

Wallace & Tiernan® Flow Measurement Equipment Glass Tube Varea-Meter® Units

Features

Rugged, One-Piece Enclosure

The welded, deep-formed frame is heavy gauge 302 stainless steel. It protects tube alignment from pipe strain, makes for easy assembly with minimum number of parts.

Positive Tube Seating, Easy Tube Removal

An external clamp locks the tube in place. An O-ring gasketed tube retainer gives positive tube seating and sealing. Yet tube removal is quick and easy. The clamp is loosened and the tube lifted out. There is no spring in the flow stream to foul or corrode. O-rings are the same size, minimizing the number of wearable spares.

Convenient to Connect

Horizontal end fittings rotate through 360 degrees. Piping can be brought in from any direction. End fittings for vertical connection are available also.

Size for Size, Greater Capacity, Cost Less

Varea-Meter® floats have their metering discs between the upper and lower bodies. The resultant short lower body permits greater pressure recovery and restricts flow less than other designs. This float design allows tubes to be made with a taper that gives low pressure drop plus high capacity for the tube, size. Often a smaller Varea-Meter® unit can be specified for a given capacity at less cost.

Convenient Capacity Change

All viscosity-immune floats for any given-size tube have similar characteristic flow curves. Thus, capacity can usually be changed by changing the float only. The same percentage flow scale may be used and the meter will not lose its inherent accuracy of 2% of full scale.

Key Benefits

- Protects your investment with a longer lifespan than other meters
- Easily installed in any piping system
- Reliable long term performance in gas or liquid service
- Highly accurate and stable readings for precise measurement and control
- Reduced maintenance costs compared to other meters



Glass Tube Varea-Meter® Flow Measurement Unit

Product Sheet

Water Technologies

SIEMENS

Technical Data

Accuracy

2% of full scale.

Capacity

1.0 to 69 gpm water or 1.0 to 281 SCFM air.

Range

10 to 1.

Pressure-temperature rating

350 psi and 200°F maximum (See chart on page 3)

Tubes

3/8- to 1 1/2-inch sizes are beaded types. Made of high quality borosilicate glass to very close tolerances.

Scales

Meters with 5- or 10-inch scales available. Detached scales are aluminum with etched white graduations on black background.

Scale Units

Percent is standard. Gpm water, scfm air, or specific-unit graduations are also available.

End Fittings

For vertical or horizontal connection. Both types available with screwed connections. (See page 6)

Enclosure

The enclosure is a welded one-piece heavy gauge, 302 stainless steel. Standard front and rear tube shields have clear polycarbonate windows and stainless steel bezels.

Materials

Wetted parts are available in a selection of materials which provide a range of chemical resistance. (See table on page 3)

Mounting

May be pipeline mounted with vertical or horizontal connections. Optional bezels for flush panel mounting.

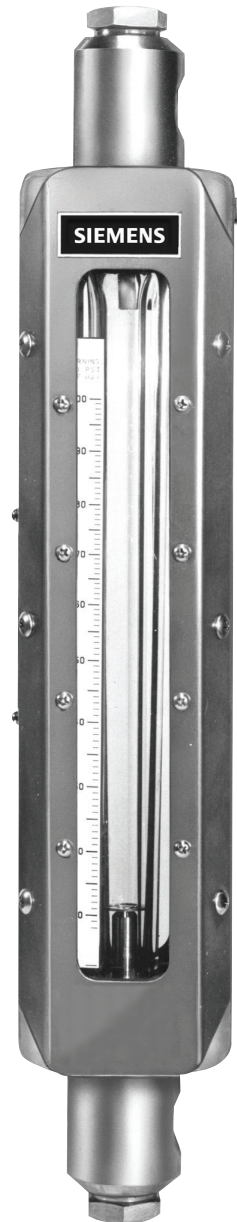
Dimensions

All critical dimensions conform to ISA Recommended Practice. See page 8 and literature numbers:

WT.520.100.100.UA.CN

WT.520.100.102.UA.CN

WT.520.100.104.UA.CN



3/4-inch Varea-Meter® unit with 10-inch scale and standard enclosure.

Materials of Construction

End fittings	316 Stainless
Retainers	Kynar® - to 180°F
O-rings	Buna N, Viton®
Floats	316 Stainless
Tube	Borosilicate Glass
Frame	304 Stainless Steel

Note: Do not use glass tube meters for fluids which are toxic, hazardous or which attack glass. For such applications, write for WT.520.205.000.UA.PS on the metal tube Varea-Meter® units. Write for literature WT.500.001.000.UA.CG, which is a detailed listing of meter compatibility with a wide range of fluids.

Recommended Maximum Operating Temperatures and Pressures

The information in this graph is based on the best practices known to Siemens Water Technologies Corp. It should not be assumed that the information is complete or that all possible circumstances, safety measures, precautions, etc., have been included. Since the conditions of use are beyond its control, Siemens Water Technologies Corp. makes no guarantee of results and assumes no liability in connection with the information contained herein. (Pressure and temperature limitations may be determined by components other than the tube.)

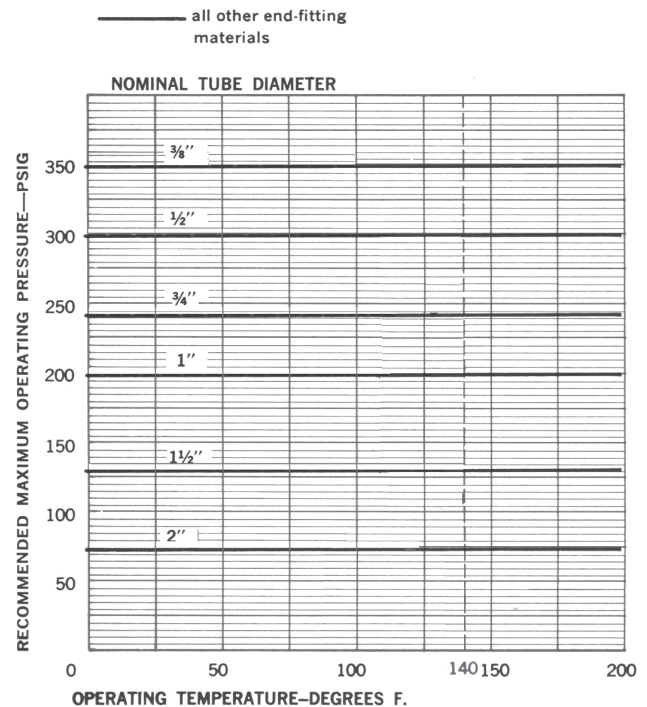
Ordering Procedure

Example: To order a 1/2" Glass tube meter with 5" scale length, 316 SS float, NPT Vertical In/Out stainless end fittings, Kynar® retainers, Buna O-rings, a capacity of 2.0 GPM Water, standard percent calibration, detached scale, no accessories & no tag specify:

5210B02108XXPB406SXX

Note: Your order number should consist of 20 characters.

*Indicates a Non-Viscosity (NVI) float configuration all other floats are viscosity (VI) types.



Liquid Service

Selection Procedure

Determine the capacity range, temperature and pressure capability, materials of construction, and options required for each meter. (See Pg. 3)

From chemical supplier determine float material. If the liquid is other than water, the desired units are other than GPM, its flow rate must be converted to GPM water (Equivalent Flow Rate).

How to Determine Water Equivalent

For liquids with viscosities greater than viscosity ceiling table 1, pages 6 and 7, consult distributor. For liquids with specific gravities other than 1, follow the formula to determine Equivalent Flow Rate Q_E in GPM

$$\begin{aligned} \text{Equivalent Flow Rate } Q_E \text{ GPM} &= \frac{\text{Desired Flow Rate } Q_D}{\text{Correction Factors } F_E \times F_U} \end{aligned}$$

1. From Table A determine F_E from Specific Gravity Correction factors.
2. From Table B determine F_U from Unit Conversion factors.
3. Work formula to obtain Equivalent Flow Rate (Q_E).
4. Use Equivalent Flow Rate to select tube and float code from Table 1, pages 6 and 7.

Table A

Liquid Specific Gravity Correction F_E

Specific Gravity	Float Material	Specific Gravity	Float Material
	F_E 316 Stainless Steel		F_E 316 Stainless Steel
0.50	0.682	1.30	1.164
0.55	0.718	1.35	1.192
0.60	0.753	1.40	1.218
0.65	0.786	1.45	1.244
.070	0.818	1.50	1.271
0.75	0.851	1.55	1.296
0.80	0.882	1.60	1.323
0.85	0.912	1.65	1.347
0.90	0.941	1.70	1.374
0.95	0.971	1.75	1.400
1.00	1.000	1.80	1.426
1.05	1.026	1.85	1.450
1.10	1.055	1.90	1.475
1.15	1.083	1.95	1.503
1.20	1.110	2.00	1.527
1.25	1.137		

To determine F_E for specific gravities not shown in Table A use liquid specific gravity correction equation.

Table B

Unit Conversion F_U

Imp gal/min	X	1.201	=	GAL/MIN
Ltr/min	X	0.2642	=	GAL/MIN
Lbs/min	X	$0.1198 \div S_L$	=	GAL/MIN
Kilograms/min	X	$0.2641 \div S_L$	=	GAL/MIN

Liquid Specific Gravity Correction Equation

$$F_E = \sqrt{\frac{6.96 \times S_L}{S_F - S_L}}$$

F_E = Equivalence factor
 S_L = Specific gravity of liquid
 S_F = Specific gravity of float

SPECIFIC GRAVITY OF FLOAT (S_F)
 316SS = 7.96

Gas Service

Selection Procedure

Determine the capacity range, temperature and pressure capability, materials of construction, and options required for each meter. (See Pg. 3) From chemical supplier determine float material. Table 1 capacities, pages 6 and 7 are air SCFM at 14.7 PSIA & 70°F. If the gas is other than the above, its flow rate must be converted to SCFM air (Equivalent Flow Rate).

How to Determine Air Equivalent

1. From Table A select appropriate Formula to determine Equivalent Flow Rate (Q_E).
2. From Table B determine F_G from Specific Gravity Correction factors.
3. From Table C determine F_P from Pressure Correction factors.
4. From Table D determine F_T from Temperature Correction factors.
5. From Table F determine F_U from Unit Conversion factors.
6. Work Formula to obtain Equivalent Flow Rate (Q_E).
7. Use Equivalent Flow Rate to select tube and float code from Tables 1, Pages 6 and 7

Table A
Formulas

Fluid Condition	Equivalent Flow Rate	=	Desired Flow Rate	X	Correction Factors
Standard (Q _S)	Q _E (SCFM)	=	Q _S	X	F _G X F _P X F _T X F _U
Operating (Q _{OP})	Q _E (SCFM)	=	Q _{OP}	X	F _G X ¹ /F _P X ¹ /F _T X F _U
Weight (W)	Q _E (SCFM)	=	W x 13.33*	X	¹ /F _G X F _P X F _T X F _U

Table B
Gas Specific Gravity Correction F_G

$F_G = \sqrt{\text{SP.GR} \times \frac{7.96}{\text{FLOAT SP.GR.}}}$ <small>FLOAT SP.GR. 316SS = 7.96</small>			
Gas SP.GR. At 70° & 14.7 PSIA	F _G 316SS	GAS SP.GR. AT 70° & 14.7 PSIA	F _G 316SS
2.445 (Chlorine)	1.562	.965 (Nitrogen)	.982
1.520 (Carbon Dioxide)	1.232	.587 (Ammonia)	.766
1.103 (Oxygen)	1.049	.138 (Helium)	.372
1.000 (Air)	1.000	.0696 (Hydrogen)	.264

Table C
Operating Pressure Correction F_P

$F_P = \sqrt{\frac{14.7}{14.7 + \text{psig}}}$									
OPER. PRESS. Hg. Vac.	FACTOR F _P	OPER. PRESS. PSIG	FACTOR F _P	OPER. PRESS. PSIG	FACTOR G _P	OPER. PRESS. PSIG	FACTOR F _P	OPER. PRESS. PSIG	FACTOR F _P
1"	1.017	0	1.000	9	0.787	55	0.459	140	0.308
2"	1.035	1	0.983	10	0.772	60	0.443	160	0.290
3"	1.054	2	0.968	15	0.704	65	0.429	180	0.275
4"	1.074	3	0.938	20	0.651	70	0.416	200	0.262
5"	1.096	4	0.911	25	0.608	75	0.404	220	0.250
6"	1.118	5	0.887	30	0.574	80	0.394	240	0.240
7"	1.142	6	0.864	35	0.545	85	0.384	260	0.231
8"	1.168	7	0.843	40	0.518	90	0.374	280	0.223
9"	1.196	8	0.823	45	0.496	100	0.358	300	0.216
10"	1.226	9	0.806	50	0.476	120	0.331	350	0.201

Table D
Operating Temperature Correction F_T

$F_T = \sqrt{\frac{460 + F}{530}}$					
Oper. Temp. F	Factor F _T	Oper. Temp. F	Factor F _T	Oper. Temp. F	Factor F _T
0	.932	70	1.000	140	1.064
10	.942	80	1.009	150	1.073
20	.952	90	1.019	160	1.082
30	.962	100	1.028	170	1.091
40	.972	110	1.037	180	1.099
50	.981	120	1.046	190	1.108
60	.991	130	1.055	200	1.116

Table E
Unit Conversion F_U

Liters/min	X	0.03532	=	Cu ft/min
Cu.Meters/min	X	35.316	=	Cu ft/min
Lb/min	X	1.0	=	Lb/min
Kg/min	X	2.205	=	Lb/min

Ordering Procedure 5" Glass Tube Gas or Liquid Service

1 - Basic Arrangement

5210

2 - Float Type

Code	Description
B	5" Scale

3 - Connections

Code	Description		
0	In/Out	Vertical	NPT
1	In/Out	Horiz.	NPT
H	In	Vertical	NPT
	Out	Horiz.	NPT
I	In	Horiz.	NPT
	Out	Vertical	NPT

End Fittings

Code	Description
2	316 Stainless

4 - Retainers and O-Rings

Code	Description	
Standard		
1	Kynar®	(BUNA N)
Optional		
2	Kynar®	(Viton®)

5 - Tube Size

From Shaded Area in Table 1

6 - Scale

Code	Description
B	Special Gas Detached
D	% Air Detached
I	Special Liquid Detached
P	% Water Detached

7 - Float

From Shaded Area in Table 1

8 - Float Material

Code	Description
S	316SS

9 - Accessories

Code	Description
X	None
D	Panel Mtg. Brackets (opt.)

10 - Tag

Code	Description
X	None (Standard)
1	Stainless Steel

Table 1
Ordering numbers for tubes and floats

Equivalent Capacity		Connections IPS	min operating press. for gas service, PSIG	Viscosity Ceiling, CSS	Pressure drop inches Water	Tube Code	Float Code
GPM	SCFM						
0.24	1.0	1/2	0	3.0	1.4	06	A202
0.40	1.6	1/2	0	2.0	4.4	06	A206
0.49	2.2	1/2	0	2.0	7.6	06	A208
0.59	2.6	1/2	0	2.0	7.6	06	A210
0.84	3.6	1/2	0	2.0	4.4	06	A404
1.00	4.5	1/2	0	2.0	6.3	06	A406
1.20	5.2	1/2	30	3.0	9.5	06	A408
1.38	6.0	1/2	0	4.0	10	08	B402
1.70	7.3	1/2	0	4.5	14	08	B404
2.00	8.9	1/2	0	3.8	20	08	B406
2.90	12.8	1/2	0	3.0	43	08	B410
2.80	12.5	3/4	0	3.0	5.0	12	C402
3.40	15.0	3/4	0	3.1	7.6	12	C404
4.00	17.7	3/4	0	3.2	10	12	C406
4.60	20.0	3/4	0	3.1	13	12	C408
5.60	26.0	3/4	0	1.0	18	12	C428*
5.70	25.0	1	0	10.0	5.0	16	D402
7.00	30.0	3/4	30	9.8	30	12	C412
6.90	30.0	1	0	14.0	7.6	16	D404
8.10	34.0	1	0	14.0	10	16	D406
9.80	42.0	1	30	12.0	15	16	D408
11.60	48.0	1	30	16.0	20	16	D410
11.50	48.0	1 1/2	0	15.0	5.0	24	E402
14	62	1	30	20	34	16	D412
18	70	1	30	13	45	16	D414
17.5	73	1 1/2	0	24	12	24	E406
21	89	1 1/2	0	22	16	24	E408
32	140	1 1/2	30	30	33	24	E412
38	155	1 1/2	30	16	42	24	E414
46	200	1 1/2	30	7.0	62	24	E416
53	241	1 1/2	30	1.0	82	24	E434*
69	281	1 1/2	30	1.0	106	24	E436*

See Tech. Data Section for Temp. & Press. Limits

Ordering Procedure 10" Glass Tube Gas or Liquid Service

5 2 1 0 2 2 2 X X 6 7 8 9 10

1 - Basic Arrangement

5210

2 - Float Type

Code	Description
G	10" Scale

3 - Connections

Code	Description
0	In/Out Vertical NPT
1	In/Out Horiz. NPT
H	In Vertical NPT
	Out Horiz. NPT
I	In Horiz. NPT
	Out Vertical NPT

4 - Retainers and O-Rings

Code	Description
Standard	
1	Kynar® (BUNA N)
Optional	
2	Kynar® (Viton®)

5 - Tube Size

From Shaded Area in Table 1

6 - Scale

Code	Description
B	Special Gas Detached
D	% Air Detached
I	Special Liquid Detached
P	% Water Detached

7 - Float

From Shaded Area in Table 1

8 - Float Material

Code	Description
S	316SS

9 - Accessories

Code	Description
X	None
E	Panel Mtg. Brackets (opt.)

10 - Tag

Code	Description
X	None (Standard)
1	Stainless Steel

End Fittings

Code	Description
2	316 Stainless

Table 1

Ordering Numbers for Tubes and Floats

Equivalent Capacity		Connections IPS	min operating press. for gas service, PSIG	Viscosity Ceiling, CSS	Pressure drop inches Water	Tube Code	Float Code
GPM	SCFM						
0.24	1.0	1/2	0	3.0	0.8	06	A202
0.39	1.7	1/2	0	2.0	3.5	06	A206
0.48	2.1	1/2	0	2.0	5.6	06	A208
0.58	2.5	1/2	0	2.0	7.4	06	A210
0.82	3.6	1/2	0	2.0	5.7	06	A404
1.0	4.3	1/2	0	2.0	8.8	06	A406
1.2	5.0	1/2	30	3.0	13	06	A408
1.4	6.0	1/2	0	4.0	8.8	08	B402
1.7	7.2	1/2	0	4.5	14	08	B404
2.9	12.7	1/2	30	3.0	44	08	B410
2.9	12.4	3/4	0	3.0	5.0	12	C402
3.5	15.1	3/4	0	3.1	7.6	12	C404
4.0	17.8	3/4	0	3.2	10	12	C406
4.7	20.5	3/4	0	3.1	14	12	C408
5.8	25.1	3/4	0	1.0	18	12	C428*
7.0	30.5	3/4	30	9.8	29	12	C412
6.9	30.3	1	0	14.0	7.6	169	D404
8.2	36.4	1	0	14.0	10	16	D406
9.7	42.3	1	30	12.0	15	16	D408
11.4	49.9	1	30	16.0	20	16	D410
11.6	50	1 1/2	0	15	4.8	24	E402
14	62	1	30	20	32	16	D412
17.3	79	1	30	13	44	16	D414
17.7	75	1 1/2	0	24	11	24	E406
22	92	1 1/2	0	22	16	24	E408
31.6	138	1 1/2	30	30	31	24	E412
37.5	169	1 1/2	30	16	39	24	E414
51.7	240	1 1/2	30	1.0	69	24	E434*
59.9	254	1 1/2	30	1.0	88	24	E436*

See Tech. Data Section for Temp. & Press. Limits

Ordering Procedure

Example: To order a 1" Glass tube meter with 10" scale length, 316 SS float, NPT Vertical In/Out 316 stainless steel end fittings, Kynar® retainers, Buna O-rings, a capacity of 62 SCFM of air, standard percent calibration, detached scales, no accessories & no tag specify:

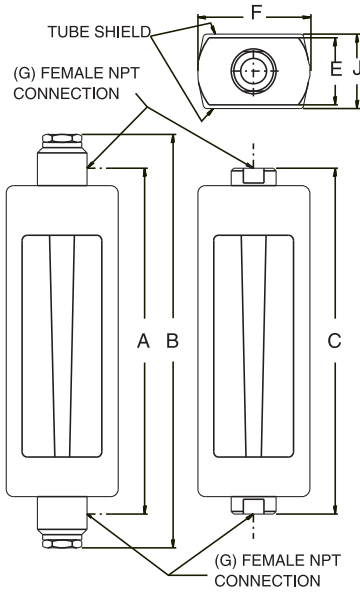
5210 G 0 2 1 16 X X D D412 S X X

Note: Your order number should consist of 20 characters.

*Indicates a Non-Viscosity (NVI) float configuration all other floats are viscosity (VI) types.

Dimensions

Glass Tube Varea-Meter® Units with Screwed End Fittings



Screwed

Tube size	Scale length	A (Horiz)	B (Horiz)	C (vertical)	E	F	G	J
				Screwed				
3/8"	5"	11 1/2" (292)	14 3/8" (365)	12 3/8" (314)	2 1/2" (64)	3 3/4" (95)	1/2" (13)	3 1/8" (79)
	10"	16 1/2" (419)	19 3/8" (492)	17 3/8" (441)				
1/2"	5"	11 1/2" (292)	14 3/8" (365)	12 3/8" (314)	2 1/2" (64)	3 3/4" (95)	1/2" (13)	3 1/8" (79)
	10"	16 1/2" (419)	19 3/8" (492)	17 3/8" (441)				
3/4"	5"	12 1/2" (318)	15 5/8" (397)	12 1/2" (318)	2 1/2" (64)	3 1/2" (13)	3/4" (19)	3 1/8" (79)
	10"	17 1/2" (445)	20 5/8" (524)	17 1/2" (445)				
1"	5"	12 1/2" (318)	16" (406)	12 1/2" (318)	3 1/4" (83)	4 3/4" (121)	1" (25)	4 3/8" (106)
	10"	17 1/2" (445)	21" (533)	17 1/2" (445)				
1 1/2"	5"	15 1/2" (394)	18 1/2" (470)	15 1/2" (394)	4 1/4" (108)	5 3/4" (146)	1 1/2" (38)	5 1/2" (140)
	10"	20 1/2" (521)	23 1/2" (597)	20 1/2" (521)				

Siemens
Water Technologies

USA
+1 856 507 9000
wtus.water@siemens.com

© 2010 Siemens Water Technologies Corp.
Literature No.: WT.520.100.000.UA.PS.1010

Subject to change without prior notice.

Wallace & Tiernan and Varea-Meter are trademarks of Siemens, its subsidiaries or affiliates. Viton is a trademark of DuPont Performance Elastomers, LLC. Kynar is a trademark of Arkema, Inc.

The information provided in this literature contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of the contract.