

# Laminar Flow Element



## Laminar Flow Element

Meriam Laminar Flow Elements are gas volume rate of flow differential producers operating on capillary flow principles. They are available in a wide range of types and sizes and are ideally suited to many flow measurement and calibration applications.

Some typical applications of Meriam LFE Elements include: combustion airflow to internal combustion engines, fan and blower calibration, leak testing, and testing of automobile components. LFE's are used to calibrate other flow metering devices such as variable area meter, thermal anemometers, orifices, nozzles, etc. Contact us for application assistance.

## Calibration and Accuracy

Meriam LFE elements are calibrated with air at atmospheric conditions, and referenced to 29.92" mercury absolute (760MM HG Abs.) and 70°F. (21.1°C). Each completed element is calibrated and correlated to Meriam flow standards, which are traceable to the National Institute of Standards and Technology. The Meriam LFE element is supplied with a reproducible flow curve in terms of SCFM versus differential pressure in inches of water. Correction factors are included to cover an inlet pressure range from 26 to 36 inches of mercury absolute and an inlet temperature from 50°F to 150°F. For special flow applications, we request you contact Meriam, giving complete flow information. The rated accuracy\* of all Meriam LFE elements is of actual reading and is not the much wider tolerance of other devices which are based on percentage of maximum flow rate.

### \*Accuracy Levels Available:

Commercial Calibration	+0.86% of Actual Reading
Master Calibration	+0.70% of Actual Reading
Independent Lab Calibration	+0.50% of Actual Reading

Special calibration procedure service is available for those Meriam LFE units, which are governed by quality programs requiring periodic recalibration. The Special Calibration Procedure #A-33544 is designed to meet the basic requirements of MIL-STD-45662A, ANSI Z540, 10CFR50 and MIL-Q-9858A. Contact Meriam direct for information.






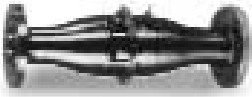
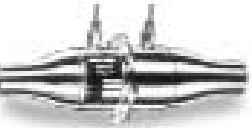
Meriam LFE Elements are normally rated for maximum flow at 4 or 8 inches of water differential. There is no recovery of pressure differential in a Laminar Flow Element matrix. Filters, inlet and outlet configurations increase the total pressure drop and must be considered when pressure loss considerations are critical.

### GAS PROPERTIES AT STANDARD CONDITIONS OF 29.92" Hg. Abs. and 70 °F

Gas	Density (lb/ft3)	μViscosity Micropoises	Specific Gravity
Air	0.0749	181.87	1.000
Argon	0.1034	222.45	1.380
Helium	0.0103	196.90	0.138
Hydrogen	0.0052	88.41	0.0695
Nitrogen	0.0725	175.72	0.968
Oxygen	0.0828	201.91	1.105
Carbon Dioxide	0.1143	147.84	1.526

NOTE: Ref. American Institute of Chemical Engineers

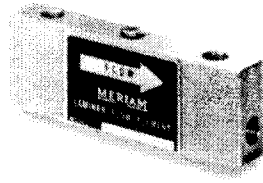
# Meriam LFE Quick Selection Chart

MODEL NUMBER & DESCRIPTION		MODEL	NOMINAL AIR FLOW RANGE STANDARD CUBIC FEET/MINUTE (29.92" Hg. Abs. & 70°F) (SCFM)		
<b>Model 50MK10</b>		<b>Pipe Size</b>			
	Utilizes stainless steel capillary tubes cemented into a stainless steel body. Inlet, outlet, and differential pressure connections are 1/4" NPT.	1/4" 1/4" 1/4" 1/4" 1/4" 1/4" 1/4" 1/4"	50MK10-8 50MK10-7 50MK10-6 50MK10-5 50MK10-4 50MK10-3 50MK10-2 50MK10-1	.00019 .00062 .00124 .0025 .0046 .0081 .0149 .046	SCFM @ 4" water diff. " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " "
<b>Model 50MJ10</b>					
	All stainless steel unit with fused matrix. Differential pressure connections are 1/4" NPT. Line connections 1/2" NPT, except Type 9 which has a 3/4" NPT.	1/2" 1/2" 1/2" 1/2" 1/2" 3/4"	50MJ10-14 50MJ10-13 50MJ10-12 50MJ10-11 50MJ10-10 50MJ10-9	0.10 0.18 0.38 0.70 1.60 3.00	SCFM @ 8" water diff. " " " " " " " " " " " " " " " " " " " " " " " " " " " " " "
<b>Model 50MW20</b>					
	All stainless steel welded unit with fused matrix. Line connections are threaded. Differential pressure connections are 1/4" NPT.	1" 1 1/2" 2"	50MW20-1 50MW20-1 1/2 50MW20-2	7.5 22.0 40.0	SCFM @ 8" water diff. " " " " " " " " " "
<b>Model 50MH10</b>					
	All stainless steel unit with fused matrix. Line connections are plain ends (no threads) for hose connection. Differential pressure connections are 1/4" NPT.	1" 1 1/4" 1 1/2" 2" 3" 4" 5" 6" 8" 10" 12" 16"	50MH10-1 50MH10-1 1/4 50MH10-1 1/2 50MH10-2 50MH10-3 50MH10-4 50MH10-5 50MH10-6 50MH10-8 X 50MH10-10 X 50MH10-12 X 50MH10-16 X	7.5 16.0 23.0 40.0 90.0 160.0 250.0 360.0 640.0 1000.0 1440.0 2250.0	SCFM @ 8" water diff. " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " "
<b>Model 50MY15</b>					
	All stainless steel unit with fused matrix. Differential pressure connections are 1/4" NPT. Line connections are 150 lb. flanges.	2 1/2" 3" 4" 5" 6" 8" 10" 12" 16"	50MY15-2 1/2 50MY15-3 50MY15-4 50MY15-5 50MY15-6 50MY15-8 X 50MY15-10 X 50MY15-12 X 50MY15-16 X	60.0 90.0 160.0 250.0 360.0 640.0 1000.0 1440.0 2250.0	SCFM @ 8" water diff. " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " " "
<b>Model 50MR2</b>					
	This unit is for low pressure applications. Differential pressure connections are 1/4" NPT. Aluminum 150 lb. flanges are furnished at inlet and outlet	2" 4" 6" 8"	50MR2-2 50MR2-4 50MR2-6 50MR2-8	100.0 400.0 1000.0 2250.0	SCFM @ 8" water diff. " " " " " " " " " " " " " " " " " " " "
<b>Model 50MC2</b>					
	This unit is for low pressure applications. Differential pressure connections are 1/4" NPT. Designed for use with hose for line connections at inlet and outlet	FOR HOSE 2" I.D. 4" I.D. 6" I.D. 8" I.D.	50MC2-2 50MC2-4 50MC2-6 50MC2-8	100.0 400.0 1000.0 2250.0	SCFM @ 8" water diff. " " " " " " " " " " " " " " " " " " " "

**MODEL NUMBER & DESCRIPTION**

NOMINAL AIR FLOW RANGE  
(760 MM Hg. Abs. & 21.1°C)

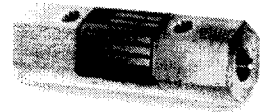
**Model 50MK10**



Utilizes stainless steel capillary tubes cemented into a stainless steel body. Inlet, outlet, and differential pressure connections are 1/4" NPT.

CC/MIN	LPM	Kg/M	MAX DP MM H <sub>2</sub> O
5.38	0.00538	6.44 x 10 <sup>-6</sup>	101.6
17.5	0.0175	2.10 x 10 <sup>-5</sup>	101.6
35.1	0.0351	4.21 x 10 <sup>-5</sup>	101.6
70.8	0.0708	8.48 x 10 <sup>-5</sup>	101.6
130	0.130	1.56 x 10 <sup>-4</sup>	101.6
229	0.229	2.75 x 10 <sup>-4</sup>	101.6
422	0.422	5.06 x 10 <sup>-4</sup>	101.6
1300	1.30	0.00156	101.6

**Model 50MJ10**



All stainless steel unit with fused matrix. Differential pressure connections are 1/4" NPT. Line connections 1/2" NPT, except Type 9 which has a 3/4" NPT.

2830	2.83	0.00339	203.2
5100	5.10	0.0061	203.2
10700	10.8	0.0129	203.2
19800	19.8	0.0237	203.2
45300	45.3	0.0543	203.2
85000	85.0	0.102	203.2

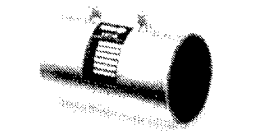
**Model 50MW20**



All stainless steel welded unit with fused matrix. Line connections are threaded. Differential pressure connections are 1/4" NPT.

2.12 x 10 <sup>5</sup>	212	0.254	203.2
6.23 x 10 <sup>5</sup>	623	0.746	203.2
1.13 x 10 <sup>6</sup>	1130	1.357	203.2

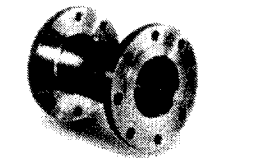
**Model 50MH10**



All stainless steel unit with fused matrix. Line connections are plain ends (no threads) for hose connection. Differential pressure connections are 1/4" NPT.

2.12 x 10 <sup>5</sup>	212	0.254	203.2
4.53 x 10 <sup>5</sup>	453	0.543	203.2
6.51 x 10 <sup>5</sup>	651	0.780	203.2
1.13 x 10 <sup>6</sup>	1130	1.35	203.2
2.55 x 10 <sup>6</sup>	2550	3.05	203.2
4.53 x 10 <sup>6</sup>	4530	5.43	203.2
7.08 x 10 <sup>6</sup>	7080	8.48	203.2
1.02 x 10 <sup>7</sup>	10200	12.2	203.2
1.81 x 10 <sup>7</sup>	18100	21.7	203.2
2.83 x 10 <sup>7</sup>	28300	33.9	203.2
4.07 x 10 <sup>7</sup>	40800	48.8	203.2
6.37 x 10 <sup>7</sup>	63700	76.3	203.2

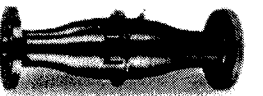
**Model 50MY15**



All stainless steel unit with fused matrix. Differential pressure connections are 1/4" NPT. Line connections are 150 lb. flanges.

1.69 x 10 <sup>6</sup>	1700	2.03	203.2
2.55 x 10 <sup>6</sup>	2550	3.05	203.2
4.53 x 10 <sup>6</sup>	4530	5.43	203.2
7.08 x 10 <sup>6</sup>	7080	8.48	203.2
1.01 x 10 <sup>7</sup>	10200	12.2	203.2
1.81 x 10 <sup>7</sup>	18100	21.7	203.2
2.83 x 10 <sup>7</sup>	28300	33.9	203.2
4.07 x 10 <sup>7</sup>	40800	48.8	203.2
6.37 x 10 <sup>7</sup>	63700	76.6	203.2

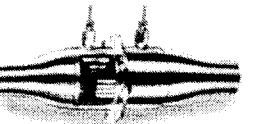
**Model 50MR2**



This unit is for low pressure applications. Differential pressure connections are 1/4" NPT. Aluminum 150 lb. flanges are furnished at inlet and outlet

2.83 x 10 <sup>6</sup>	2830	3.39	203.2
1.13 x 10 <sup>7</sup>	11300	13.6	203.2
2.83 x 10 <sup>7</sup>	28300	33.9	203.2
6.37 x 10 <sup>7</sup>	63700	76.3	203.2

**Model 50MC2**



This unit is for low pressure applications. Differential pressure connections are 1/4" NPT. Designed for use with hose for line connections at inlet and outlet

2.83 x 10 <sup>6</sup>	2830	3.39	203.2
1.13 x 10 <sup>7</sup>	11300	13.6	203.2
2.83 x 10 <sup>7</sup>	28300	33.9	203.2
6.37 x 10 <sup>7</sup>	63700	76.3	203.2

# LAMINAR FLOW ELEMENT (LFE) TECHNICAL NOTES

## Accuracy levels available:

commercial calibration  $\pm 0.86\%$

reading: master calibration  $\pm 0.70\%$

reading: independent lab calibration  $\pm 0.5\%$  reading.

## Units available to measure 15,000 SCFM.

## All units available with filters except those marked with X.

**For pressures greater than 30 PSIG or 120° F**, Meriam Instrument recommends the Universal Calibration Curve Method for calculating flow rate through an LFE. This method incorporates density corrections instead of the ideal gas law corrections common to the Classical LFE equations. While the Classical equations are excellent at conditions below 30 PSIG or 120° F, the Universal Calibration Method provides more accurate results above these values. Consult Meriam for your higher pressure or temperature applications and for sizing assistance.

## NOTES

1. The flows and differential pressure rating of production units are subject to a variation of plus or minus 10% from the nominal values listed above.
2. Each LEE unit is calibrated with air to Meriam flow standards, which are traceable to the National Institute of Standards and Technology. Meriam calibration flow curves are furnished with each unit.
3. A special service is available for those Meriam LEE units, which are governed by quality programs requiring periodic recalibration. The Special Calibration Procedure A-33544 is designed to meet the basic requirements of 10CFR50, ANSI-Z540-I & ML-Q-9858A. Contact Meriam direct for further information.
4. The catalog capacities refer to the following base conditions: Base flowing gas: Air. Base pressure 29.92" mercury absolute. Base temperature: 70° F, 530°R absolute. Base viscosity: 181.87 micropoise. Base Reynolds Number: 300 at 8" H<sub>2</sub>O, 150 at 4" H<sub>2</sub>O.
5. SCFM defined : see section on how to size Laminar Flow Elements
6. All units are offered with optional integral filter on inlet side except those marked (X). Removal or replacement of filter necessitates recalibration.
7. Rated flow pressure and temperature for standard units are 30 psig and 150° F. to maintain laminar flow, calibration, linearity and accuracy. For higher pressure and temperature ratings call your Meriam Representative or Meriam Instrument.

## INSTALLATION

Due to asymmetry of filter elements, calibration accuracy of assembly cannot be guaranteed if filter is removed for any reason. If filter is removed, the assembly should be recalibrated to ensure accurate performance.

# LFE Sizing Worksheet

Date: \_\_\_\_\_

Customer Name: \_\_\_\_\_

POC: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

Fax: \_\_\_\_\_

Customer No. : \_\_\_\_\_

MERIAM No. : \_\_\_\_\_

Tag or ID No. : \_\_\_\_\_ Service Description: \_\_\_\_\_

GAS: \_\_\_\_\_ (AIR) (ARGON) (CARBON DIOXIDE) (HELIUM) (HYDROGEN)  
(NITROGEN) (OXYGEN)

STANDARD CONDITIONS: \_\_\_\_\_ DEG \_\_\_\_\_ (70 DEG F)  
(29.92" HG ABS.)

TEMPERATURE AT FLOW: \_\_\_\_\_ DEG (F) (C) (R) (K)

FLOWING PRESSURE UNITS: ("Hg @ 0 DEG C) (mm Hg @ 0 DEG C) (" H<sub>2</sub>O @ 4 DEG C)  
(mm H<sub>2</sub>O @ 4 DEG C) (cm H<sub>2</sub>O @ 4 DEG C) (PSI)  
(Kg/m<sup>2</sup>) (Bar) (MILLIBAR) (PASCALS)

FLOW: (MASS) \_\_\_\_\_ (POUNDS) (KILOGRAMS)  
(SECONDS) (MINUTE) (HOUR)  
(VOLUME) \_\_\_\_\_ (ACTUAL) (STANDARD)  
(CUBIC CENTIMETER) (CUBIC FOOT) (CUBIC METER) (LITER)  
(SECONDS) (MINUTE) (HOUR)

SPECIFIC GRAVITY: \_\_\_\_\_ (MOLECULAR WT. OF FLOWING GAS / 28.95)

VISCOSITY: \_\_\_\_\_ (MP) (CP) (LB. SEC/FT<sup>2</sup>) (LB/(FT•S))  
(PASCAL SEC)

DENSITY \_\_\_\_\_ (LB/FT<sup>3</sup>) (Kg/CM<sup>3</sup>) (Kg/M<sup>3</sup>) (g/CM<sup>3</sup>)