



# MEMFlo "SERIES H" FLOWMETERS

## Features & Benefits

- Tough, simple & accurate meters for high pressure service including hydraulic fluids, compressed gases and steam.
- Models for up to 5000 PSIG service
- Extended flow ranges averaging 25 to 1.
- Disassembles in less than a minute without removing the meter from the pipeline.
- T-316 stainless bodies & internals standard.
- Standard 1/2", 3/4" and 1" female NPT connections. Pipe adapters may be used for other sizes without affecting accuracy.
- 360° rotation of scale. Special scales for other units or fluids & multiple scaling offered.
- Options include alarms, pressure gage on meter, oxygen cleaning.

## Specifications

**Accuracy:** ±2% of 100% flow rating standard.

Repeatability: ±1/2% of indicated flow rate.

**Rangeability:** 25 to 1 average.

**Materials:** T-316 stainless steel for body and internals, except for electroless nickel plated or encapsulated rare earth magnet on the meter float.

**Scales:** Standard direct reading (GPM or LPM Liquid, Sp. Gr. = 1.00 or SCFM Dry Air @100 psig, 70°F.) or percentage scale.

Scales are photo-etched, anodized aluminum. Special scales for other flow units or media conditions, or mylar scales for corrosive environments, are available at extra cost. Liquid meter scales for LPM Liquid, Sp. Gr. = 1.00, are stocked. Scale length is approximately 3.2".

**Operating Limits:** Please see Table 5.

**"O" Rings:** Buna N standard; Viton, Ethylene-Propylene (EPR), Silicone, Neoprene, and Teflon optional.

## General

OPTIONS: Flo-Sentry™ and Flo-Guardian™ Alarms, KIST™ two-wire transmitters, and Courier™ Remote Display, Batching, or Mass Systems, high temperature service raceway ("Hot Top"), bumper option for surge and shock conditions, panel mount kits, threaded flanged connections, pressure gauges installed on the meter, special/multiple scaling, oxygen cleaning, and safety devices available. Custom options such as welded flanged connections, electroless nickel plating or other coatings, viscosity calibrations, etc., by quotation only.

### CALIBRATION TRACEABILITY

Each MEMFlo Flowmeter is individually calibrated on test facilities designed and operated in accordance with applicable ASME, ISA, and NIST standards and practices. As individual measuring components of these facilities are certified traceable to NIST, and tandem meter arrangements are employed to continually verify flow data, all MEMFlo calibrations meet both static and dynamic traceability criteria. For an additional charge, calibrations for both ±2% and ±1% full scale accuracy

## How to Order "Series H" Flow Meters

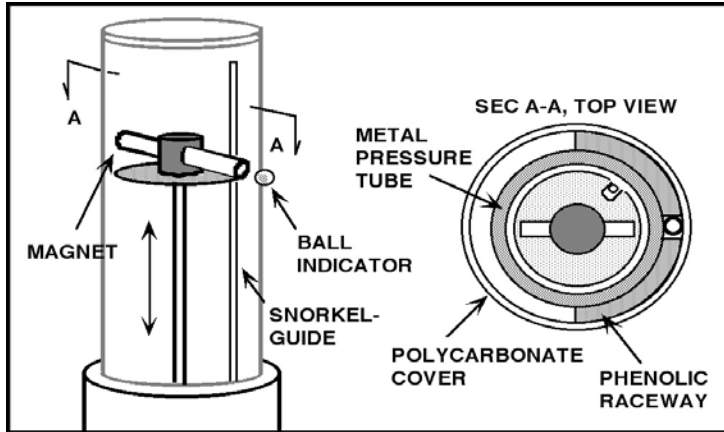
Connections Size	H	BODY Material	SIGHT TUBE OPTIONS	CONNECTION OPTIONS	OPTIONS	CAPACITY CODE *	SCALING OPTION	FLUID SERVICE	"O" RING OPTION	OTHER OPTIONS
4 = 1/2" 6 = 3/4" 8 = 1"	H	S = T316 stainless steel	S = T316 stainless steel	Blank = Std. Female NPT F = Flanged connection	Reserved for special options	From "100%" flow capacity column	D = Std. direct P = Std. % S = Special M = Multiple	L = Liquid G = Gas	B = Buna N (std.) E = EPR D = EPDM N = Neoprene S = Silicone T = Teflon V = Viton	T = Std. Teflon Buffer/Bumper Flow alarms, outputs, custom modifications, etc. Please consult Flow Line Options for further details.

For example, a 1" NPT 10 GPM model for hydraulic fluid with Viton O-ring might be: MEMFlo Model 8HSS10.0SLV

can be certified per MIL-STD-45662.

### FLOW RATE SELECTION

It is common practice to select a flowmeter placing normal flow at about 75% of full scale. However, the unique “over-read” feature of MEMFlo Flowmeters allows sizing meters to normal flows in the 85% – 100% range. This provides more precise flow measurement, as meter accuracy is generally a percentage of the 100% scale rating.



### TEMPERATURE CONSIDERATIONS

A flowmeter should be selected for a specific operating temperature with the understanding that significant temperature changes will alter fluid density and meter accuracy in a manner that is not always predictable. Density changes with temperature in some liquids may not affect accuracy significantly because of partial or complete compensation by coincident viscosity changes. Consult MEMFlo for specific recommendations if temperature extremes are anticipated.

### SPECIAL & UNUSUAL CONSIDERATIONS — METERING EMULSIONS, SLURRIES, ETC.

The slotted cylinder design of MEMFlo Flowmeters allows them to accommodate fairly heavy emulsions, suspensions, and other mild slurries. Large particles classified as “sharp” or “abrasive” may cause periodic jamming of the float and require frequent flushing or cleaning (MEMFlo’s quick and easy disassembly facilitates this procedure if required). As with viscous fluids, larger capacity flowmeters are generally better able to handle slurry-like liquids. If the liquid to be metered is very viscous or contains significant levels of suspended particles, it may be desirable to forward a sample to Flow Line Options for analysis and specific recommendations.

When metering other fluids and/or fluid conditions, the following equations may be used to convert the application conditions to equivalent flow per the MEMFlo standard bases. Please note that these equations are for flowmeter sizing only, and are not intended to correct readings for other fluid conditions on installed meters (those formulae are included with the meter instructions).

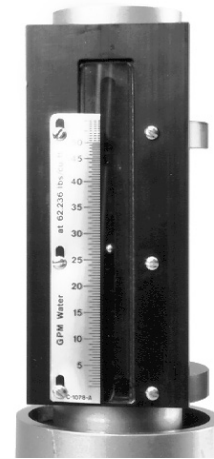


Figure 2: High Temperature Raceway (“Hot Top” Option)

### High temperature raceway option for fluids over 275°F.

If exposed to prolonged temperatures of 275°F. or higher, the standard external plastic raceway may begin to bubble, distort, or even melt. To accommodate temperatures up to 600°F., MEMFlo offers a “Hot Top” option for hot liquid, gas, and steam applications. The standard raceway is replaced with the aluminum assembly shown in Figure 2. Two set screws in the mounting rings hold the assembly in place. A small strip of safety glass covers the raceway and indicator.

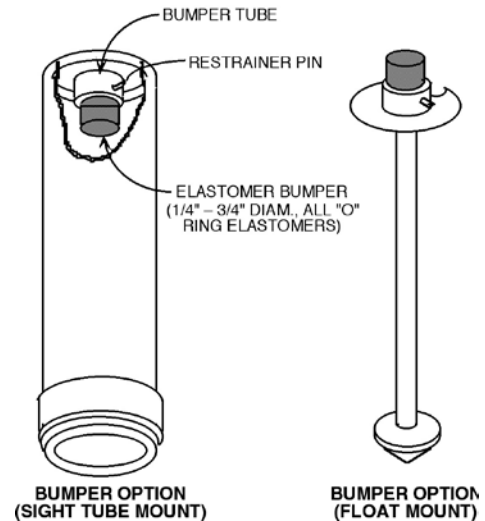


Figure 3: MEMFlo Bumper Option

### MEMFlo’s BUMPER OPTION FOR SURGE CONDITIONS

Unavoidable shock or surge conditions, such as steam purging, are unavoidable in some fluid systems. To minimize the chance of meter or float damage, Flow Line Options offers the “bumper” option shown in Figure 3. An elastomeric cushion of a fluid compatible material is mounted inside the sight tube or on top of the meter float. It is important to remember that some surges are so severe that no amount of cushioning can guarantee protection from damage. Harsh surges should be designed out of the system.

## Liquid Sizing Equations

Either 
$$Q_m = Q_c \times \sqrt{\frac{\rho_c (\rho_f - \rho_m)}{\rho_m (\rho_f - \rho_c)}}$$

or

$$Q_m = Q_c \times \sqrt{\frac{d_c (d_f - d_m)}{d_m (d_f - d_c)}}$$

Where:

Q<sub>m</sub> = GPM Liquid, Sp. Gr. = 1.00 (MEMFlo Base)  
 Q<sub>c</sub> = GPM of liquid to be metered  
 ρ<sub>m</sub> = Specific gravity per MEMFlo Std. (Related to water in atmosphere at 70°F. having Sp. Gr. - 1.00)  
 ρ<sub>c</sub> = Specific gravity of liquid being metered, same base as ρ<sub>m</sub>  
 d<sub>m</sub> = Density of liquid, MEMFlo Base, #/ft<sup>3</sup>  
 d<sub>c</sub> = Density of liquid being metered, #/ft<sup>3</sup>  
 ρ<sub>f</sub> = Specific gravity of flowmeter float  
 d<sub>f</sub> = Density of flowmeter float per table below.

### MEMFlo FLOAT SPECIFIC GRAVITIES & DENSITIES

MATERIAL	ρ <sub>f</sub>	d <sub>f</sub>
Brass	8.30	516.6
Stainless steel	8.05	501.1

### FLOW EQUIVALENTS

One Gallon per Minute equals:

231 Cu. Inches/Min.	3785 Cu. Centimeters/Min.
0.1337 Cu. Ft./Min.	3.785 Liters/Min.
0.02381 Barrels/Min. (oil)	0.0037854 Cu. Meters/Min.
128 Oz./Min.	8.32 lbs./Min. (Water)

## Gas Sizing Equations

$$Q_m = Q_g \times 0.465 \times \sqrt{\frac{\rho_g \times T_g}{P_g}}$$

Where:

Q<sub>m</sub> = SCFM DRY AIR @ 100 psig, 70°F. (MEMFlo Base)  
 Q<sub>g</sub> = SCFM of gas to be metered at operating conditions  
 ρ<sub>g</sub> = Specific gravity of gas to be metered at standard conditions (14.697 psia, 70°F.)  
 T<sub>g</sub> = Metering temperature, absolute, °R (460 + °F.)  
 P<sub>g</sub> = Metering pressure, absolute (14.697 + psig)

### FLOW & PRESSURE EQUIVALENTS:

1 SCFM equals	1 psig equals
0.02832 Cu. Meters/Min.	0.07031 Kg/Sq cm
1.6992 Cu. Meters/Hr.	27.70 In. Water Column
28.32 Liters/Min.	2.036 In. Hg
28,320 CC/Min.	51.714 mm Hg
60 Std. Cubic Feet/Hr.	6.895 Kpa
1728 Cu. Inches/Min.	0.06895 Bar
7.481 Gallons, U.S.	16.0 Oz./Sq. In.
6.229 Gallons, Imperial	0.06804 Atmospheres

**NOTE:** MEMFlo meters can also be used with vapors such as steam and other "non-perfect" gases. Contact Flow Line Options for assistance for these applications.

## Steam Service Quick Sizing Chart for MEMFlo Flowmeters

PSIG	SAT. TEMP	K = SCFM/LBS. PER HOUR @ °F. SHOWN									PSIG
		SAT.	250°	300°	350°	400°	450°	500°	550°	600°	
0	212°	0.880	0.907	0.939	0.971	1.001	1.031	1.059	1.086	1.113	0
5	228°	0.762	0.775	0.815	0.831	0.857	0.883	0.907	0.931	0.954	5
10	240°	0.686	0.692	0.713	0.743	0.766	0.789	0.811	0.832	0.853	10
20	259°	0.586	L	0.605	0.626	0.646	0.666	0.684	0.703	0.720	20
40	287°	0.474	L	0.479	0.498	0.514	0.530	0.545	0.559	0.574	40
60	308°	0.410	L	L	0.424	0.438	0.452	0.465	0.478	0.490	60
80	324°	0.367	L	L	0.374	0.388	0.401	0.413	0.424	0.435	80
100	338°	0.336	L	L	0.338	0.351	0.363	0.374	0.385	0.395	100
125	353°	0.305	L	L	L	0.317	0.332	0.338	0.348	0.357	125
150	366°	0.282	L	L	L	0.290	0.296	0.301	0.310	0.319	150
200	388°	0.248	L	L	L	0.251	0.261	0.270	0.279	0.286	200
250	406°	0.224	L	L	L	L	0.233	0.242	0.250	0.257	250
300	422°	0.206	L	L	L	L	0.212	0.220	0.228	0.235	300
350	436°	0.192	L	L	L	L	0.194	0.203	0.210	0.217	350
400	448°	0.180	L	L	L	L	0.182	0.189	0.196	0.203	400
500	470°	0.161	L	L	L	L	L	0.166	0.174	0.180	500
600	489°	0.147	L	L	L	L	L	0.149	0.157	0.162	600

L = LIQUID STATE

## “Series H” Flowmeter Capacities, Gpm Liquid, Sp. Gr. = 1.00

BODY SIZE <sup>1</sup>	DESIGNATOR & 100% FLOW <sup>2</sup>	OVER-READ FLOW <sup>3</sup>	MINIMUM FLOW	SCALE INCREMENTS <sup>4</sup>	ΔP, INCHES H <sub>2</sub> O
6 (3/4" NPT)	1.20	1.25	0.06	0.01	7.5
	1.64	1.78	0.08	0.02	7.5
	2.60	2.82	0.10	0.02	14.2
	3.80	4.40	0.15	0.05	17.2
	5.40	6.10	0.20	0.05	17.2
	7.00	7.90	0.20	0.10	22.0
	10.0	12.0	0.20	0.10	22.0
	14.0	16.0	0.60	0.20	40.0
	23.0	30.0	0.50	0.50	75.0

## “Series H” Flowmeter Capacities, SCFM Dry Air, @ 100 PSIG, 70°F.

BODY SIZE <sup>1</sup>	DESIGNATOR & 100% FLOW <sup>2</sup>	OVER-READ FLOW <sup>3</sup>	MINIMUM FLOW	SCALE INCREMENTS <sup>4</sup>	ΔP, INCHES H <sub>2</sub> O
6 (3/4" NPT)	14.0	15.0	0.60	0.20	3.1
	20.0	23.0	1.0	0.25	3.3
	26.0	28.0	1.0	0.50	3.4
	35.0	39.0	1.00	0.50	4.0
	50.0	55.0	2.00	0.50	4.5
	70.0	75.0	3.00	1.00	11.8
	85.0	100.0	4.00	1.00	18.0
	125.	140.	6.00	1.00	22.0
	160.	180.	6.0	2.00	45.0
	260.	290.	4.00	2.00	93.0

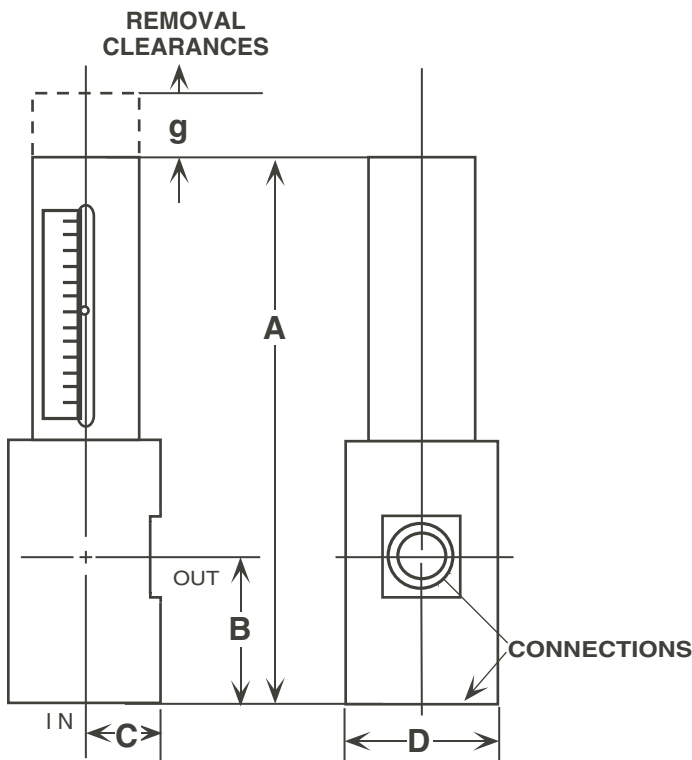
<sup>1</sup> Based on standard female NPT connection ports. Standard pipe adapters may be used to adapt meters to other pipe sizes without affecting accuracy. Flow Line Options can provide flanges or other connections on a custom basis at additional cost.

<sup>2</sup> This value designates flow capacity in the model number. Accuracy & turndown statements are based on this 100% value.

<sup>3</sup> The over-read section of the scale is at reduced resolution, and meters are not calibrated in this zone.

<sup>4</sup> These are minimum values, and larger increments may be used toward the top end of the scale on some models.

<sup>5</sup> Flo-Sentry Alarms cannot be used on standard versions of these models.



## Dimensions: “Series H” Flowmeters

Model TYPE	A	B	C	D	g	Female NPT	Approx. lbs.
4SS	11.80	3.07	1.28	2.75	3.00	1/2"	11
6SS	11.86	3.13	1.37	3.00	3.00	3/4"	14
8SS	12.23	3.5	1.46	3.25	3.00	1"	16

Notes: All dimensions are in inches, with a tolerance of ±0.05".

Flow Line Options can also supply meters with other connections, special inlet & outlet piping runs, pipe & tube adapters, etc. For pricing, please contact Flow Line Options with your requirements. Specifications subject to change without prior notice.