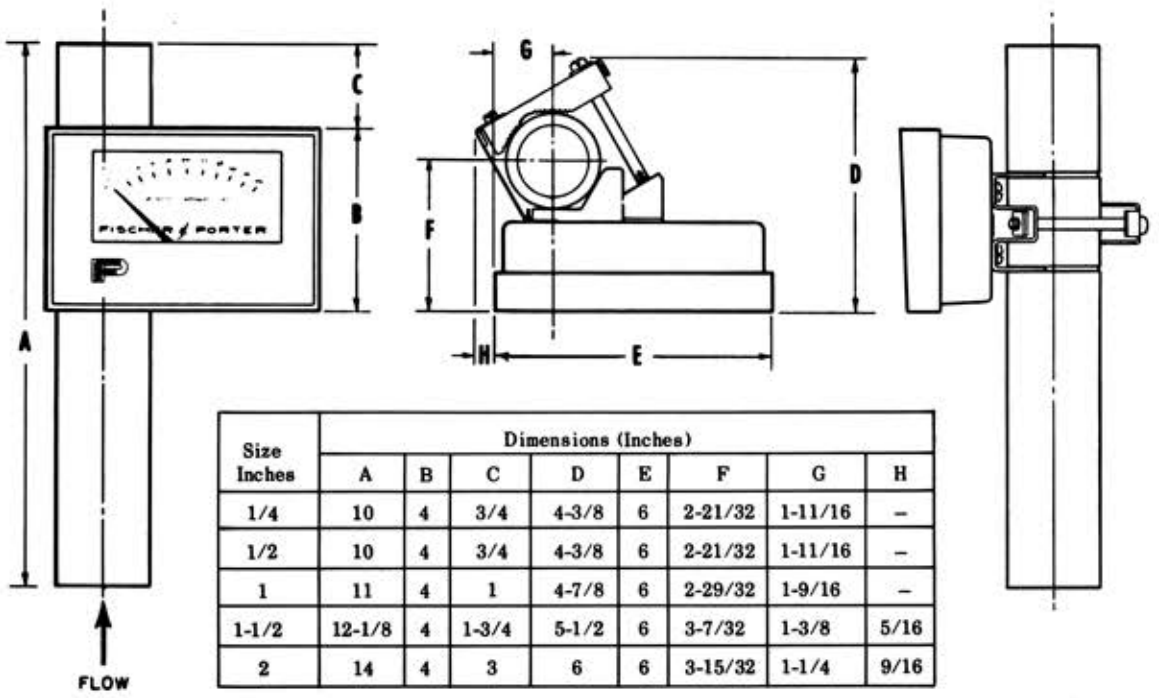
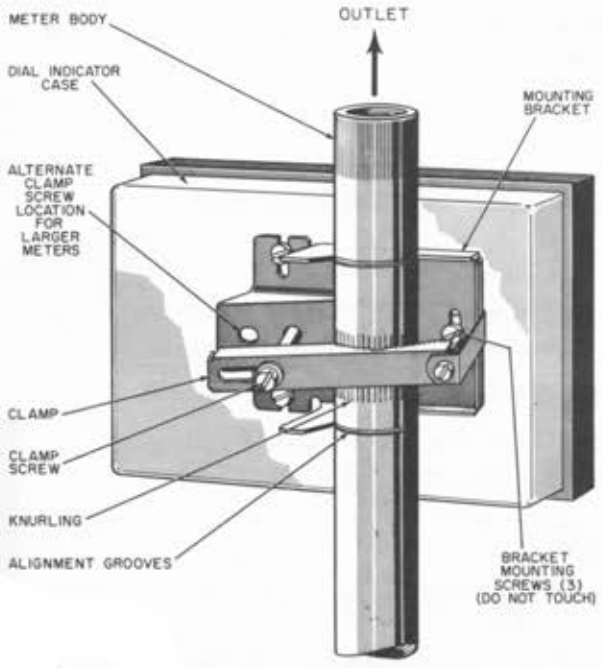
10A2227

DIMENSIONS



Size Inches	Dimensions (Inches)							
	A	B	C	D	E	F	G	H
1/4	10	4	3/4	4-3/8	6	2-21/32	1-11/16	–
1/2	10	4	3/4	4-3/8	6	2-21/32	1-11/16	–
1	11	4	1	4-7/8	6	2-29/32	1-9/16	–
1-1/2	12-1/8	4	1-3/4	5-1/2	6	3-7/32	1-3/8	5/16
2	14	4	3	6	6	3-15/32	1-1/4	9/16



INSTALLATION NOTES

No two meters should be mounted any closer together than 12" at any point; otherwise interaction between float and pointer magnets may occur.

Do not touch the bracket mounting screws. The bracket is positioned during factory calibration and the screws painted for reference.

Position the dial indicator case to any desired viewing angle by loosening clamp screw, rotating case and re-tightening screw.

FISCHER & PORTER COMPANY

GENERAL OFFICES: WARMINSTER, PENNSYLVANIA, U.S.A.

A world-wide control instrument company with manufacturing plants in Australia, Canada, England, France, West Germany, Italy, Mexico, Netherlands, Spain and U.S.A.

Pub. 15364a

Printed in U.S.A. August 1966

Specification

Variable Area Flowmeters
Variable Area Dial Flow Indicator
Series 10A2227

- **Easily Installed:** Unit mounts directly in vertical pipe line. Indicator case can be positioned 360º around meter body for best viewing angle.
- **Less Down Time:** Through-flow design prevents float-restricting buildup of dirt or process fluid. Snap-in retainer ring permits easy disassembly for cleaning.
- **No Seals to Leak:** Due to one-piece construction of seamless stainless steel tubing.

Series 10A2227
Variable Area Dial Flow Indicator

ABB Automation

VARIABLE AREA DIAL FLOW INDICATOR

The Fischer & Porter Series 10A2227A Dial Flow indicator is rugged, all metal, variable area meter for high pressure, high temperature flow indication. The metering float is magnetically coupled to an indicator housed in a fully gasketed, reinforced fiberglass case which is particularly suited for corrosive atmospheres and outside installations. This series is also available with 50FT1000 Pneumatic or Electronic Transmitter or Electronic Alarm. Refer To Specification 10A2227A-50FT1000.

Engineering Specifications

Performance:
Repeatability: 1% of full scale
Rangeability: From 10 to 100% of full scale reading (10 to 1 turndown)
Accuracy: ±5% of full scale reading
±3% of full scale reading with special calibration.
Maximum Temperature: 300°F (149°C) fluid at 75°F (24°C) ambient; 250°F (121°C) fluid at 140°F (60°C) ambient.
Maximum Pressure:

Connection Type	Max. Safe Static Working Pressure at			
	100 F (38 C)		300 F (149 C)	
	psig	kPa ga	psig	kPa ga
Theaded	1500	10342	1425	9825
Flanged (ANSI Class 150)	275	1896	195	1344

Connections:
NPT, Threaded or Flanged per ANSI Class 150 Raised Face.

Meter Size (Inches)	Meter Connection Size (Inches)	
	Vertical Threaded	Vertical Flanged
1/4	1/4	---
1/2	1/2	1/2
1	1	1
1-1/2	1-1/2	1-1/2
2	2	2

Mounting: Vertical, in-line.
Scales:
Standard: 4" scale length, graduated 10-100% full scale reading with standard factor for gph or gpm of water or scfm Air @ 14.7 psia and 70°F (101.3 kPa abs. and 21°C),
Optional: Special % of scale factors or direct reading.

Materials of Construction

Body (Threaded or Flanged) and Float: 316 SS
Snap Rings: ph 15-7MO Stainless Steel
Indicator Case: Reinforced fiberglass

Unit Weight

Meter Size	Connections			
	Threaded		Class 150 Flanges	
	lb	kg	lb	kg
1/4	10	4.5	---	---
1/2	10	4.5	14	6.4
1	13	5.9	17	7.7
1-1/2	17	7.7	23	10.5
2	20	9.1	25	11.4

Sizing

For sizing flowmeters with type 316 stainless steel floats when the required flow is of liquid (density 1.0 g/cc), or of gas (sp gr of air and at 14.7 psia and 70°F or 101.3 kPa abs and 21°C) the capacity table may be entered directly.
The conversion equations shown below permit the capacity tables to be used for other operating conditions.

Liquid Conversion

$$\text{gpm } H_2O = \sqrt{\frac{7.02 \times \rho}{8.02 - \rho}}$$

$$\text{gpm } H_2O = \frac{\text{lbs/min.}}{8.33 \times \rho} \sqrt{\frac{7.02 \times \rho}{8.02 - \rho}}$$

where:
gpm = desired maximum flow rate in gpm
lbs/min = desired maximum flow rate in pounds per minute
ρ = fluid density, g/cc at operating conditions
gpm H_2O = equivalent flow rate in gpm H_2O

TABLE I (LIQUID SERVICE)

Meters are suitable for water or low viscosity liquids only. All liquids above 4 cps. viscosity require special sizing by the Engineering Department and an actual hydraulic calibration.

Meter Size (Inches)	Standard Model				
	Cap. Code	Maximum Water Flow Rate		Pressure Loss at 100%	
		Std Factor	Metric L/min.	psi	kPa
1/4	B	10 gph	0.63	5.6	38.6
1/2	C	25 gph	1.58	1.1	7.6
	E	75 gph	4.73	1.2	8.3
	F	150 gph	9.45	1.5	10.3
1	G	5 gpm	18.9	2.0	13.8
	H	7.5 gpm	28.4	2.3	15.8
	J	15 gpm	56.8	3.3	26.2
1-1/2	K	25 gpm	94.5	3.8	26.2
	L	50 gpm	189	6.6	45.5
2	M	75 gpm	284	9	62
	N	100 gpm	378	11	76

TABLE II (GAS SERVICE)

Meter Size (Inches)	Standard Model					
	Cap. Code	Max. Air @ 14.7 psia & 70° F of Flow Rate		Pressure Loss at 100%		Min. Press. (1)
		Std Factor scfm	Metric Sm3/h	psi	kPa	psia
1/2	P	5.2	8.8	1.2	8.3	14.7
	Q	10.3	17.4	1.5	10.3	14.7
1	R	20.6	34.8	2.0	13.8	14.7
	S	30.9	52.2	2.3	15.8	14.7
	T	61.8	104.4	3.3	26.2	14.7
1-1/2	U	103.0	174.0	3.8	26.2	14.7
	V	206.0	348.0	6.6	45.5	14.7
2	W	309.0	522.0	9	62	14.7
	Y	412.0	696.0	11	76	14.7

(1) Minimum allowable operating pressure to eliminate possibility of float bounce.

Gas Conversion

scfm air equivalent at 14.7 psia and 70°F $= \text{scfm} \sqrt{\frac{\text{sp gr} \times 14.7 \times T_{op}}{1.0 \times P_{op} \times 530}}$

or

scfm air equivalent= lbs/min 13.34 at 14.7 psia and 70°F $\sqrt{\frac{1.0 \times 14.7 \times T_{op}}{\text{sp gr} \times P_{op} \times 530}}$

where:

scfm = desired maximum flow rate in scfm

sp gr = specific gravity of gas at standard temperature and pressure referred to air at standard temperature and pressure (14.7 psia and 70°F)

T_{op} = Absolute temperature (460 + °F) at operating pressure

P_{op} = Absolute pressure in psia at operating conditions scfm air equivalent = flow rate in scfm of air at 14.7 psia and 70°F with stainless steel float.

MODEL NUMBER DESIGNATION

10A2227AB **X X X** ___ ___ ___ **S X X X X X** ___ ___

Armored Dial Type Indicator 10A2227AB

Model Type
Indicator ..... X X X

Meter Size
1/4" (not available for gas service or with flanges) 2
1/2" 3
1" 4
1-1/2" 5
2" 6

Capacity
Enter Code fron Capacity Tables I or II ..... --

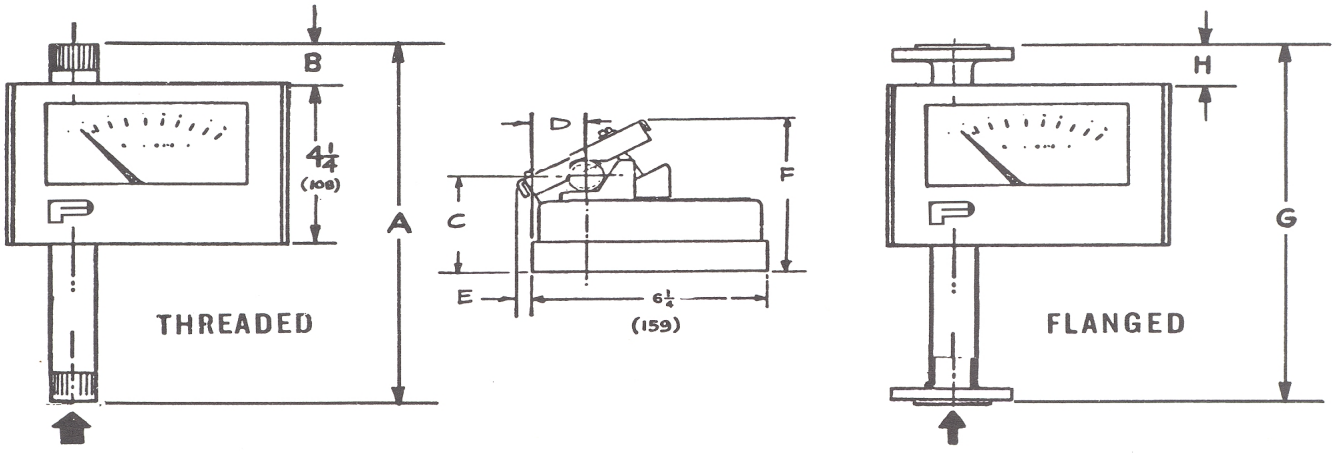
Scale
Percent of Maximum Flow 1
Direct Reading 2

Fitting Material
316 Stainless Steel ..... S

Connections
Threads - NPT ..... B
Flanged - ANSI Cl.150 R.F C

Calibration
Not Required (± 5% of Max. Flow ..... A
Required (±3% of Max. Flow) ..... B

DIMENSIONS



Meter (Inches)	NPT Threaded Size (Inches)	ANSI Flanged Size (Inches)	DIMENSIONS															
			A		B		C		D		E		F		G		H	
			inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1/4	1/4	–	10	254	5/8	15	2-1/4	57	1-13/16	46	–	–	3-15/16	100	—	–	–	–
1/2	1/2	1/2	10	254	5/8	16	2-1/4	57	1-13/16	46	–	–	3-15/16	100	10-1/4	260	3/4	19
1	1	1	11	279	7/8	22	2-1/2	63	1-11/16		–	–	4-7/16	113	11-1/4	286	1	25
1-1/2	1-1/2	1-1/2	12-1/8	308	1-5/8	41	2-13/16	71	1-1/2	38	3/16	5	5-1/16	129	12-1/2	317	1-7/8	48
2	2	2	14	356	2-7/8	73	3-1/6	78	1-3/8	35	7/16	11	5-9/16	141	14-1/4	362	3	76

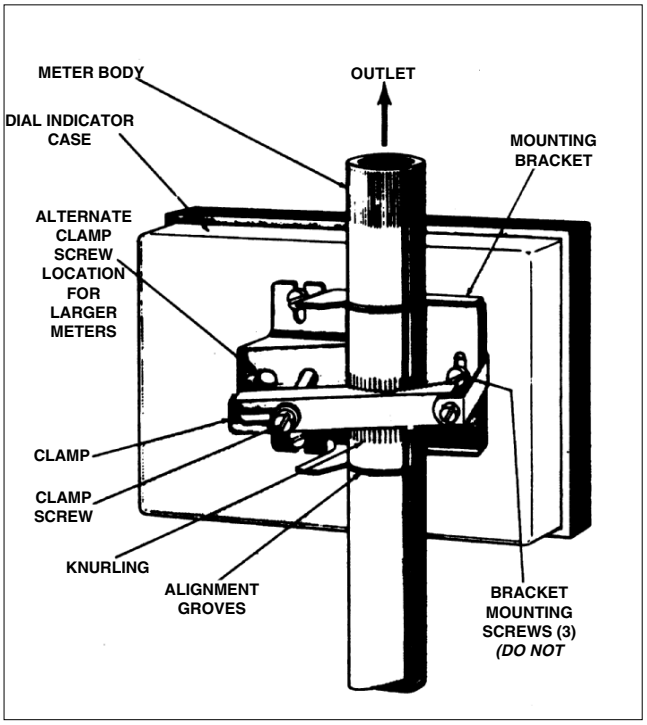
Installation Notes

No two meters should be mounted any closer together than 12" at any point; otherwise interaction between float and pointer magnets any occur.

Do not touch the bracket mounting screws. The bracket is positioned during factory calibration and the screws painted for reference.

Position the dial indicator case to any desired viewing angle by loosing clamp screw, rotating case and retightening screw.

This meter may not function properly if installed in a strong magnetic field.



Ordering Information

When Ordering Specify:

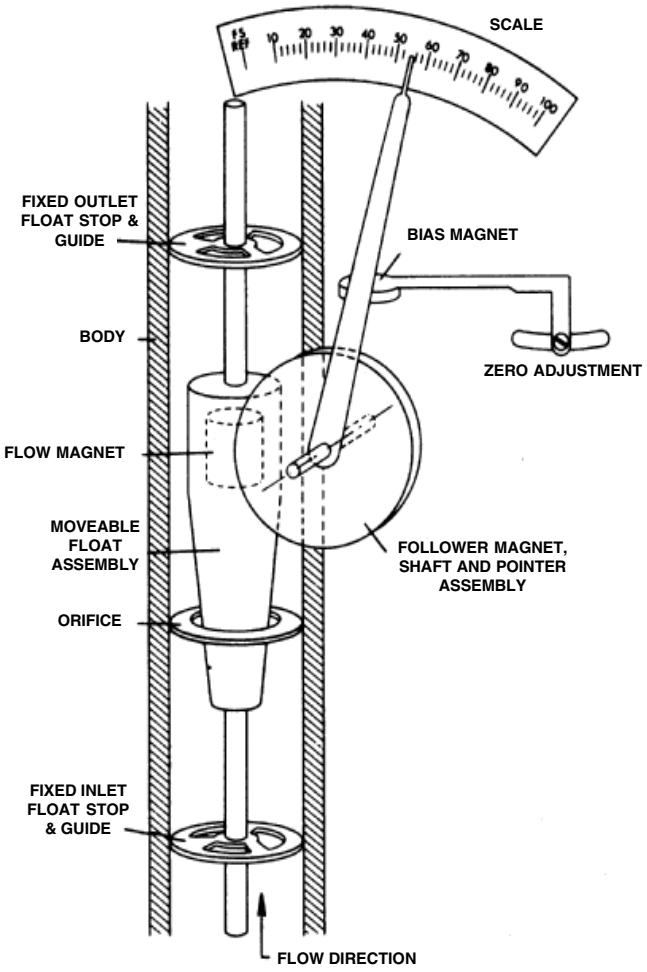
- Model or Part Number
- Meter Size
- End Connections (Threaded or Flanged)
- Fluid Measured
- If Liquid -- Density and Viscosity at Operating Temperature
- If Gas -- Specific Gravity or Density at Standard Conditions
- Operating Temperature or Pressure
- Maximum Flow Rate
- Scale Units
- Accuracy
- Allowable Pressure Loss

Principle Of Operation

Since the annular area between the tapered float body and the orifice bore is proportional to the vertical height of the float above the position of the fixed inlet float stop & guide, an increase in the flow rate will cause the float assembly to rise, seeking a larger area. Conversely as the flow decreases the float assembly moves down.

The position of the float is indicated by the rational position of the circular follower magnet connected to a pointer. A bias magnet is used to provide zero adjustment. This meter operates in accordance with standard rotameter principles and all standard correction formulae apply.

SONEMATIC DIAGRAM OF VARIABLE-AREA DIAL FLOW INDICATOR



NOTES

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VARIABLE AREA DIAL FLOW INDICATOR MODEL 10A2227A

The Model 10A2227A is an inexpensive, all metal, variable-area meter for high pressure, high temperature flow indication. The metering float is magnetically coupled to an indicator housed in a fully gasketed, reinforced fiberglass case; this case is suited for corrosive atmospheres and outside installation.

DESIGN FEATURES

- Accurate to within ±5% of maximum scale reading.
- Easily installed – mounts directly in vertical pipe line. Indicator case rotates 360° around meter body for best viewing angle.
- Less down time – through-flow design prevents float-restricting buildup of dirt or process fluid. Snap-in retainer ring permits easy disassembly for cleaning.
- Uninterrupted flow indication – magnetic coupling assures flow indication even with sudden flow changes.

ENGINEERING SPECIFICATIONS

PERFORMANCE

Rangeability: From 10 to 100% of full scale reading (10 to 1 turndown).

Accuracy: ±5% of full scale reading.

Capacities:

Size Inches	Water Flow	Pressure Drop, psi	Approx. Shipping Weight, lbs.
1/4	10 gph	1.0	10
1/2	150 gph 75 gph 25 gph	1.5 1.2 1.1	10
1	15 gpm 7.5 gpm 5 gpm	3.8 2.3 2.0	13
1-1/2	50 gpm 25 gpm	6.6 3.8	17
2	100 gpm 75 gpm	11 9	20

Meters suitable for gas service when operating pressures exceed 125 psig. Flow throttling valve close coupled to meter outlet recommended for all gas applications.

scfm air @ STP = gpm x 4.12

OPERATIONAL LIMITS

Maximum Temperature: 400 F

Maximum Pressure:

316 stainless steel – 1500 psig @ 100 F
Brass – 400 psig @ 100 F

PIPE CONNECTIONS: Threaded NPT – see table for size.

MOUNTING: Vertical, in-line.

SCALES: Graduated 10-100% full scale reading.

MATERIALS OF CONSTRUCTION

Body and Float Material: Brass or 316 stainless steel.

Snap Rings: PH 15-7MO stainless steel.

Case: Reinforced fiberglass.

HOW TO ORDER

Select maximum flow capacity from table.

To order, specify:

Order number — Model number 10A2227A
Quantity — Capacity

Material of construction (brass or 316 stainless steel)

Fluid—if other than water also specify specific gravity, operating temperature, pressure and viscosity.

Ordering Example: Model 10A2227A Flowrator, 50 gpm water, 316 stainless steel body and float, 1-1/2 NPT.

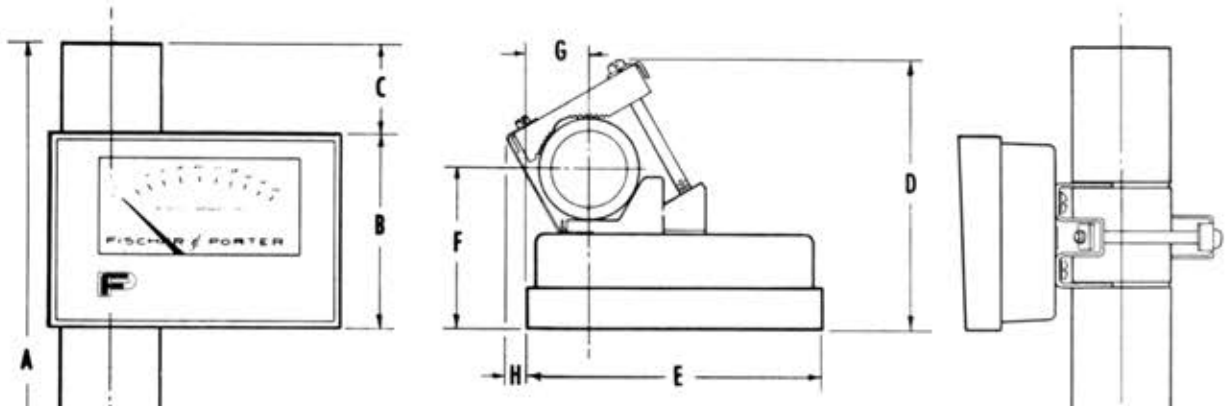
*Supersedes Specification 10A3/10A2227

FISCHER & PORTER

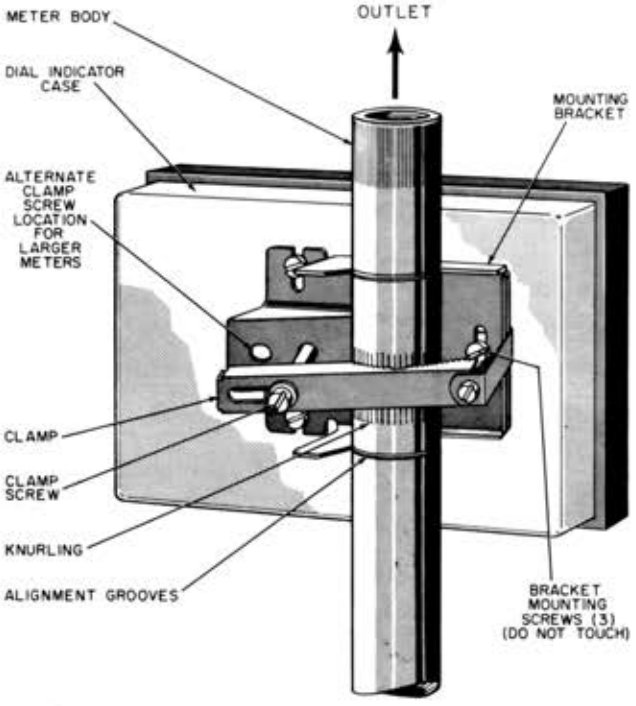
Complete Process Instrumentation

SPECIFICATION 10A1/10A2227*

DIMENSIONS



Size Inches	Dimensions (Inches)							
	A	B	C	D	E	F	G	H
1/4	10	4	3/4	4-3/8	6	2-21/32	1-11/16	–
1/2	10	4	3/4	4-3/8	6	2-21/32	1-11/16	–
1	11	4	1	4-7/8	6	2-29/32	1-9/16	–
1-1/2	12-1/8	4	1-3/4	5-1/2	6	3-7/32	1-3/8	5/16
2	14	4	3	6	6	3-15/32	1-1/4	9/16



INSTALLATION NOTES

No two meters should be mounted any closer together than 12" at any point; otherwise interaction between float and pointer magnets may occur.

Do not touch the bracket mounting screws. The bracket is positioned during factory calibration and the screws painted for reference.

Position the dial indicator case to any desired viewing angle by loosening clamp screw, rotating case and re-tightening screw.

FISCHER & PORTER COMPANY

GENERAL OFFICES: WARMINSTER, PENNSYLVANIA, U.S.A.

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Pub. 15364a

Printed in U.S.A. August 1966

INSTRUCTION BULLETIN

VARIABLE AREA FLOWMETERS
10A2227 Dial Indicator Purge Meter

INSTALLATION

I. GENERAL

The Model 10A2227 Dial Indicator Purgemeter is intended for vertical installation only. The inlet and outlet connections of the meter are tapped for either 1/4", 1/2", 1", 1-1/2" or 2" NPT as specified. The Dial Indicator Purgemeter is pipeline mounted and requires no external supports. If, however, there is excessive vibration in the pipeline, the inlet and outlet lines should be supported.

The metering tube is made of 316 stainless steel. Pressure ratings are as follows:

1500 psig @ 100^{o}F

1425 psig @ 300^{o}F

Because the upper end of the float extends 1" above the meter at maximum flow rate, a short length of straight pipe must immediately follow the meter outlet. Since the Dial Indicator Purgemeter operates on a magnetic bond principle between the meter float and pointer magnets, do not mount any two meters closer than 12" in any direction. Mounting the meter near a magnetic field or iron-bearing materials may affect the operation of the float and pointer.

II. MOUNTING

The indicator case may be removed from the meter body if desired to facilitate installation. This may be necessary when the Dial Indicator Purgemeter is installed against a wall or where clearance is otherwise restricted. To remove the indicator case, proceed as follows:

Refer to Fig. 1 for text reference.

1) Loosen and remove the clamp screw. Be careful not to lose the square nut on the underside of the bracket when the clamp screw is removed.

2) The clamp is now free and the dial indicator case may be lifted from the meter. Notice that the other end of the clamp is held to the dial indicator case by means of a thin, flexible strap.

After piping the meter into the line, replace the indicator case, if previously removed. When replacing the indicator case, make certain that the mounting bracket edges are in the alignment grooves as shown in Fig. 1.

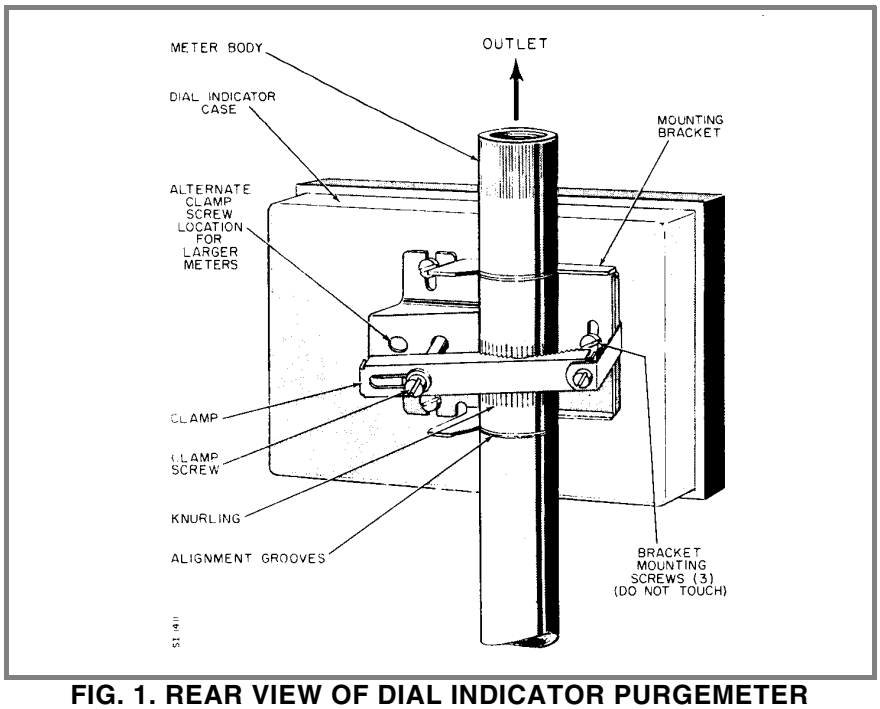

FIG. 1. REAR VIEW OF DIAL INDICATOR PURGEMETER

CAUTION

Do not touch the bracket mounting screws. This bracket was positioned at the time of factory calibration and the screws painted for reference.

The dial indicator case may be rotated to the desired viewing angle. Simply loosen the clamp screw and rotate the case. When the desired viewing angle is obtained, tighten the clamp screw.

III. ALIGNMENT

Prior to placing the Dial Indicator Purgemeter into operation and with no flow through the meter, perform the following steps: (Refer to Fig. 2.)

1) Remove the cover.

2) Remove the shipping screw and store it in the hole provided for future use as a calibration screw.

3) If pointer is on the FS REF mark (Float Stop Reference) no further adjustment is necessary. If pointer is not on the FS REF mark, loosen the lever lock screw and move the zero adjustment lever as required to position the pointer on the FS REF mark.

NOTE

When making the zero adjustment, move all ferrous materials & tools at least 12" from the indicator so they will not influence the pointer position.

4) Tighten the lever lock screw and replace the cover.

PLACING IN OPERATION

After making any adjustment required for zero correction, as noted under Alignment, turn on the fluid flow. The Dial Indicator Purgemeter is now operative.

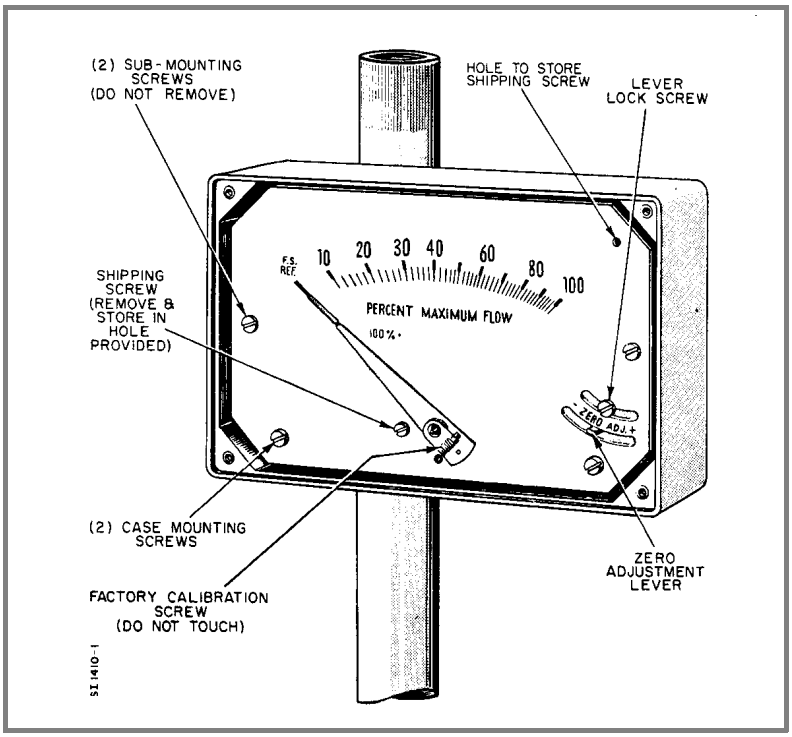

FIG. 2. FRONT VIEW WITH COVER REMOVED

NOTICE

READ THESE INSTRUCTIONS BEFORE INSTALLING THE INSTRUMENT.

PN24339

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INSTRUCTION MANUAL

ARMORED FLOWMETERS
10A2227-1

Used with Series 50FT1000
Flow Rate Indicator

SERIES 10A2227 ARMORED FLOWMETER

PN23586

ABB Automation

SPECIFICATIONS

Accuracy
- Standard ..... ±5% fsc
- Optional (at extra cost) ..... ±3% fsc

Design Pressure @ 100°F (38°C)
- NPT Connection ..... 1500 psig (10.3 MPa)
- ANSI Class 150 Flanges ..... 275 psig (1.9 MPa)

Temperature

Maximum Fluid
- •Used w/Pneumatic xmtr ..... 0 to 600°F (−18 to 316°C)
- •Used w/Electronic xmtr ..... 0 to 400°F (−18 to 204°C)
- •Used w/Electronic Alarm ..... 0 to 400°F (−18 to 204°C)

Ambient
- •Used w/Pneumatic xmtr ..... −40 to 212°F (−40 to 100°C)
- •Used w/Electronic xmtr ..... −40 to 150°F (−40 to 66°C)
- •Used w/Electronic Alarm ..... −40 to 150°F (−40 to 66°C)

Materials
- Body ..... 316 sst
- Retainers ..... ARMCO PH 15-7 MO
- Flanges (Optional) ..... 316 sst
- Float ..... 316 sst

INTRODUCTION

The Fischer & Porter Series 10A2227A Armored Flowmeter is an all metal variable area flowmeter. The meter is intended for vertical installation only. The inlet and outlet connections may be either threaded or flanged, as specified. The NPT internal connection is available in 1/4", 1/2", 1", 1½" and 2" sizes. Flat or raised face ANSI Class 150 flanges are available in 1/2", 1", 1½" and 2" sizes.

Since the meter tube is all metal and the float cannot be seen, a readout device is required. A Series 50FT1000 Flow Rate Indicator is one of the devices used for this purpose. Here, the position of the meter float, which contains a strong permanent magnet, is detected. Refer to the Instruction Bulletin furnished with the Indicator for additional details.

Figure 1 is a cross-section of the meter. In this variable area meter, the float is tapered rather than the tube as in the conventional meter. Notice that the annular area between the orifice bore and the tapered float changes as the float moves vertically. The upward flow will position the float, in dynamic balance, at a position directly proportional to flow rate. The position of the magnet embedded in the float is detected by the referenced Flow Rate Indicator.

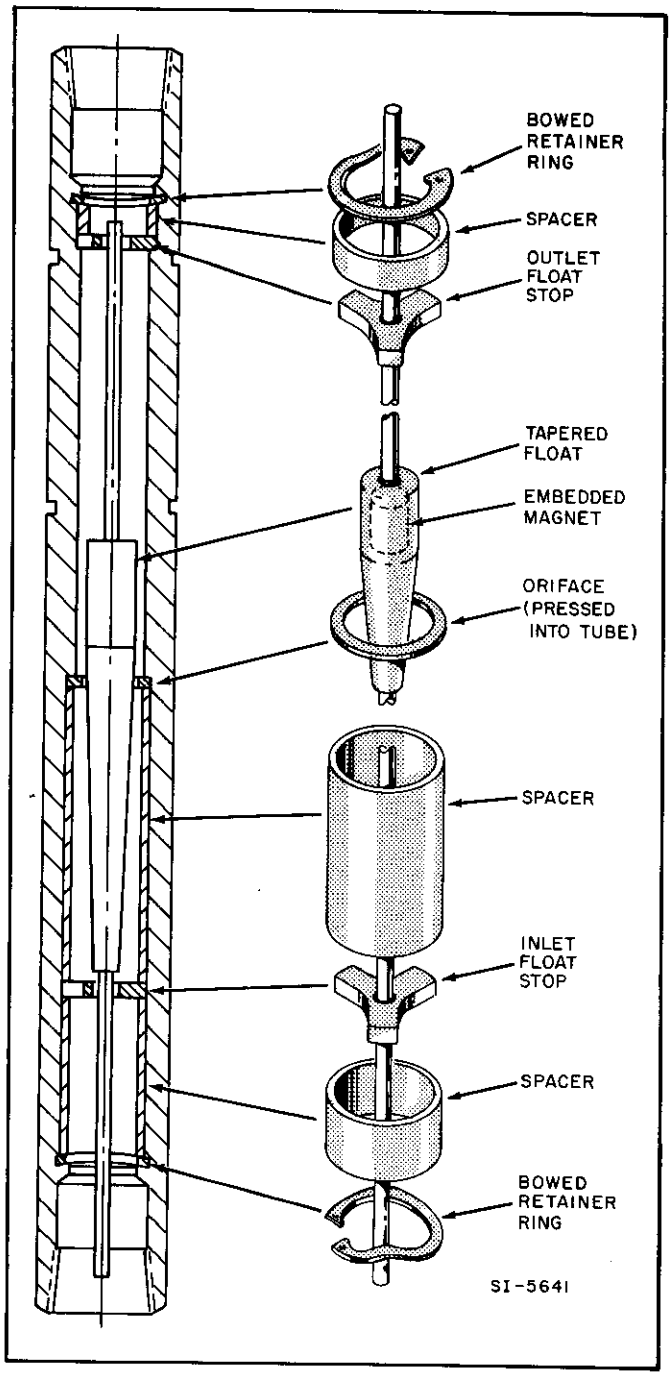


FIGURE 1. CROSS-SECTION

INSTALLATION

I. General

The upper end of the meter float extension extends approximately 1" beyond the meter body at maximum flow rate. Because of this, a short length of straight pipe must immediately follow the meter outlet.

The instructions given herein cover generally the description, installation, operation and maintenance of subject equipment. F&P reserves the right to make engineering refinements that may not be reflected in this Bulletin. Should any questions arise which may not be answered specifically by these instructions they should be directed to the Fischer & Porter Co. for further detailed information and technical assistance.

Since the Armored Flowmeter and its associated Flow Rate Indicator operate on a magnetic bond principal, avoid mounting near heavy electrical equipment; the nearest parallel running pipe line should ideally be 12" away.

The meter float is blocked in place for shipment. Remove the shipping pieces and check that the float is free to travel by moving it with the guide rod.

When installed, the meter tube should be vertical with the outlet at the top. The use of a spirit level or plumb bob to check the vertical alignment is recommended.

II. Process Piping

A. General

If the meter is to be installed in a process pipeline where shut-down is undesirable, a bypass manifold as shown in Figure 2 should be installed. The bypass valve must be absolutely leak tight to maintain the meter's accuracy. Many customers prefer to install two bypass valves in series to prevent the possibility of leaks. The bypass valve should be a globe type with a resilient seat and be large enough to pass the maximum flow rate. The shut-off valves should be of the gate type so that they do not disturb the flow profile.

If the meter is to be used in a process where stagnant areas in the pipeline are not permitted, the bypass line is not practical.

Maximum working pressure decreases as temperature increases. Refer to ANSI Std. B16.5 for additional information. Make certain that the operating conditions are within the reference specification.

B. Liquid Service

When the Armored Flowmeter is used for liquid service, the piping between the inlet and outlet shut-off valves should be the same as the meter size. Beyond these points the piping should be as large as economically practical. Control valves may be used in either the inlet or discharge piping without regard to the distance from the meter.

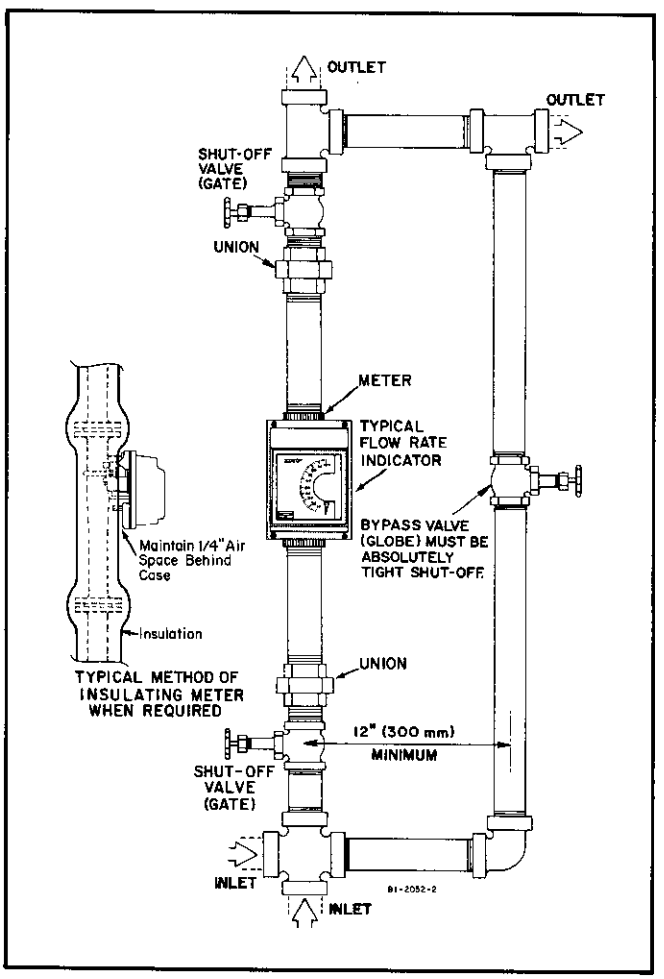


FIGURE 2. TYPICAL INSTALLATION OF METER WITH BYPASS MANIFOLD

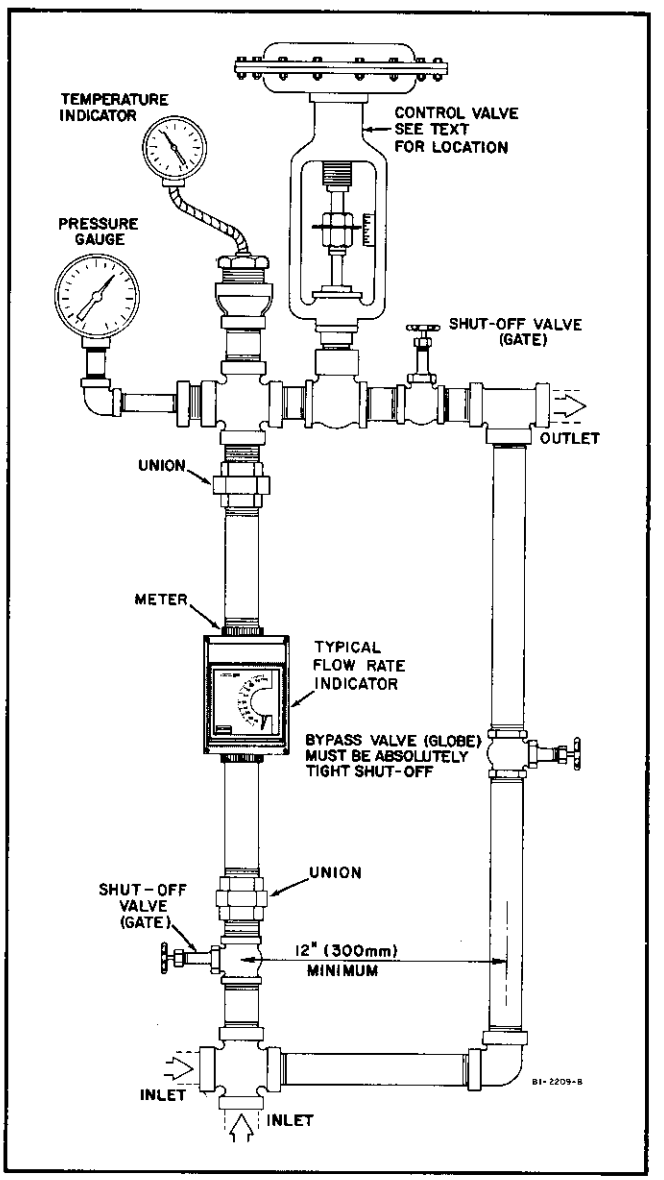


FIGURE 3. TYPICAL INSTALLATION OF METER FOR GAS SERVICE

C. Gas Service

Because gas is compressible, it must be metered at a known constant pressure and temperature (for which the instrument is calibrated). Operation at other conditions requires the use of correction factors. Usually the pressure on the downstream side of a gas flowmeter is maintained to avoid the use of correction factors. Pressure control can be accomplished by discharging into a constant pressure line or a control valve can be used. The control valve could be a simple hand valve or a diaphragm operated valve of some type. If the pressure control valve is placed on the discharge side of the meter keep it as close to the outlet as possible. If the pressure control valve is placed on the inlet side of the meter, place it 5 pipe diameters from the meter connection.

Piping between the inlet and outlet shut-off valves should be the same size as the meter. Beyond the shut-off valves, the piping should be as large as economically practical.

Figure 3 shows a typical installation of a meter used for gas service. Notice that the pressure and temperature are measured immediately downstream of the meter ahead of the pressure control valve.

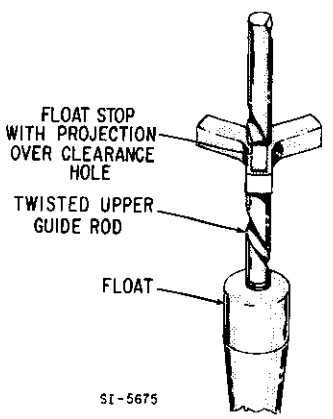
D. Surge Chambers and Accumulators

Surge Chambers and Accumulators are frequently used on flowmeter installations to smooth out pulsations of the meter float where reciprocating pumps or compressors are used on the feed line to the meter. Surge chambers, when used on liquid service, may have a gas padding pressure applied to the top of the chamber.

When it is objectionable to have a gas padding in contact with the liquid, accumulators are used. Accumulators are similar to surge chambers except that they include a rubber bag which seals the gas from the liquid. Accumulators usually have the rubber bag factory-sealed with nitrogen or other suitable gas, to a pressure of approximately 60% of the pumping pressure. It is recommended that the accumulator manufacturer be consulted for the correct size surge chamber or accumulator required to suite the installation.

MAINTENANCE

There is no routine maintenance to be performed. If the meter is to be disassembled for any purpose, refer to Figure 1, the cross-section, to aid the procedure. In the 1/4" size meter, additional 1/2" × 1/4" reducers are included in the meter's inlet and outlet connections. Also, the upper spacer and bowed retainer ring are not used; in their place is a spring, that holds the outlet float stop, by means of the outlet reducer bushing.



NOTE

When a meter is specified for gas service, the upper guide rod is a twisted design. The upper float stop is modified by the addition of a projection over the guide rod clearance hole. As the float moves vertically, due to changes in flow rate, the projection rides in the twisted slot of the guide rod causing the float to turn. This effectively damps the float's vertical motion, preventing oscillations, so that stable readings are provided.