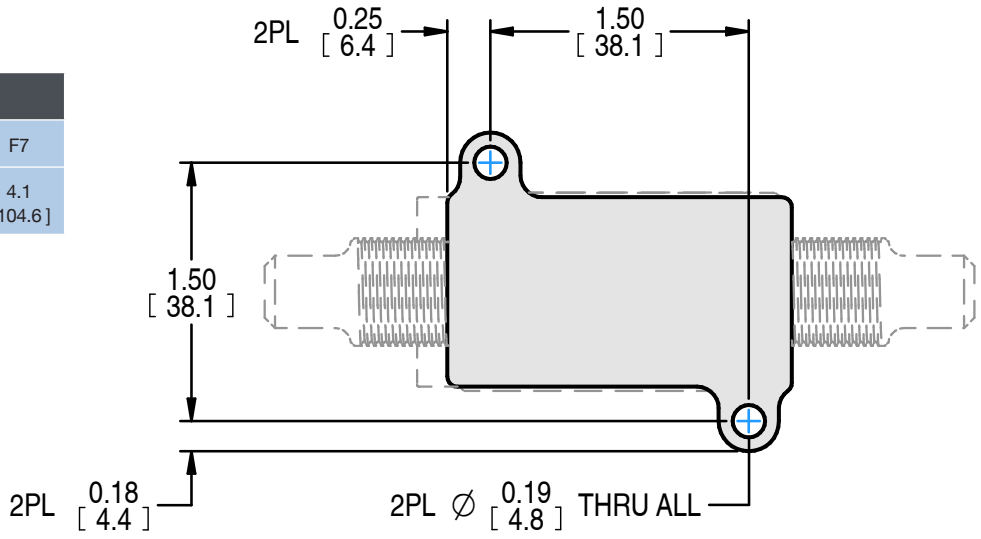

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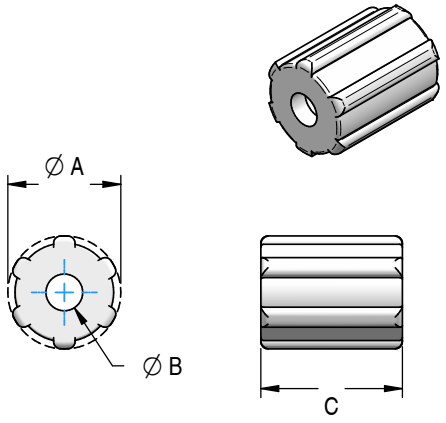
FLARE NUT DIMENSIONS

VARIABLE DIMENSIONS			
CODE	∅ A	∅ B	C
F4	0.78 [19.8]	0.26 [6.6]	1.0 [25.4]
F6	0.90 [22.9]	0.38 [9.6]	1.0 [25.4]
F7	1.0 [25.4]	0.50 [12.7]	1.1 [27.9]



Related Products

IRIDIUM Flow Controllers

Modular flow controller platform for liquid applications

U80X Series Flow Controllers

Integrated microturbine Liquid Flow Controllers

Model 275 Display

Digital panel display for use with the U70X Series

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Document DS-707 2501 A