VANE FLOW METER

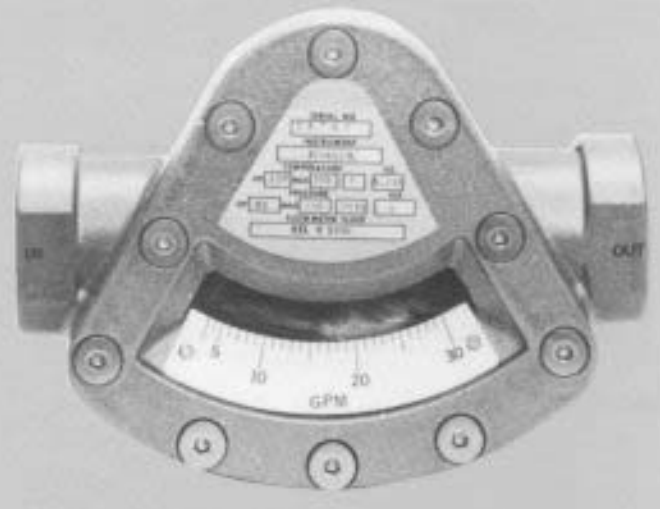
Measures gases, liquids and steam

PRODUCT DESCRIPTION

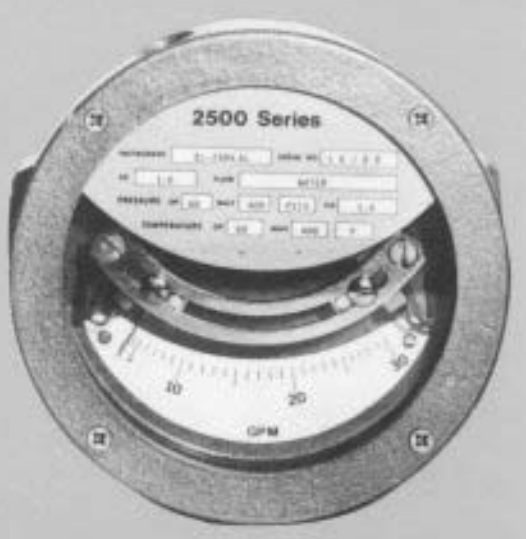
These rugged in-line meters measure rate of flow in SCFM, GPM, PPH and any other engineering units. They are available in pipe sizes from ½" through 12" and suitable for media temperatures to 400°F and pressures to 200 psig.

FEATURES

- 10 to 1 turndown standard metering range (40 to 1 optional on 400 Series)
- Accuracy ±2%
- No electrical connections
- Easy to install
  - ½", ¾" and 1" meters have female NPT threaded ends
  - 1½" through 12" meters are available with male NPT threaded ends, weld ends or 150# flanges
- Available in aluminum, brass, carbon steel or stainless steel to match any pipe material
- Can be used for horizontal or vertical flows
- Low maintenance — wedge shape of meter housing is practically self-cleaning
- 2500 Series can be equipped with
  - high and low limit switches
  - analog or frequency output transmitter



400 Series for gases and clear liquids has optional 40 to 1 turndown.



2500 Series for steam and non-transparent fluids

OPERATION

Each vane flowmeter is calibrated for the specific fluid and metering application and comes with a direct reading scale in the range desired. Vane position directly indicates flow rate in this variable area/differential pressure device. Media flows through the meter with a minimum pressure loss — usually .25 to 2 psig.

The 400 Series has an alloy vane indicator which is visible through a tempered glass window. The fluid can be visually inspected for color, clarity and flow. The vane is readable as it marks flow position on the scale. 10 to 1 turndown scale is standard; 40 to 1 turndown is available as an option.

The 2500 Series has an alloy vane which is magnetically coupled to the visible indicator. This model must be used for steam and other non-transparent fluids which would obscure vane position. Any 10 to 1 turndown range within the maximum and minimum limits can be selected. The 2500 Series can be equipped with one or two limit switches or an analog/frequency output transmitter.

INSTALLATION

The meter assembly can be threaded, welded or installed with flanges directly in the pipe. Ten pipe diameters are required upstream and five downstream of the meter. Locate valves or regulators downstream. The meter housing is available in aluminum, brass or stainless steel. Aluminum is usually used for air and gases, brass for liquids or steam.

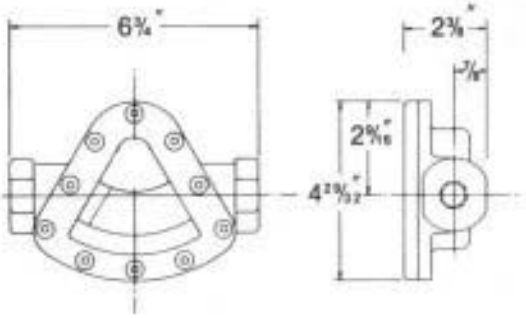
The ½", ¾" and 1" meter housings have female NPT threaded ends which are installed directly in the line. In the larger sizes, the meter housing includes a shunt which is installed in the line. The shunt material is usually carbon steel to match the mating pipe, but is also available in aluminum, brass or stainless steel. End connections can be male NPT threaded, weld ends, or 150# flanges.

400 Series with flanged shunt

DIMENSIONS

400 Series

½" to 1" Meters



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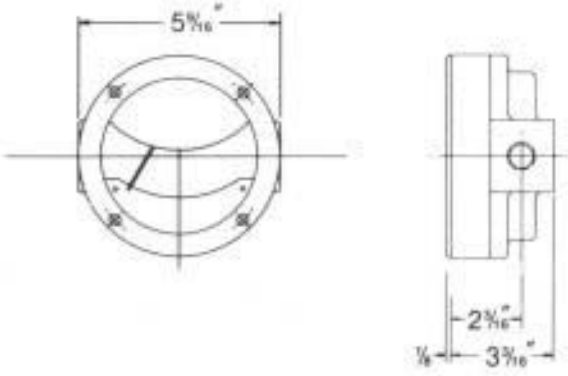
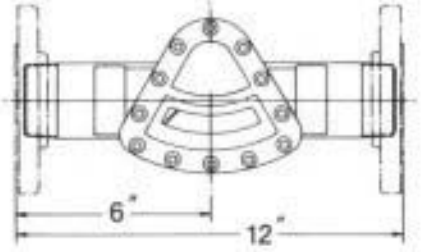


400 Series with shunt

1½" to 12" Meters



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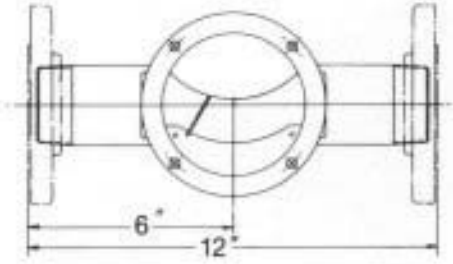

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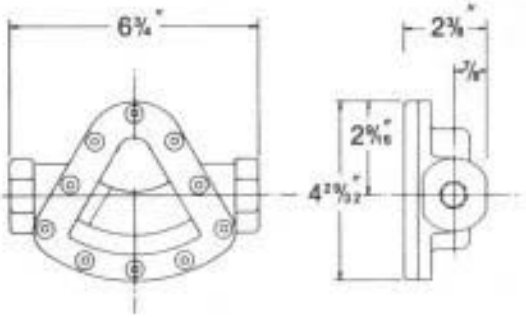

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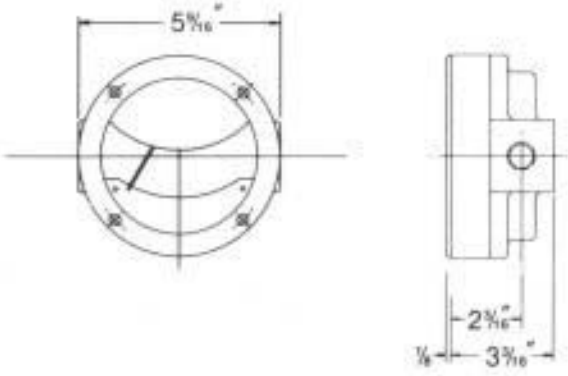

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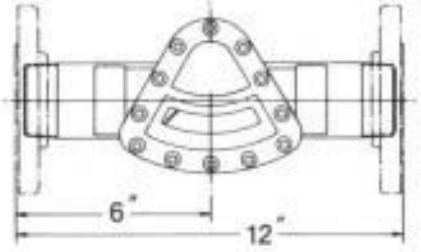

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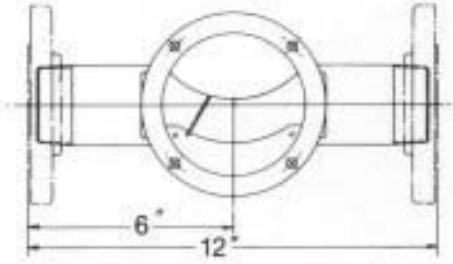

GASES AND LIQUIDS

Any 10 to 1 flow range may be selected within the minimum-maximum limits shown for each size meter. 40 to 1 range is available as an option on the 400 Series meters.

The meter is ideal for most liquids. Maximum operating temperature is 400°F, maximum viscosity is 300 centistokes. No. 2 oil and heated No. 6 oil are less than 300 cSt.

The maximum line pressure loss for gases is less than .30 psi. Loss for liquid flows will normally be 1 or 2 psi. However, if the range of the meter is near the maximum, the loss will be greater.

The charts below are shown in SCFM and GPM, however, meters can be scaled in any engineering units such as SCFH, GPM, ACFM, ACFH, PPM, PPH, etc.

Air: Minimum & Maximum Flow Rates SCFM

Meter Size	0 psig	10 psig	25 psig	50 psig	75 psig	100 psig	150 psig
½"	.4 - 10	.6 - 13	.7 - 16	.9 - 21	1.0 - 25	1.2 - 28	1.4 - 33
¾"	.4 - 15	.6 - 20	.7 - 25	.9 - 31	1.0 - 37	1.2 - 42	1.4 - 50
1"	.6 - 30	.8 - 39	1.0 - 50	1.3 - 63	1.5 - 75	1.7 - 84	2.0 - 100
1½"	1.5 - 200	2 - 260	3 - 330	3 - 420	4 - 495	5 - 560	5 - 670
2"	2.0 - 250	3 - 325	4 - 410	5 - 525	5 - 620	6 - 700	7 - 835
2½"	3.0 - 300	4 - 390	5 - 495	7 - 630	8 - 740	9 - 840	10 - 1000
3"	4 - 500	6 - 650	7 - 820	9 - 1050	10 - 1235	12 - 1400	14 - 1670
4"	4 - 1000	6 - 1300	7 - 1620	9 - 2100	10 - 2470	12 - 2800	14 - 3345
6"	8 - 2000	9 - 2590	12 - 3280	15 - 4200	18 - 4940	20 - 5585	25 - 6690
8"	10 - 2000	13 - 2590	16 - 3280	21 - 4200	25 - 4940	28 - 5585	33 - 6690
10"	15 - 2000	20 - 2590	25 - 3280	31 - 4200	37 - 4940	42 - 5585	50 - 6690
12"	20 - 2000	26 - 2590	33 - 3280	42 - 4200	50 - 4940	56 - 5585	67 - 6690

Notes: 1. The above flows are based on air at 60°F. At 200°F reduce the limits by 11%, at 400°F reduce by 22%.
2. Flow rates are based on a Specific Gravity of 1.00. For lighter gases, increase the limits; for heavier gases, decrease. For natural gas at .6 S.G., increase 30%; for propane at 1.55 S.G., decrease by 20%.

Water: Minimum & Maximum Flow Rates GPM

½"	.4 - 15	1"	.8 - 50	2"	4 - 200	3"	4 - 500	6"	20 - 2000	10"	75 - 2000
¾"	.4 - 30	1½"	3 - 200	2½"	4 - 300	4"	10 - 1000	8"	40 - 2000	12"	100 - 2000

Formula to calculate head loss for liquid flows:

$$\text{Loss (psi)} = \left[2 + 6\left(\frac{HF - 10\ MI}{MX - 10\ MI}\right)\right]\left[\frac{OF}{HF}\right]^2$$

Where: HF = Highest Flow (GPM) on selected meter
OF = Operating Flow (normal)
MX = Maximum Flow on sizing chart
MI = Minimum Flow on sizing chart

Example: To find the head loss for a 2" meter with the high end of the scale at 100 GPM and normal flow at 65 GPM.

$$\left[2 + 6\left(\frac{100 - (10 \times 4)}{200 - (10 \times 4)}\right)\right]\left[\frac{65}{100}\right]^2 = 1.8 \text{ psi}$$

This formula applies to meters greater than 1". For smaller sizes the loss will be approximately one-half the calculated value.

STEAM

Any 10 to 1 flow range may be selected within the minimum-maximum limits on the chart.

The pressure loss for steam is less than ½ psi for any flow listed.

Steam: Minimum & Maximum Flow Rates PPH

Meter Size	10 psig	25 psig	50 psig	75 psig	100 psig	150 psig	200 psig
½"	3 - 40	3 - 50	3 - 63	3 - 74	4 - 83	4 - 100	5 - 112
¾"	3 - 60	3 - 75	3 - 95	3 - 110	4 - 125	4 - 148	5 - 168
1"	3 - 120	4 - 150	4 - 190	5 - 220	5 - 250	6 - 295	7 - 335
1½"	6 - 810	8 - 1.0K	10 - 1.2K	11 - 1.4K	13 - 1.7K	15 - 2.0K	17 - 2.3K
2"	8 - 1.0K	10 - 1.2K	13 - 1.6K	15 - 1.8K	17 - 2.1K	20 - 2.5K	23 - 2.9K
2½"	12 - 1.2K	15 - 1.5K	19 - 1.9K	22 - 2.2K	25 - 2.5K	30 - 3.0K	34 - 3.4K
3"	17 - 2.0K	21 - 2.5K	26 - 3.2K	30 - 3.7K	34 - 4.2K	40 - 5K	45 - 5.6K
4"	17 - 4.0K	21 - 5.0K	26 - 6.4K	30 - 7.4K	34 - 8.3K	40 - 10K	45 - 11K
6"	31 - 8.0K	38 - 10K	48 - 13K	56 - 15K	63 - 17K	75 - 20K	85 - 22K
8"	40 - 8K	50 - 10K	65 - 13K	75 - 15K	85 - 17K	100 - 20K	115 - 22K
10"	60 - 8K	75 - 10K	100 - 13K	115 - 15K	130 - 17K	150 - 20K	170 - 22K
12"	80 - 8K	100 - 10K	130 - 13K	150 - 15K	170 - 17K	200 - 20K	230 - 22K

SPECIFICATIONS

	400 Series	2500 Series
Accuracy	±2% full scale	±2% full scale
Repeatability	±1% full scale	±1% full scale
Rangeability	10 to 1	10 to 1
Optional	40 to 1	N/A
Maximum pressure	200 psig	200 psig
Maximum temperature	250°F	400°F
Optional	400°F	
Materials of construction*		
Meter housing	aluminum (air) brass (liquids) 316SS	aluminum (air) brass (liquids or steam) 316SS
Shunt material	carbon steel, brass, aluminum or 316SS	
Window	tempered glass or	
Optional	polycarbonate (250°F)	
Vane	17-7 ph SS	cobalt/chromium/ nickel alloy
"O" rings	Buna-N	Viton
Pipe connections		
½" - 1"	FNPT threaded	
1½" - 12"*	MNPT threaded, weld ends or 150# R.F. flanges	

**Specify materials of construction and end connections when ordering.*

OPTIONS FOR 2500 SERIES

Transmitter

Analog output signal	4 - 20 mA
Frequency output signal	0 - 1000 hz
Signal load range	100 - 1000 ohms
Operating voltage	20 - 30 VDC
Input power	5 watts
Temperature limits	32 - 212°F
Maximum distance to input	5000 ft
Output signal accuracy	±2.0% full scale
Output signal repeatability	±.5% full scale

Limit switches

Number	one or two
Contact rating	0.25 amp, 120 VAC
Temperature limits	−10°F - 400°F
Adjustment limits	
Low limit	10 - 50% full scale
High limit	50 - 90% full scale
Low/high differential	30%
Accuracy	±2% full scale
Repeatability	±1% full scale

INFORMATION REQUIRED WHEN ORDERING

- Pipe size _____
- Scale range _____
- Fluid _____
- Line pressure _____
- Fluid temperature _____
- Specific gravity _____
- Viscosity (liquid) _____
- Flow direction _____
  - Left to right
  - Right to left
  - Up or down
- Housing material _____
- Shunt material _____
- Type of end connections _____

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