

# Variable Area Flowmeters

## VA Master™ Indicating Flowrator® Meters

10A4500

- Rugged body design with all type 300 stainless steel construction
- Metering tube can be removed for range change or cleaning in O-ring or packing type with meter in line and without disassembly of meter.
- Polycarbonate operator protection shield designed to protect personnel from glass fragments in the event of accidental tube rupture
- Universal threaded process connections
- Screw-on flanges
- Rotatable end fittings
- Visibility of tube and float through wide angle with standard enclosure & mounting



VA Master™  
Indicating Flowrator® Meters  
Series 10A4500

## VA MASTER™ INDICATING FLOWRATOR® METERS

The ABB Series VA Master Flowrator meter is a glass tube variable-area flowmeter providing visual indication of flow rate over a 12-1/2 to 1 range on a linear scale. Seals in the meter can be either O-ring or packing gland type to suit the application.

With either type of seal, the glass meter tube can be removed easily for range change or cleaning, without disassembling the end fittings or removing the meter from the line. Both types have the same external dimensions and are interchangeable with regard to piping assembly. Also available with one or two bistable alarms to give contact closure (or opening) on rising or falling flow.

Universal threaded process connections allow the meter to be installed with either horizontal or vertical piping arrangements. Screw-on flanges provide the maximum in versatility.

The meter is available in tube sizes from 1/2-inch through 2-inch bore for liquid or gas service.

### Engineering Specifications

**Repeatability:** 0.5% of full scale.

**Accuracy:** Standard is ±2% of maximum flow.  
Calibrated standard is ±1% of maximum flow.

**Range:** 12-1/2 to 1

**Mounting:** Standard — line mounting;  
Optional — panel mounting (flush, surface).

### SCALES

Tube Sizes, Inches	Scale	
	Nominal Length	Type and Location
½ thru 2	10-in. (250 mm)	Percentage on tube or Direct Reading on external metal scale with blank tube
½-50 (only)	9-in. (227 mm)	

### Materials of Construction:

**Tube:** Beadguide™ borosilicate glass  
**USV, SV, NSV Floats:** Type 316 stainless steel;  
**O-rings:** Standard - Buna N; Optional - Viton, EPR  
**Packing:** Standard - Neoprene; Optional - molded Teflon liner.  
**Fittings:** Type 316 stainless steel  
**Plugs:** 316 stainless steel  
**Float Stops:** Teflon  
**Tube Rest Gaskets:**

Standard - Klinger-Sil  
Optional - Teflon (10A4600 only)

### Electrical Specifications for Alarms

**Supply Voltage:** 120V ac ±15%, 45-65 Hz

**Contact Rating:** Max. 250V; Max. 2A

**Sensor Switch Cable:** Standard - 6.5 feet  
Optional - up to 980 feet

**Safety Classification:** The sensor(s) is intrinsically safe for Class I, Div. 1, Group A, B, C & D and Class II, Div. 1, Group E, F & G when connected with control amplifier mounted in non-hazardous location.

### Service Conditions

**Applications:** Glass tube meters are not recommended for continuous service on alkalis above 100°F (38°C) or more than 20% concentrations; nor for fluorine, hydrofluoric acid, water above 200°F (93°C), steam, slurries, or molten metal.

**Temperature Ratings:** Minimum recommended process fluid temperature is 32°F (0°C). Maximum recommended process fluid temperature is 250°F (121°C).

**Ambient Temperature Range:** 32°F to 140°F

### Pressure Ratings:

Tube Size (inches)	Maximum Safe Working Pressure @ 100°F (38°C)	
	psig	kPa gauge
½ NPT	300	2069
½ Flanged; Stainless Steel	275	1896
¾ All	200	1379
1 All	200	1379
1½ All	130	896
2 All	100	689

### CAUTION

Is it important that the O-ring material be compatible with the process fluid. Meter tube breakage can occur if the wrong material is used. For example: VITON O-RING MUST NEVER BE USED FOR AMMONIA SERVICE.

### Weights and Connection

Tube Size (inches)	Conn. Size (inches)	Threaded		Flanged*	
		Weight			
		lb	kg	lb	kg
½	½	8.5	3.9	12	5.5
¾, 1	¾ NPT	17	7.5	--	--
¾, 1	1 Flgd	--	--	21	9.5
1 ½, 2	1 ½	29	13	35	16

\*Flanges match drilling of ANSI Class 125/150 Flanges.

## Meter Sizing

For sizing flowmeters when the required flow is of liquid (density 1.0 g/mL), 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 permit the capacity tables to be used for other operating conditions, and apply to all Capacity Tables shown with Type 316 Stainless Steel Floats.

## Liquid Conversion

$$\text{gpm H}_2\text{O} = \text{gpm} \sqrt{\frac{7.02 \times \rho}{8.02 - \rho}}$$

or

$$\text{gpm H}_2\text{O} = \frac{\text{lbs/min.}}{8.33 \times \rho} \sqrt{\frac{7.02 \times \rho}{8.02 - \rho}}$$

where:

gpm = desired maximum flow rate in gpm  
 lbs/min = desired maximum flow rate in pounds per minute  
 $\rho$  = fluid density, g/cc at operating conditions  
 gpm H<sub>2</sub>O = equivalent flow rate in gpm H<sub>2</sub>O

## Gas Conversion

$$\begin{array}{l} \text{scfm air} \\ \text{at 14.7 psia} \\ \text{and 70°F} \end{array} = \text{scfm} \sqrt{\frac{\text{spgr} \times 14.7 \times T_{\text{op}}}{1.0 \times P_{\text{op}} \times 530}}$$

or

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

Where:

scfm = desired maximum flow rate in scfm  
 sp gr = specific gravity of gas at standard temperature and pressure, referenced to air at standard temperature and pressure (14.7 psia and 70°F)  
 $T_{\text{op}}$  = absolute temperature, (460 +°F) at operating conditions  
 $P_{\text{op}}$  = 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

## WARNING

These meters must not be operated without the operator protection shield in place. To do so could result in injury to personnel.

## Accessories

**Metal Scale Plate(s):** Graduated metal scale plate mounted adjacent to metering tube.

**Alarms:** One or two\* bi-stable alarm switches, adjustable over entire scale length to give contact closure (or opening) upon rising or falling flow. Available with SPDT or DPDT switch action.

*\*Note when using two switches, the minimum spacing is on 1" centers (approx. 10% of full scale).*

**Surface (Front) Panel Mounting:** Nuts, bolts, and lock washers for mounting meter against front of panel by means of mounting holes provided in every meter body.

**Flush (Rear) Panel Mounting:** Brackets, bezel and hardware for mounting meter behind panel.

**Welded Flanges:** Upon request, flanges - nipples - end fittings can be supplied as a welded assembly.

## Ordering Information

To eliminate any delays in the processing of orders and to insure prompt delivery, please specify:

- Complete Model Number
- Accuracy Desired
- Alarm Settings if applicable
- Operating Conditions
- Fluid Measured
- Maximum Flow Rate and Unit of Flow
- Fluid Density
- Fluid Viscosity
- Allowable Pressure Drop
- Operating and Maximum Temperature
- Operating and Maximum Pressure

**Capacity Table (Low Pressure Drop Design)**

Tube Size (Inch)	Maximum Flow		Tube Number	Tube Code	Float Number (316 sst)	Float Code	Total DP (See Note 1)	V.I.C. (See Note 2)	psia Critical (See Note 3)
	gpm H <sub>2</sub> O Equiv.	scfm Air Equiv.							
1/2"	0.198	0.8	FP-1/2-17-G-10	A1	1/2-GUSVT-410	01	0.53	2.2	3.6
	0.238	0.982	FP-1/2-21-G-10	A2	1/2-GUSVT-410	01	0.53	2.2	3.6
	0.324	1.339	FP-1/2-27-G-10	A3	1/2-GUSVT-410	01	0.58	2.2	3.6
	0.436	1.796	FP-1/2-35-G-10	A4	1/2-GUSVT-410	01	1	2.2	3.6
	0.825	3.4	FP-1/2-50-G-9	A6	1/2-GUSVT-410	01	2	2.2	3.6
3/4"	0.633	2.62	FP-3/4-21-G-10	B1	3/4-GUVT-510	02	0.6	3.3	3.1
	0.86	3.54	FP-3/4-27-G-10	B2	3/4-GUVT-510	02	0.71	3.3	1.5
1"	1.205	4.98	FP-1-27-G-10	C1	1-GUSVT-611	03	1.28	4	1
	1.67	6.9	FP-1-35-G-10	C2	1-GUSVT-611	03	1.83	4	0.75
	2.58	10.7	FP-1-27-G-10	C1	1-GUSVT-610	04	5.47	8.6	4.5
	3.6	14.84	FP-1-35-G-10	C2	1-GUSVT-610	04	7.97	8.6	3.4
1 1/2"	2.45	10.3	FP-1 1/2 - 21-G-10	D1	1 1/2 - GUSVT-867	05	0.92	6.5	1
	3.33	13.8	FP-1 1/2 - 27-G-10	D2	1 1/2 - GUSVT-867	05	1.24	6.5	1
	6.5	27	FP-1 1/2 - 21-G-10	D1	1 1/2 - GUSVGT-814	06	5.75	16.2	6.8
	8.7	36	FP-1 1/2 - 27-G-10	D2	1 1/2 - GUSVGT-814	06	7.2	16.2	6.8
2"	5.54	22.9	FP-2-27-G-10	E1	2-GUSVT-913	07	1.65	8.9	1
	13.75	56.7	FP-2-27-G-10	E1	2-GUSVT-914	08	9	22	6.2

Note: Standard percent scales are not applicable to low pressure drop floats.

Notes:

1. Pressure drop is total pressure loss across the meter at 100% flow rate in inches of water column.
2. Meter is unaffected by viscosity when the value of  $\frac{cps}{\sqrt{\rho}}$  (using  $\rho$  = operating density in g/cc and cps = viscosity in centipoises) is less than V.I.C. (viscosity immunity ceiling). V.I.C. is applicable to liquids only; all gas flows fall below Viscosity Immunity Ceiling.
3. Meters are not recommended for gas service where pressure is below minimum shown. A flow throttling valve close coupled to meter outlet is recommended for all gas applications.

**CAPACITY TABLE**  
**Bead Guide Meters with USV, SV and NSV Floats**

Tube Size (Inch)	Maximum Flow		Tube Number	Tube Code	Float Number (316 sst)	Float Code	Total DP (See Note 1)	V.I.C. (See Note 2)	psia Critical (See Note 3)
	gpm H <sub>2</sub> O Equivalent	scfm Air Equivalent							
1/2"	0.267	1.1	FP-1/2-17-G-10	A1	1/2-GUSVT-40A	09	1.2	2.9	5.5
	0.328	1.35	FP-1/2-21-G-10	A2	1/2-GUSVT-40A	09	1.4	2.9	3.5
	0.442	1.82	FP-1/2-27-G-10	A3	1/2-GUSVT-40A	09	2	2.9	2.7
	0.48	1.92	FP-1/2-17-G-10	A1	1/2-GSVT-45A	10	3.5	5.1	17.9
	0.6	2.47	FP-1/2-21-G-10	A2	1/2-GSVT-45A	10	4.6	5.1	11.5
	0.619	2.55	FP-1/2-35-G-10	A4	1/2-GUSVT-40A	09	3.1	2.9	2
	0.67	2.76	FP-1/2-17-G-10	A1	1/2-GSVT-44A	11	6.4	7.1	33.4
	0.69	2.85	FP-1/2-17-G-10	A1	1/2-GSVT-48A	12	7.3	7.6	39
	0.81	3.35	FP-1/2-27-G-10	A3	1/2-GSVT-45A	10	6.8	5.1	8.4
	0.83	3.42	FP-1/2-21-G-10	A2	1/2-GSVT-44A	11	7.7	7.1	33.8
	0.88	3.62	FP-1/2-21-G-10	A2	1/2-GSVT-48A	12	8	7.6	24.6
	0.885	3.65	FP-1/2-17-G-10	A1	1/2-GNSVT-48A	13	8.2	1.1	19.8
	1.1	4.52	FP-1/2-21-G-10	A2	1/2-GNSVT-48A	13	9.9	1.1	20
	1.12	4.6	FP-1/2-27-G-10	A3	1/2-GSVT-44A	11	12.3	7.1	16.2
	1.15	4.74	FP-1/2-35-G-10	A4	1/2-GSVT-45A	10	8.2	5.1	8.5
	1.19	4.9	FP-1/2-27-G-10	A3	1/2-GSVT-48A	12	13.7	7.6	18.6
	1.44	5.93	FP-1/2-27-G-10	A3	1/2-GNSVT-48A	13	15.8	1.1	16.5
	1.56	6.43	FP-1/2-35-G-10	A4	1/2-GSVT-44A	11	14.8	7.1	16.5
	1.66	6.85	FP-1/2-35-G-10	A4	1/2-GSVT-48A	12	17.2	7.6	18.8
	3/4"	2	8.24	FP-1/2-50-G-9	A6	1/2-GSVT-45A	10	12	5.1
2.76		11.4	FP-1/2-50-G-9	A6	1/2-GSVT-44A	11	31	7.1	7.7
2.9		12	FP-1/2-50-G-9	A6	1/2-GSVT-48A	12	35.2	7.6	8.9
3.52		14.5	FP-1/2-50-G-9	A6	1/2-GNSVT-48A	13	52	1.1	8.8
1.96		8.1	FP-3/4-21-G-10	B1	3/4-GSVGT-54A	14	5.3	10.4	13.9
2.49		10.2	FP-3/4-21-G-10	B1	3/4-GNSVGT-54A	15	6.8	1.6	13.9
2.66		11	FP-3/4-21-G-10	B1	3/4-GSVGT-59A	16	7	14.1	28.7
2.7		11.1	FP-3/4-27-G-10	B2	3/4-GSVGT-54A	14	7.7	10.4	9.6
1"	3.37	13.9	FP-3/4-21-G-10	B1	3/4-GNSVGT-59A	17	11.5	2.1	25.3
	3.55	14.6	FP-3/4-27-G-10	B2	3/4-GNSVGT-54A	15	11.5	1.6	9.6
	3.67	15.1	FP-3/4-27-G-10	B2	3/4-GSVGT-59A	16	13.7	14	19.8
	4.8	19.8	FP-3/4-27-G-10	B2	3/4-GNSVGT-59A	17	20.5	2.1	19.8
	4.25	17.5	FP-1-27-G-10	C1	1-GSVGT-64A	18	12.9	14.8	11.5
	4.82	19.9	FP-1-27-G-10	C1	1-GSVGT-68A	19	18.7	16.9	15.6
	5.63	23.2	FP-1-27-G-10	C1	1-GNSVGT-64A	20	20.7	2.2	11.3
	6	24.7	FP-1-35-G-10	C2	1-GSVGT-64A	18	24.6	14.8	6.8
1 1/2"	6.46	26.6	FP-1-27-G-10	C1	1-GNSVGT-68A	21	32.5	2.5	15.6
	6.8	28	FP-1-35-G-10	C2	1-GSVGT-68A	19	37	16.9	8.9
	7.62	31.4	FP-1-27-G-10	C1	1-GNSVGT-69A	23	75	1.5	22.2
	7.84	32.4	FP-1-35-G-10	C2	1-GNSVGT-64A	20	37.7	2.2	6.8
	9	37	FP-1-35-G-10	C2	1-GNSVGT-68A	21	62.8	2.5	8.9
	9.5	39.2	FP-1-35-G-10	C2	1-GSVGT-69A	22	65.3	8.5	13.4
	11	45.3	FP-1-35-G-10	C2	1-GNSVGT-69A	23	112	1.5	13.4
	13.2	54.4	FP-1 1/2 - 27-G-10	D2	1 1/2 - GSVGT-87A	24	9.5	27.6	15.4
2"	14.6	60	FP-1 1/2 - 27-G-10	D2	1 1/2 - GSVGT-86A	25	13.5	31	22
	17.6	72	FP-1 1/2 - 27-G-10	D2	1 1/2 - GNSVGT-87A	26	12.8	4.2	15.4
	18.6	76.5	FP-1 1/2 - 27-G-10	D2	1 1/2 - GNSVGT-86A	27	15.2	4.8	22
	24	99	FP-2-27-G-10	E1	2-GSVGT-97A	28	24	26.5	16.4
	30	123.8	FP-2-27-G-10	E1	2-GSVGT-98A	29	34	18.5	21.2
	32	132	FP-2-27-G-10	E1	2-GNSVGT-97A	30	32	3	16.4
	36.1	149	FP-2-27-G-10	E1	2-GNSVGT-98A	31	45	3.3	21.2
48.0(5)	-	FP-2-27-G-10	E1	BL-954	32	70	2	-	
60.0(5)	-	FP-2-27-G-10	E1	BL-953	33	95	2	-	
68.0(5)	-	FP-2-27-G-10	E1	BL-950	34	110	2	-	
90(5)	-	FP-2-27-G-10	E1	BL-951	35	192.7	1	-	

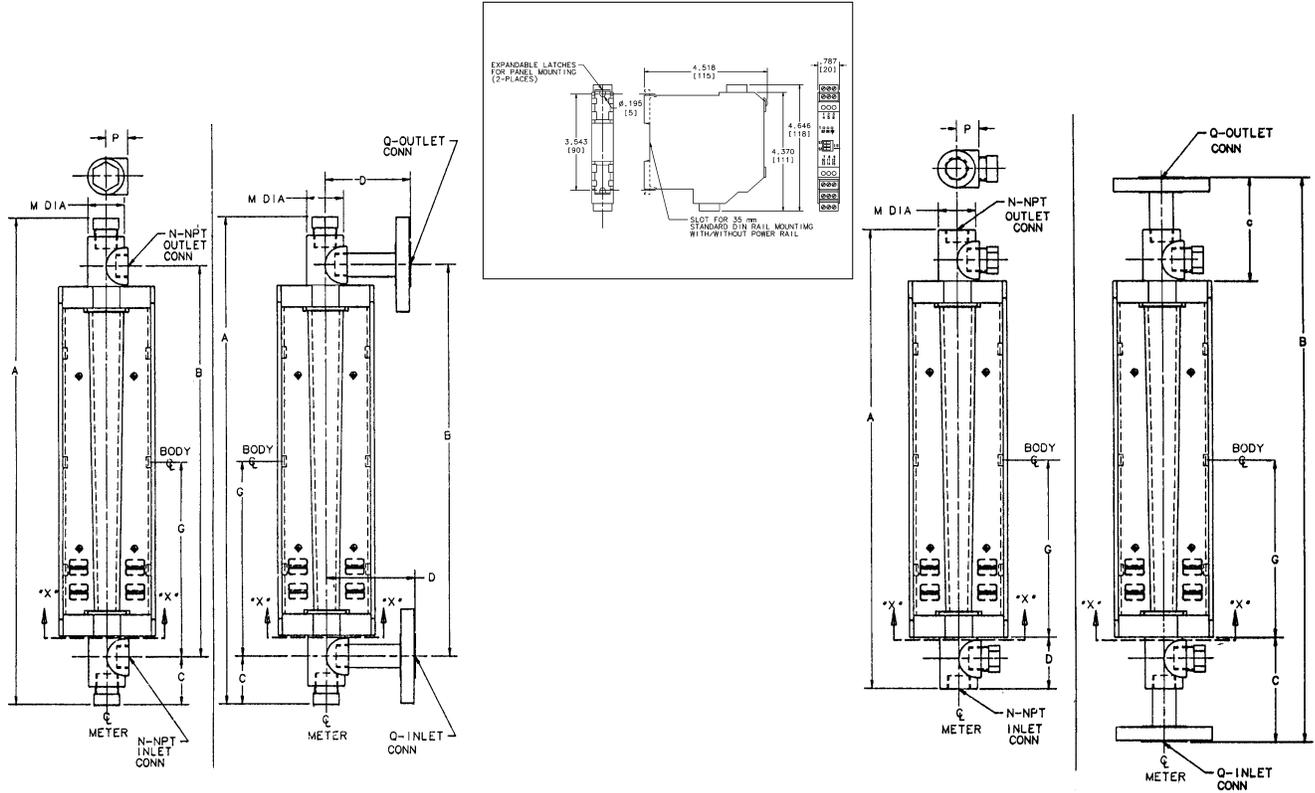
Note: 1. Pressure drop is total pressure loss across the meter at 100% flow rate in inches of water column.  
 2. Meter is unaffected by viscosity when the value of  $\frac{cps}{\sqrt{\rho}}$  using  $\rho$  = operating density in g/cc and cps = viscosity in centipoises) is less than V.I.C. (viscosity immunity ceiling). V.I.C. is applicable to liquids only; all gas flows fall below Viscosity Immunity Ceiling.  
 3. Meters are not recommended for gas service where pressure is below minimum shown. For such applications use low pressure drop capacity table. A flow throttling valve close coupled to meter outlet is recommended for all gas applications.  
 4. Unless other shown, Range is equal to or greater than 12.5:1  
 5. Short Range Floats; BL-954 is 8:1; BL-953 is 3.5:1; BL-950 & BL-951 are 3:1.

### CAPACITY TABLE Meters with Alarm Option

Tube Size (Inch)	Maximum Flow		Tube Number	Tube Code	Float Number (316 sst)	Float Code	Total DP (See Note 1)	V.I.C. (See Note 2)	psia Critical (See Note 3)
	gpm Liquid sp. gr. 1.0	scfm Air @ STP							
1/2"	0.67	2.76	FP-1/2-17-G-10	A1	1/2-GSVTA-44	36	6.4	7.1	33.4
	0.69	2.85	FP-1/2-17-G-10	A1	1/2-GSVTA-48	37	7.3	7.6	39
	0.83	3.42	FP-1/2-21-G-10	A2	1/2-GSVTA-44	36	7.7	7.1	33.8
	0.88	3.62	FP-1/2-21-G-10	A2	1/2-GSVTA-48	37	8	7.6	24.6
	0.885	3.65	FP-1/2-17-G-10	A1	1/2-GNSVTA-48	38	8.2	1.1	19.8
	1.03	4.24	FP-1/2-21-G-10	A2	1/2-GNSVTA-44	39	8.9	1.1	33.4
	1.1	4.52	FP-1/2-21-G-10	A2	1/2-GNSVTA-48	38	9.9	1.1	20
	1.12	4.6	FP-1/2-27-G-10	A3	1/2-GSVTA-44	36	12.3	7.1	16.2
	1.19	4.9	FP-1/2-27-G-10	A3	1/2-GSVTA-48	37	13.7	7.6	18.6
	1.44	5.93	FP-1/2-27-G-10	A3	1/2-GNSVTA-48	38	15.8	1.1	16.5
	1.56	6.43	FP-1/2-35-G-10	A4	1/2-GSVTA-44	36	14.8	7.1	16.5
	1.66	6.85	FP-1/2-35-G-10	A4	1/2-GSVTA-48	37	17.2	7.6	18.8
	1.84	7.6	FP-1/2-27-G-10	A3	1/2-GNSVTA-43	40	18.5	1.3	27.5
	2	8.24	FP-1/2-35-G-10	A4	1/2-GNSVTA-48	38	19	1.1	8.8
	2.43	10	FP-1/2-35-G-10	A4	1/2-GNSVTA-43	40	30	1.3	22.7
	2.76	11.4	FP-1/2-50-G-9	A6	1/2-GSVTA-44	36	31	7	7.7
	2.9	12	FP-1/2-50-G-9	A6	1/2-GSVTA-48	37	35.2	7.6	8.9
	3.52	14.5	FP-1/2-50-G-9	A6	1/2-GNSVTA-48	38	52	1.1	8.8
4	16	FP-1/2-50-G-9	A6	1/2-GNSVTA-43	40	72	1.3	12.3	
3/4"	1.96	8.1	FP-3/4-21-G-10	B1	3/4-GSVTA-54	41	5.3	10.4	13.9
	2.49	10.2	FP-3/4-21-G-10	B1	3/4-GNSVTA-54	42	6.8	1.6	13.9
	2.7	11.1	FP-3/4-27-G-10	B2	3/4-GSVTA-54	41	7.7	10.4	9.6
	3.15	13	FP-3/4-21-G-10	B1	3/4-GSVTA-53	43	11	16.6	36
	3.55	14.6	FP-3/4-27-G-10	B2	3/4-GNSVTA-54	42	11.5	1.6	9.6
	3.85	15.8	FP-3/4-27-G-10	B2	3/4-GSVTA-56	44	12	14.9	19.8
	4.35	18	FP-3/4-27-G-10	B2	3/4-GSVTA-53	43	13	16.8	25
	5.05	20.8	FP-3/4-27-G-10	B2	3/4-GNSVTA-56	45	14	2.2	19.8
	5.7	23.6	FP-3/4-27-G-10	B2	3/4-GNSVTA-53	46	16	2.5	25
1"	4.25	17.5	FP-1-27-G-10	C1	1-GSVTA-64	47	12.9	14.8	11.5
	4.82	19.8	FP-1-27-G-10	C1	1-GSVTA-65	48	15	16.9	14.8
	5.63	23.2	FP-1-27-G-10	C1	1-GNSVTA-64	49	20.7	2.2	11.3
	6	24.7	FP-1-35-G-10	C2	1-GSVTA-64	47	24.6	14.8	6.8
	6.75	27.9	FP-1-35-G-10	C2	1-GSVTA-65	48	27	16.9	8.9
	7.84	32.4	FP-1-35-G-10	C2	1-GNSVTA-64	49	37.7	2.2	6.8
	8.46	35.1	FP-1-35-G-10	C2	1-GSVTA-63	50	45	20.8	13.9
	9	36.9	FP-1-35-G-10	C2	1-GNSVTA-65	52	62.8	2.5	8.9

- Note: 1. Pressure drop is total pressure loss across the meter at 100% flow rate in inches of water column.  
 2. Meter is unaffected by viscosity when the value of  $\frac{cps}{\sqrt{\rho}}$  using  $\rho$  = operating density in g/cc and cps = viscosity in centipoises) is less than V.I.C. (viscosity immunity ceiling). V.I.C. is applicable to liquids only; all gas flows fall below Viscosity Immunity Ceiling.  
 3. Meters are not recommended for gas service where pressure is below minimum shown. For such applications use low pressure drop capacity table. A flow throttling valve close coupled to meter outlet is recommended for all gas applications.  
 4. Unless other shown, Range is equal to or greater than 12.5:1

### Dimension Drawings

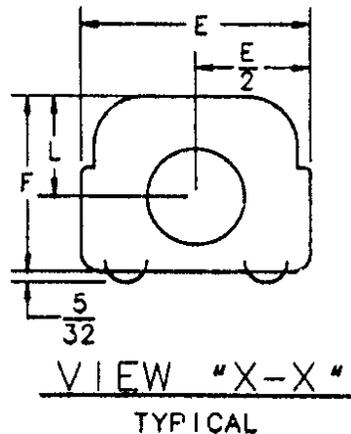


Panel Mounting

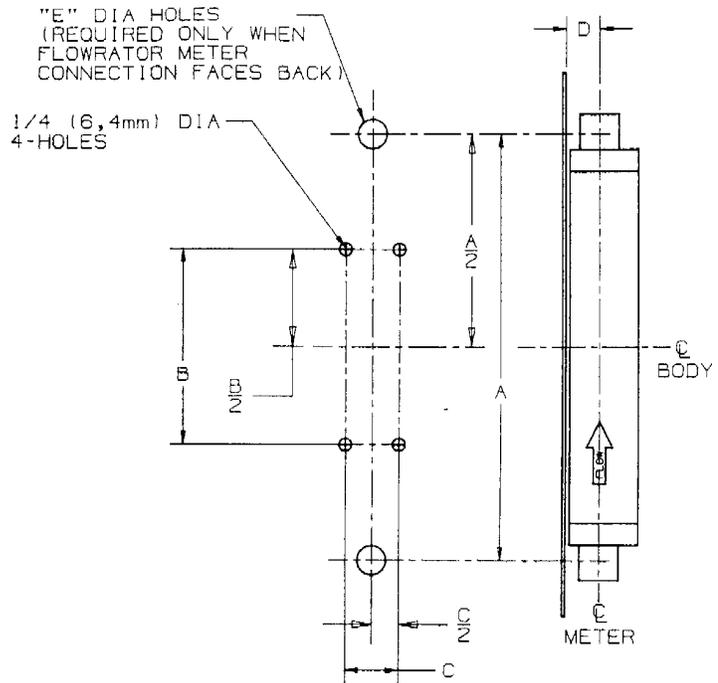
Meter Tube Size	1/2"		3/4" to 1"		1-1/2" to 2"	
	Inch	mm	Inch	mm	Inch	mm
Dim. A	19-5/16	490	21-3/16	538	26-7/15	671
B	16-1/2	419	17-1/2	445	20-1/2	521
C	1-13/32	37	1-27/32	47	2-31/32	75
D	3-1/2	89	4	103	5	127
E	3-3/8	86	4-3/8	111	5-11/16	144
F	2-5/8	67	3-27/64	87	4-7/8	124
G	8-1/4	210	8-3/4	222	10-1/4	260
L	1-1/2	38	1-59/64	49	2-5/8	67
M	1-1/4	32	1-1/2	38	2-1/2	64
N	1/2	13	3/4	19	1-1/2	38
P	3/4	19	1-1/8	29	1-7/8	48
Q	1/2	13	1	25	1-1/2	38

Line Mounting

Meter Tube Size	1/2"		3/4" to 1"		1-1/2" to 2"	
	Inch	mm	Inch	mm	Inch	mm
Dim. A	18-9/16	471	20	508	24-5/16	618
B	20-5/8	524	22-1/8	562	27-11/16	703
C	2-21/32	68	3-5/32	80	5-7/32	133
D	1-5/8	41	2-3/32	53	3-17/32	90
E	3-3/8	86	4-3/8	111	5-11/16	144
F	2-5/8	67	3-27/64	87	4-7/8	124
G	7-21/32	194	7-29/32	201	8-5/8	219
L	1-1/2	38	1-59/64	49	2-5/8	67
M	1-1/4	32	1-1/2	38	2-1/2	64
N	1/2	13	3/4	19	1-1/2	38
P	3/4	19	1-3/8	29	1-7/8	48
Q	1/2	13	1	25	1-1/2	38



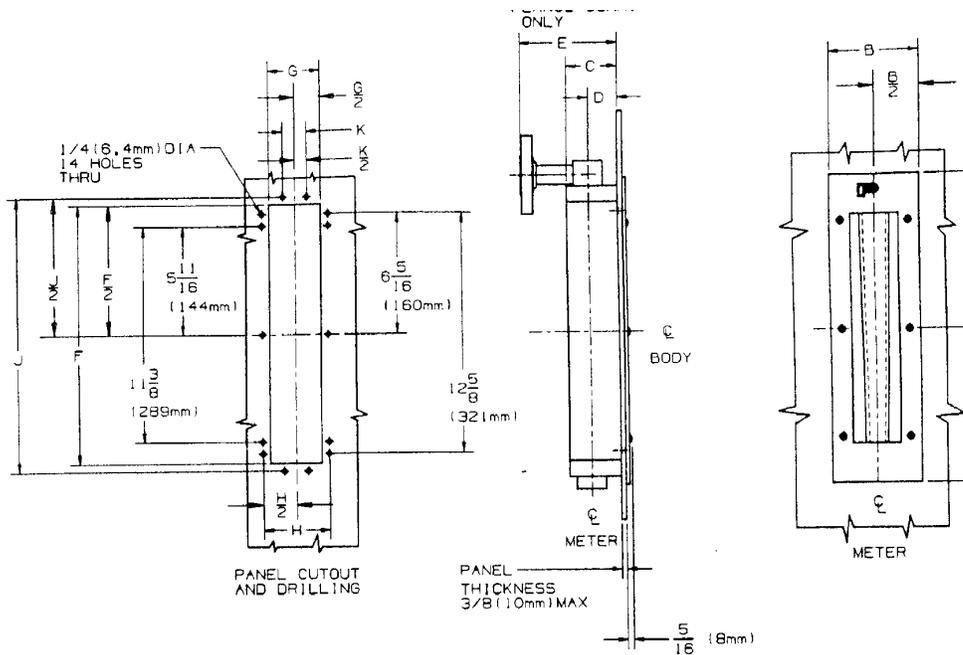
# FRONT PANEL MOUNTING



## FRONT PANEL MOUNTING 10A4500 / 4500 SERVICES

Note: Front Panel Mounting Not Available with Alarms

# REAR PANEL MOUNTING



Conn. Size	1/2"		3/4" & 1"		1-1/2"	
Scale Length	10"		10"		10"	
Dim.	Inch	mm	Inch	mm	Inch	mm
A	16-3/16	411	16-3/16	411	17-3/4	451
B	4/9/2016	116	5/1/2004	133	6/1/2008	156
C	2/5/2008	67	3/7/2016	87	4/7/2008	124
D	1/1/2002	38	1/15/2016	49	2/5/2008	67
E	5	127	5/15/2016	151	7/5/2008	200
F	13-5/8	346	13-7/8	352	15-5/16	389
G	2/11/2016	68	3/3/2008	86	4/1/2004	108
H	3/7/2016	87	4/1/2008	105	5	127
J	14-7/16	367	14-13/16	376	16-1/4	413
K	1/1/2004	32	1/11/2016	43	2/3/2008	60

For detailed specifications, refer to Product Specification D-FV-10A4500.

Product Code A

Base price includes borosilicate glass metering tube, fittings of material shown, Buna "N" O-rings or Neoprene packing, 316 SST float, blank tube, percent on metal scale and factor tag.

Calibration is required on all meters used above the Viscosity Immunity Ceiling and/or for ±1% of maximum flow rate accuracy, or where accuracy certification is required.

Alarms: Price adder includes mounting bracket assembled to meter body, alarm float, amplifying relay and minimum and/or maximum switches with 5.5 feet of lead wire.

<b>Code</b>	
-------------	--

<b>Variable Area Indicating Flowrator Meter Model 10A45 / 4600</b>	<b>10A4</b>
For quantity greater than 10 call	

**1 : Seals**

O-Ring Pressure	55
Packing Gland Type Pressure	65

**2 : Connection Designation**

Horizontal Threaded	5
Horizontal Flanged	6
Vertical Threaded	7
Vertical Flanged	8

**3 : Scale Type**

Percent on Tube	X
Direct Reading on Tube	Y
Direct Reading Metal Scale and Percent on Tube	E
Percent on Metal Scale	P
Direct Reading Metal Scale	S
Dual Direct Reading Metal Scales	D

**4 : Panel Mounting**

Line Mounted	X
Front Panel Mounted	(Note: 1) Y
Rear (Flush) Panel Mounted Not Available W/ Flanged Vertical Connections	(Note: 2) Z

**5 : Design Level**

B	B
---	---

**6 : Connection Size**

Connector, Size 1/2 In. Tube Size 1/2 In.	H	<a href="#">Table 10A4-A</a>
Connector, Size 3/4 In. NPT, Tube Size 3/4 In.	(Note: 1) J	<a href="#">Table 10A4-A</a>
Connector, Size 3/4 In. NPT, Tube Size 1 In.	(Note: 1) K	<a href="#">Table 10A4-A</a>
Connector, Size 1 In., Flanged, Tube Size 3/4 In.	(Note: 3) L	<a href="#">Table 10A4-A</a>
Connector, Size 1 In., Flanged Tube Size 1 In.	(Note: 3) M	<a href="#">Table 10A4-A</a>
Connector, Size 1-1/2 In., Tube Size 1-1/2 In.	N	<a href="#">Table 10A4-A</a>
Connector, Size 1-1/2 In. Tube Size 2 In.	P	<a href="#">Table 10A4-A</a>

**7 : Fitting Material**

AISI 316 SST (1.4401)	C
-----------------------	---

**8 : Seal Material**

Packing Gland Design Neoprene	(Note: 4) E	<a href="#">Table 10A4-B</a>
Packing Gland Design Teflon	(Note: 4) D	<a href="#">Table 10A4-B</a>
O-Ring Design Buna-N	(Note: 5) F	<a href="#">Table 10A4-B</a>
O-Ring Design Viton (Not used with Ammonia)	(Note: 5) H	<a href="#">Table 10A4-B</a>
O-Ring Design EPDM	(Note: 5) J	<a href="#">Table 10A4-B</a>

**9 : Connection Type**

NPT	(Notes: 1, 6) B
RF Flange Class 150	(Notes: 3, 7) D

## 10A4

Code	
------	--

### 10 : Alarms

Not Required	X	<a href="#">Table 10A4-C</a>
Low Alarm, SPDT	C	<a href="#">Table 10A4-C</a>
High Alarm, SPDT	B	<a href="#">Table 10A4-C</a>
High & Low Alarm, SPDT	D	<a href="#">Table 10A4-C</a>
Low Alarm, DPDT	F	<a href="#">Table 10A4-C</a>
High Alarm, DPDT	E	<a href="#">Table 10A4-C</a>
High & Low Alarm, DPDT	G	<a href="#">Table 10A4-C</a>
High & High Alarm, SPDT	H	<a href="#">Table 10A4-C</a>
Low & Low Alarm, SPDT	J	<a href="#">Table 10A4-C</a>
High & High Alarm, DPDT	K	<a href="#">Table 10A4-C</a>
Low & Low Alarm, DPDT	L	<a href="#">Table 10A4-C</a>

### 11 : Reserved

Not Required	X
--------------	---

### 12 : Inlet Connection Orientation

Front	(Note: 8)	1
Back	(Note: 8)	2
Right	(Note: 8)	3
Left	(Note: 8)	4
Bottom Vertical	(Note: 9)	5

### 13 : Outlet Connection Orientation

Front	(Note: 8)	1
Back	(Note: 8)	2
Right	(Note: 8)	3
Left	(Note: 8)	4
Top Vertical	(Note: 9)	5

# 10A4

Code

## 14 : Float Code

1/2-GUSVT-410	(Note: 10)	01
3/4-GUSVT-510	(Note: 11)	02
1-GUSVT-611	(Note: 12)	03
1-GUSVT-610	(Note: 12)	04
1 1/2-GUSVT-867	(Note: 13)	05
1 1/2-GUSVGT-814	(Note: 13)	06
2-GUSVT-913	(Note: 14)	07
2-GUSVT-914	(Note: 14)	08
1/2-GUSVT-40A	(Note: 10)	09
1/2-GSVT-45A	(Note: 10)	10
1/2-GSVT-44A	(Note: 10)	11
1/2-GSVT-48A	(Note: 10)	12
1/2-GNSVT-48A	(Note: 10)	13
3/4-GSVGT-54A	(Note: 11)	14
3/4-GNSVGT-54A	(Note: 11)	15
3/4-GSVGT-59A	(Note: 11)	16
3/4-GNSVGT-59A	(Note: 11)	17
1-GSVGT-64A	(Note: 12)	18
1-GSVGT-68A	(Note: 12)	19
1-GNSVGT-64A	(Note: 12)	20
1-GNSVGT-68A	(Note: 12)	21
1-GSVGT-69A	(Note: 12)	22
1-GNSVGT-69A	(Note: 12)	23
1 1/2-GSVGT-87A	(Note: 13)	24
1 1/2-GSVGT-86A	(Note: 13)	25
1 1/2-GNSVGT-87A	(Note: 13)	26
1 1/2-GNSVGT-86A	(Note: 13)	27
2-GSVGT-97A	(Note: 14)	28
2-GSVGT-98A	(Note: 14)	29
2-GNSVGT-97A	(Note: 14)	30
2-GNSVGT-98A	(Note: 14)	31
BL-954	(Note: 14)	32
BL-953	(Note: 14)	33
BL-950	(Note: 14)	34
BL-951	(Note: 14)	35
1/2-GSVTA-44	(Note: 10)	36
1/2-GSVTA-48	(Note: 10)	37
1/2-GNSVTA-48	(Note: 10)	38
1/2-GNSVTA-44	(Note: 10)	39
1/2-GNSVTA-43	(Note: 10)	40
3/4-GSVTA-54	(Note: 11)	41
3/4-GNSVTA-54	(Note: 11)	42
3/4-GSVTA-53	(Note: 11)	43
3/4-GSVTA-56	(Note: 11)	44
3/4-GNSVTA-56	(Note: 11)	45
3/4-GNSVTA-53	(Note: 11)	46
1-GSVTA-64	(Note: 12)	47
1-GSVTA-65	(Note: 12)	48
1-GNSVTA-64	(Note: 12)	49
1-GSVTA-63	(Note: 12)	50
1-GSVTA-66	(Note: 12)	51
1-GNSVTA-65	(Note: 12)	52
1-GNSVTA-66	(Note: 12)	53
1-GNSVTA-63	(Note: 12)	54
1 1/2-GSVTA-84	(Note: 13)	55
1 1/2-GSVTA-85	(Note: 13)	56
1 1/2-GSVTA-83	(Note: 13)	57
1 1/2-GNSVTA-84	(Note: 13)	58
1 1/2-GNSVTA-85	(Note: 13)	59
1 1/2-GNSVTA-83	(Note: 13)	60
2-GSVTA-94	(Note: 14)	61

## 10A4

Code
------

2-GSVTA-93	(Note: 14)	62
2-GNSVTA-94	(Note: 14)	63
2-GNSVTA-96	(Note: 14)	64
2-GNSVTA-93	(Note: 14)	65
BS-41	(Note: 10)	66
BS-50	(Note: 11)	67
BS-62	(Note: 12)	68
BS-60	(Note: 12)	69
BS-80	(Note: 13)	70
BS-90	(Note: 14)	71
BS-91	(Note: 14)	72
1/2-GL-471	(Note: 10)	73
1/2-GL-410	(Note: 10)	74
3/4-GL-571	(Note: 11)	75
3/4-GL-510	(Note: 11)	76
1-GL-671	(Note: 12)	77
1-GL-610	(Note: 12)	78
1½-GL-871	(Note: 13)	79
1½-GL-810	(Note: 13)	80
2-GL-971	(Note: 14)	81
2-GL-910	(Note: 14)	82

### 15 : Tube Code

FP-1/2-17-G-10	(Notes: 10, 15)	A1
FP-1/2-21-G-10	(Notes: 10, 15)	A2
FP-1/2-27-G-10	(Notes: 10, 15)	A3
FP-1/2-35-G-10	(Notes: 10, 15)	A4
FP-1/2-50-G-9	(Notes: 10, 15)	A6
FP-3/4-21-G-10	(Notes: 11, 16)	B1
FP-3/4-27-G-10	(Notes: 11, 16)	B2
FP-1-27-G-10	(Notes: 12, 17)	C1
FP-1-35-G-10	(Notes: 12, 17)	C2
FP-1 1/2-21-G-10	(Notes: 13, 18)	D1
FP-1 1/2-27-G-10	(Notes: 13, 18)	D2
FP-2-27-G-10	(Notes: 14, 19)	E1

### 16 : Float Material

316 Stainless Steel (standard)		1
Hasteloy C		2
Monel		3
Tantalum (float codes 66, 67, 68, 69, 70, 71, 72)	(Note: 20)	4
PVC - 1/2" size (float code 74)	(Note: 21)	5
PVC - 3/4"-1" size (float codes 76 & 78)	(Note: 22)	5
PVC - 1½ -2" size (float codes 80 & 82)	(Note: 23)	5
TEFLON - 1/2" size (float code 73)	(Note: 24)	6
TEFLON - 3/4"-1" size (float codes 75 & 77)	(Note: 25)	6
TEFLON - 1½ -2" size (float codes 79 & 81)	(Note: 26)	6

## Additional ordering information

### 17 : Calibrations Includes Certificate of Calibration

Standard; uncalibrated accuracy		C1
Calibrated Accuracy; Liquids at 1 ctk. Viscosity		C2
Calibrated Accuracy; Liquids at viscosity up to 100 ctk. (1/2 In., 3/4 In., and 1 In.)	(Note: 27)	C3
Calibrated accuracy; Liquids at viscosity up to 100 ctk. (1 1/2 In., and 2 In.)	(Note: 28)	C4
Calibrated Accuracy; Gas Service		C6

### 18 : External Needle Valve (316 sst) & Nipple (unassenbled)

1/2 In. NPT; p/n 614C068U03	(Note: 10)	V3
3/4 In. NPT; p/n 614C068U04	(Note: 29)	V4

# 10A4

Code
------

## 19 : Preparation Procedure

Oxygen cleaning per ABB 3BUJ980096	P1
------------------------------------	----

## 20 : Certifications

Certificate of Conformance; per order	D1
---------------------------------------	----

## 21 : Material Certifications

Material Certifications: "typicals", per material	M1
---	----

## 22 : Pressure Test

Hydrostatic pressure test; 1/8 In. ... 1/2 In. diameter	(Note: 10)	H1
Hydrostatic pressure test; 3/4 In. ... 1 In. diameter	(Note: 29)	H2
Hydrostatic pressure test; 1½ In. ... 2 In. Diameter	(Note: 30)	H3

## 23 : Tags

Stainless Steel Tags (wired on) per meter	T1
---	----

### Table 10A4-A

#### 10A4 Connection Size Connector, Size 1/2 In. Tube Size 1/2 In.

<b>Seals</b>
O-Ring Pressure
Packing Gland Type Pressure

#### 10A4 Connection Size Connector, Size 3/4 In. NPT, Tube Size 3/4 In.

<b>Seals</b>
O-Ring Pressure
Packing Gland Type Pressure

#### 10A4 Connection Size Connector, Size 3/4 In. NPT, Tube Size 1 In.

<b>Seals</b>
O-Ring Pressure
Packing Gland Type Pressure

#### 10A4 Connection Size Connector, Size 1 In., Flanged, Tube Size 3/4 In.

<b>Seals</b>
O-Ring Pressure
Packing Gland Type Pressure

#### 10A4 Connection Size Connector, Size 1 In., Flanged Tube Size 1 In.

<b>Seals</b>
O-Ring Pressure
Packing Gland Type Pressure

#### 10A4 Connection Size Connector, Size 1-1/2 In., Tube Size 1-1/2 In.

<b>Seals</b>
O-Ring Pressure
Packing Gland Type Pressure

#### 10A4 Connection Size Connector, Size 1-1/2 In. Tube Size 2 In.

<b>Seals</b>
O-Ring Pressure
Packing Gland Type Pressure

**Table 10A4-B**

**10A4 Seal Material Packing Gland Design Neoprene**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Seal Material Packing Gland Design Teflon**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Seal Material O-Ring Design Buna-N**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Seal Material O-Ring Design Viton (Not used with Ammonia)**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Seal Material O-Ring Design EPR**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**Table 10A4-C**

**10A4 Alarms Not Required**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms Low Alarm, SPDT**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms High Alarm, SPDT**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms High & Low Alarm, SPDT**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms Low Alarm, DPDT**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms High Alarm, DPDT**

**Connection Size**

- Connector, Size 1/2 In. Tube Size 1/2 In.
- Connector, Size 3/4 In. NPT, Tube Size 3/4 In.
- Connector, Size 3/4 In. NPT, Tube Size 1 In.
- Connector, Size 1 In., Flanged, Tube Size 3/4 In.
- Connector, Size 1 In., Flanged Tube Size 1 In.
- Connector, Size 1-1/2 In., Tube Size 1-1/2 In.
- Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms High & Low Alarm, DPDT**

**Connection Size**

**10A4 Alarms High & Low Alarm, DPDT****Connection Size**

Connector, Size 1/2 In. Tube Size 1/2 In.  
 Connector, Size 3/4 In. NPT, Tube Size 3/4 In.  
 Connector, Size 3/4 In. NPT, Tube Size 1 In.  
 Connector, Size 1 In., Flanged, Tube Size 3/4 In.  
 Connector, Size 1 In., Flanged Tube Size 1 In.  
 Connector, Size 1-1/2 In., Tube Size 1-1/2 In.  
 Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms High & High Alarm, SPDT****Connection Size**

Connector, Size 1/2 In. Tube Size 1/2 In.  
 Connector, Size 3/4 In. NPT, Tube Size 3/4 In.  
 Connector, Size 3/4 In. NPT, Tube Size 1 In.  
 Connector, Size 1 In., Flanged, Tube Size 3/4 In.  
 Connector, Size 1 In., Flanged Tube Size 1 In.  
 Connector, Size 1-1/2 In., Tube Size 1-1/2 In.  
 Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms Low & Low Alarm, SPDT****Connection Size**

Connector, Size 1/2 In. Tube Size 1/2 In.  
 Connector, Size 3/4 In. NPT, Tube Size 3/4 In.  
 Connector, Size 3/4 In. NPT, Tube Size 1 In.  
 Connector, Size 1 In., Flanged, Tube Size 3/4 In.  
 Connector, Size 1 In., Flanged Tube Size 1 In.  
 Connector, Size 1-1/2 In., Tube Size 1-1/2 In.  
 Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms High & High Alarm, DPDT****Connection Size**

Connector, Size 1/2 In. Tube Size 1/2 In.  
 Connector, Size 3/4 In. NPT, Tube Size 3/4 In.  
 Connector, Size 3/4 In. NPT, Tube Size 1 In.  
 Connector, Size 1 In., Flanged, Tube Size 3/4 In.  
 Connector, Size 1 In., Flanged Tube Size 1 In.  
 Connector, Size 1-1/2 In., Tube Size 1-1/2 In.  
 Connector, Size 1-1/2 In. Tube Size 2 In.

**10A4 Alarms Low & Low Alarm, DPDT****Connection Size**

Connector, Size 1/2 In. Tube Size 1/2 In.  
 Connector, Size 3/4 In. NPT, Tube Size 3/4 In.  
 Connector, Size 3/4 In. NPT, Tube Size 1 In.  
 Connector, Size 1 In., Flanged, Tube Size 3/4 In.  
 Connector, Size 1 In., Flanged Tube Size 1 In.  
 Connector, Size 1-1/2 In., Tube Size 1-1/2 In.  
 Connector, Size 1-1/2 In. Tube Size 2 In.

Note 1: Not available with Connection Designation code 6, 8

Note 2: Not available with Connection Designation code 8

Note 3: Not available with Connection Designation code 5, 7

Note 4: Not available with Seals code 55

Note 5: Not available with Seals code 65

Note 6: Not available with Connection Size code L, M

Note 7: Not available with Connection Size code J, K

Note 8: Not available with Connection Designation code 7, 8

Note 9: Not available with Connection Designation code 5, 6

Note 10: Not available with Connection Size code J, K, L, M, N, P

Note 11: Not available with Connection Size code H, K, M, N, P

Note 12: Not available with Connection Size code H, J, L, N, P

Note 13: Not available with Connection Size code H, J, K, L, M, P

Note 14: Not available with Connection Size code H, J, K, L, M, N

Note 15: Not available with Float Code code 02, 03, 04, 05, 06, 07, 08, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 67, 68, 69, 70, 71, 72, 75, 76, 77, 78, 79, 80, 81, 82

Note 16: Not available with Float Code code 01, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 77, 78, 79, 80, 81, 82

Note 17: Not available with Float Code code 01, 02, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 70, 71, 72, 73, 74, 75, 76, 79, 80, 81, 82

Note 18: Not available with Float Code code 01, 02, 03, 04, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 61, 62, 63, 64, 65, 66, 67, 68, 69, 71, 72, 73, 74, 75, 76, 77, 78, 81, 82

Note 19: Not available with Float Code code 01, 02, 03, 04, 05, 06, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 66, 67, 68, 69, 70, 73, 74, 75, 76, 77, 78, 79, 80

Note 20: Not available with Float Code code 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82

Note 21: Not available with Float Code code 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 75, 76

Note 22: Not available with Float Code code 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75

Note 23: Not available with Float Code code 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75

Note 24: Not available with Float Code code 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 74, 75, 76

Note 25: Not available with Float Code code 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 76

Note 26: Not available with Float Code code 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75

Note 27: Not available with Connection Size code N, P

Note 28: Not available with Connection Size code M, L, K, J, H

Note 29: Not available with Connection Size code H, N, P

Note 30: Not available with Connection Size code H, J, K, L, M

---

Notes

---

ABB (www.abb.com) is a leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs about 120,000 people.

[www.abb.com/instrumentation](http://www.abb.com/instrumentation)

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

Printed in USA (2.26.10)  
© ABB 2003, 2010

D-FV-10A4500\_3(US)

**ABB Inc.**  
125 East County Line Road  
Warminster, PA 18974  
USA

Tel: +1 215 674 6000  
Fax: +1 215 674 7183