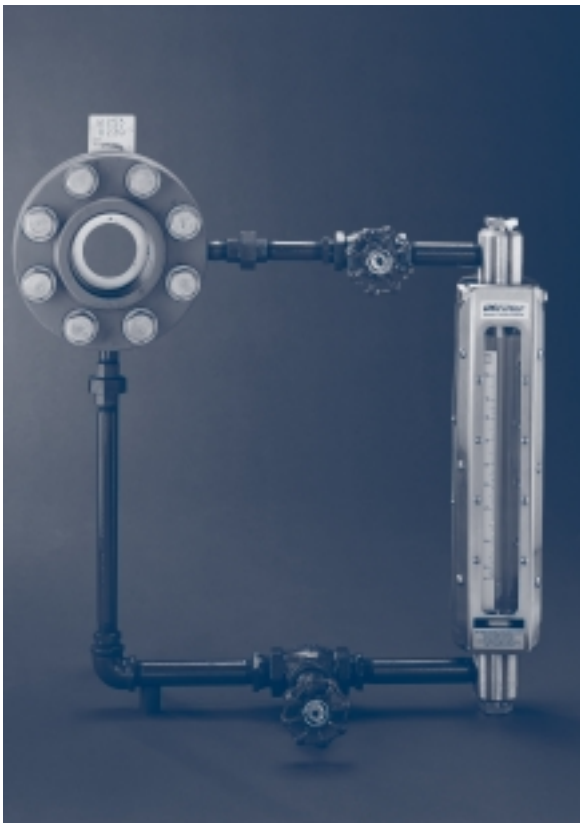
VAREA-METER® FLOW MEASUREMENT

BY-PASS TYPES



US Filter Wallace & Tiernan Products By-Pass Varea-Meter® can measure high volume flows through any pipeline that can be equipped with a standard differential-producing device. Accurate, reliable, and versatile, they are available in both Glass Tube Varea-Meter and Metal Tube Varea-Meter arrangements. A flow switch is optional on the Metal Tube type. An electronic transmitter can be substituted for the standard indicator with the Metal Tube Varea-Meter.

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FEATURES

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Accuracy

By-pass Varea-Meters are accurate to within 4% of full scale when main-line orifice installation conforms to ASME or AGA procedures and by-pass piping follows US Filter/Wallace & Tiernan Products recommendations.

Easy, Inexpensive Installation

Wallace & Tiernan Products By-pass Varea-Meters are shipped ready to install with the orifice in place. No mercurial or bellows-type manometer is required. Checking or snubbing devices can be omitted, as overranging is harmless. When the metal-tube meter's float is at rest, float extensions do not project beyond the flanges. Installation is easy.

Rugged Convenient Glass-Tube Meter

The glass-tube meter has a rigid, one-piece stainless steel frame. It features design simplicity and easy assembly. All o-rings are the same size. An external clamp holds the tube securely, and also makes it easy to remove.

Reliable Metal-Tube Metering

The metal-tube meter's float design discourages attraction of magnetic particles. A dry snubber gives reliable gas measurement down to atmospheric pressure without dashpots or offset piping. A powerful magnetic coupling between the float magnet and the follower magnet in the indicator unit and instrumentation makes for reliable indication, flow switching and transmission. The indicator unit is in a gasketed aluminum housing (NEMA 4X) and has a readable 6-inch percent scale. Other scale calibrations are optional.

Flow Switch Available

This optional, magnetically coupled switch for the metal-tube meter gives reliable high and/or low flow switching. It is easily set to open or close on increasing or decreasing flow, is compact and easily mounted on the meter. Available in a general purpose or a UL listed hazardous-location arrangement.

Reliable Flow Rate Transmission

The metal-tube meter offers an optional electronic transmitter. The transmitter is a low energy, high output load device. When used with an approved energy-limiting barrier, it is Factory Mutual approved as intrinsically safe in hazardous locations*. Position of the pointer and cam is achieved by a powerful magnetic linkage to the float. The cam has a captive follower, which positions the mechanical arm of a differential capacitance bridge sensor. Any change in the bridge causes a proportional change in the transmitter's 4-20mA output and in the bridge feedback voltage. The change in feedback voltage is used to rebalance the bridge. Zero and span adjustments are included.

- For stand-by operation, the transmitter is easily connected to operate from a battery system.
- A gasketed NEMA 4 enclosure protects the mechanism outdoors or in a dusty or corrosive atmosphere.

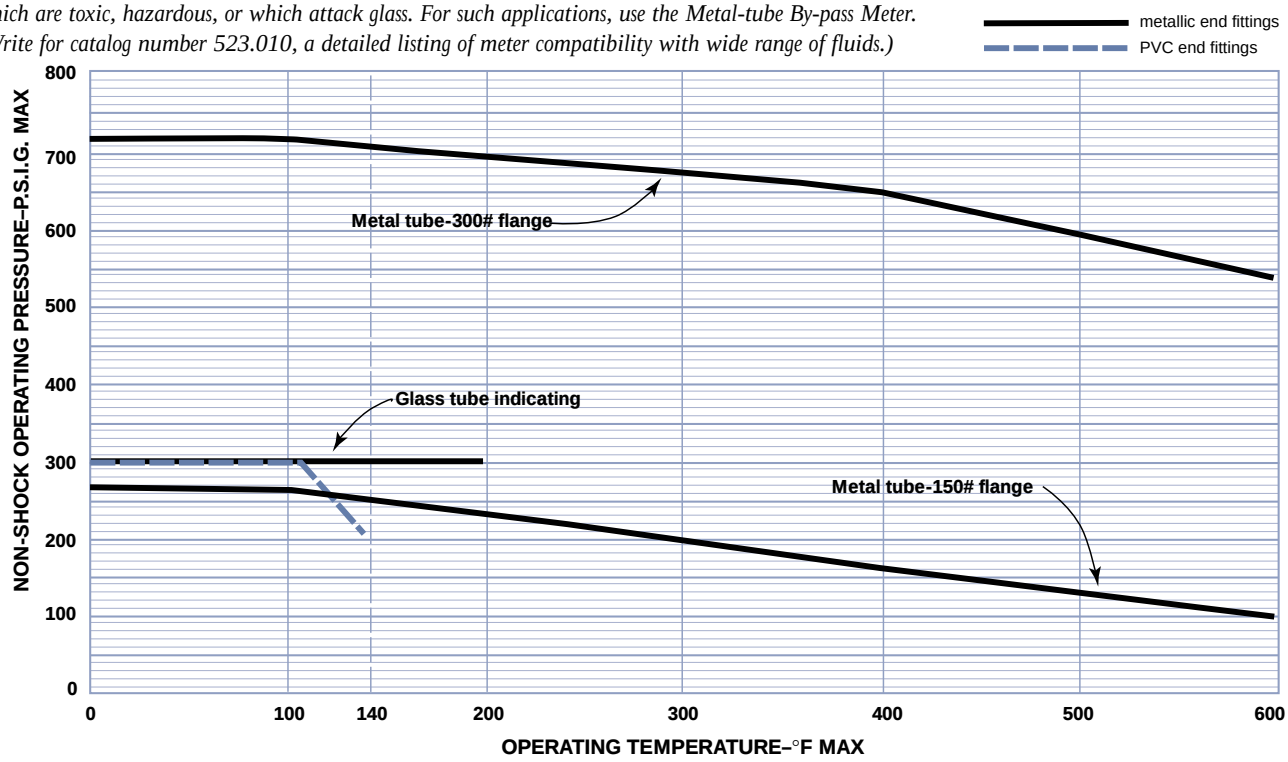
Choice of Arrangements

The transmitter is available in a Two-wire/Four-wire general purpose housing which when used with an approved energy-limiting barrier, is Factory Mutual approved as intrinsically safe* for hazardous locations. It is also available in an explosion proof* and dust-ignition proof* arrangement.
The transmitter gives reliable linear flow-proportional milliampere signals, but other characterizations are available. The transmitter is interchangeable with any other readout and may be used with a flow switch. Local readout is on a 6-inch scale; standard calibration is percent of maximum flow. Calibration in custom units is optional.

*As defined in Article 500, National Electrical Code.

RECOMMENDED MAXIMUM OPERATING PRESSURES

Warning: *Temperature & pressure limits must not be exceeded. Do not use Glass-tube By-pass Meters for fluids which are toxic, hazardous, or which attack glass. For such applications, use the Metal-tube By-pass Meter. (Write for catalog number 523.010, a detailed listing of meter compatibility with wide range of fluids.)*



BY-PASS VAREA-METER ARRANGEMENTS

	Glass-Tube Indicating	Metal Tube (1/2-inch tube)
accuracy	4% full scale	4% full scale
scale length	5" or 10"	6"
scale units	% std, others optional	% std, others optional
inlet	horizontal 1/2" NPT or 150# flange	vertical 1" 150 or 300# flange
outlet	horizontal 1/2" NPT or 150# flange	vertical 150 or 300# flange
max. f.s. differential	50, 100, 200, 400" water 7:1 10:1 10:1 10:1	50, 100, 200, 400" water 5:1 liquids; 3:1 gases 7:1 liquids; 4:1 gases 10:1 liquids; 6:1 gases 10:1 liquids; 8:1 gases
end fittings	brass, carbon steel 316 stainless, PVC	carbon steel 316 stainless
tubes	borosilicate glass	316 stainless
floats & orifices	316 stainless, Hast. C	316 stainless, Hast C
tube retainers	Kynar®, TFE	none
o-rings	Buna N, TFE	none
Flow switch	not available	optional
electronic transmitter	not available	optional
mainline orifice plate	optional	optional
mainline orifice flanges	optional	optional
by-pass piping	by customer	by customer

ORDERING PROCEDURE
BY-PASS VAREA-METER GLASS TUBE
LIQUID/GAS SERVICE

Note: *Your order number should consist of 19 characters.*

1		2	3	4	5					6		7		8	9
5	3	1	0			0	8	x	x		B	4		3		

1 SELECT CODE FOR BASIC ARRANGEMENT

5310

2 SELECT CODE FOR TUBE TYPE

B = 5" BEAD GUIDE
G = 10" BEAD GUIDE

3 SELECT CODE FOR CONNECTIONS

1= HORIZ NPT
3= HORIZ 150 lb.

4 SELECT CODE FOR END FITTINGS

1= BRASS
2= 316 STAINLESS
3= CRS
4= PVC

5 SELECT CODE FOR RETAINERS AND (O-RINGS)

STANDARD
1=KYNAR (BUNA N)
OPTIONAL
2=KYNAR **A**=TFE (BUNA N)
3=TFE **B**=TFE (VITON)
4=KYNAR **C**=TFE (EPR)

Warning: *Do not use glass-tube meters for fluids which are toxic, hazardous or attack glass.*

6 SELECT CODE FOR SCALE

A=GAS FUSED **H**=LIQUID FUSED
B=GAS DETACHED **I**=LIQUID DETACHED

7 SELECT CODE FOR MAIN LINE ORIFICE DIFFERENTIAL

A= 50"
B= 100"
C= 200"
D= 400"
See Table B on pg. 6

8 SELECT CODE FOR FLOAT MATERIAL

S= 316SS
H= HASTELLOY C

9 SELECT CODE FOR ACCESSORIES

X= NONE
D= PANEL MTG. BRACKETS (OPT.)

ORDERING PROCEDURE

Example: *To order a Glass tube By-Pass meter for a main line standard weight pipe of 6" Dia. and standard differential of 100" of H_2O with 10" detached scale, 316 SS floats, 316 SS NPT end fittings, Kynar retainers, Buna N o-rings, and no accessories specify:*

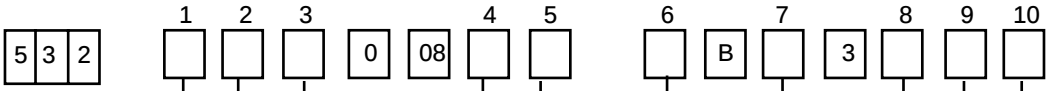
5310 G 1 2 1 08 X X I B 4 B 3 S X

ORDERING PROCEDURE

BY-PASS VAREA-METER METAL TUBE

LIQUID/GAS SERVICE

Note: *Your order number should consist of 19 characters.*



1 SELECT CODE FOR OUTPUT

0= INDICATOR ONLY (STANDARD)
1= INDICATOR W/GP INTEGRAL ALARM
2= INDICATOR W/I.S. INTEGRAL ALARM
3= GP 4-20mA 2/4 WIRE TRANSMITTER W/ INTEGRAL ALARM
4= GP 4-20mA 2/4 WIRE TRANSMITTER
6= EXPLOSION PROOF 4-20mA 2/4 WIRE XMITTER

2 SELECT CODE FOR CONNECTIONS

M2 = RF - 150lbs
M4 = RF - 300lbs

3 SELECT CODE FOR METER BODY

2 = 316 STAINLESS STEEL
6 = CRS FLANGE/316 SS BODY

4 SELECT CODE FOR EXTERIOR FLOW SWITCH

X= NONE (STANDARD)
A= GP 1 SWITCH
B= GP 2 SWITCHES
C= GP 1 SWITCH/1 RELAY
D= GP 2 SWITCHES/2 RELAYS
G= HAZ 1 SWITCH/1 RELAY
G= HAZ 2 SWITCHES/2 RELAYS

5 SELECT CODE FOR OPTIONAL

T = GLASS WINDOW
U = PLASTIC WINDOW (STANDARD)

6 SELECT CODE FOR FLUID TYPE

B = GAS
I = LIQUID

7 SELECT CODE FOR MAIN LINE ORIFICE DIFFERENTIAL

A = 50"
B = 100"
C = 200"
D = 400"
See Table B on pg. 6

8 SELECT CODE FOR FLOAT DISC MATERIAL

S = 316 STAINLESS
H = HASTELLOY C

9 TAG

X = NONE
1 = FOIL
2 = STAINLESS STEEL

10 SELECT VOLTAGE FOR BARRIER (Integral Switch Only)

X = NONE (STANDARD)
1 = 24V
2 = 120V
3 = 240V

ORDERING PROCEDURE

Example: *To order a Metal tube By-Pass meter for 8" Dia. main line standard weight pipe, and standard differential of 100" of H_2O with magnetic indicator plastic window, 316 SS float, 316 SS 150lb. Flanges and 316 SS meter body specify:*

532 0 M2 2 0 0 8 X U I B B 3 S XX

SELECTION PROCEDURE

METAL & GLASS TUBE SELECTION PROCEDURE

Gases: Consult Distributor for sizing

Liquid: See below

As indicated in Table B, By-Pass Meter capacities are determined by main line orifice design. Capacities shown are the maximum recommended flow rates for various sizes of standard weight main line pipe equipped with a sharp edge orifice having a 0.7 diameter ratio and mounted in standard orifice flanges. Such orifices produced full-scale float displacement in By-Pass Varea-Meters when main line differentials are 50, 100, 200, or 400 inches of water. Lower readings result when lower flow produces lower main line differentials. Flows in the tables are the maximum rates consistent with ASME and AGA recommended practice of limiting ratio of orifice diameter to inside pipe diameter to .07 maximum. This diameter ration gives an irrecoverable pressure loss of 52.5% of main line differential.

Sizing By-Pass Varea-Meters

1. Use Table A to multiply the actual flow of liquids other than water by the proper equivalence factor before using main line flow data in Table B.
2. Use the data in Tables C to keep by-pass piping within maximum recommended length.
3. If liquid viscosity is other than 1 css, consult Distributor for sizing assistance.

TABLE A — EQUIVALENCE FACTORS FOR LIQUIDS

Specific Gravity	Float Material	
	316 Stainless	Hastelloy C
0.5	0.68	0.64
0.6	0.75	0.71
0.7	0.82	0.77
0.8	0.88	0.83
0.9	0.94	0.88
1.0	1.00	0.94
1.1	1.06	0.99
1.2	1.11	1.04
1.3	1.16	1.09
1.4	1.22	1.14
1.5	1.27	1.19
1.6	1.32	1.23
1.7	1.37	1.28
1.8	1.43	1.33

TABLE B — MAIN LINE FLOW GPM WATER

Main-Line Std.Wt. Pipe Size, Inches	Main-Line Orifice Differential, Inches of Water			
	50	100	200	400
	Main-Line Flow at Above Differentials, GPM Water			
1½	36.2	50.3	71.0	100
2	58.7	82.9	117	165
3	131	185	255	361
4	222	312	440	621
5	347	488	691	974
6	500	707	999	1410
8	874	1230	1730	2440
10	1380	1940	2730	3840
12	1940	2740	3860	5440
14	2330	3300	4660	6450
16	3050	4310	6070	8580
18	3660	5440	7690	10800
20	4780	6770	8080	13500
24	6920	9790	13800	19500

TABLE C — BY-PASS PIPING RECOMMENDATIONS

Meter Size, Inches	Pipe Size, Inches	Maximum Recommended Equivalent Length, Feet	Equivalent Length of Fittings in Feet of Straight Pipe			
			90° EL	45° EL	Valve*	Union
½	½	6	1.5	0.8	0.35	0.17
	¾†	23	2.2	1.0	0.50	0.19
	1†	72	2.75	1.3	0.60	0.21
¾	1†	18	2.75	1.3	0.60	0.21
½ Metal-tube	1†	27	2.75	1.3	0.60	0.21

*Use gate or ball valves only and keep fittings to a minimum.
†Use reducing fittings at main line orifice and at meter if necessary.

Warning: *Do Not Use Glass-Tube Meters for fluids which are toxic, hazardous ar attack glass.*

Progressive changes in design may be made without prior announcement.

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