



SAFEGUARD ROTAMETERS

GENERAL PURPOSE

GLASS TUBE METERS

FOR MEDIUM

AND HIGH FLOWS

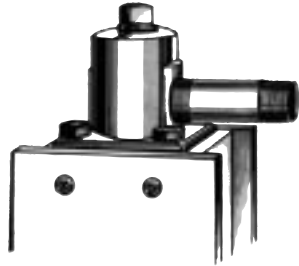
FEATURING

UNIVERSAL

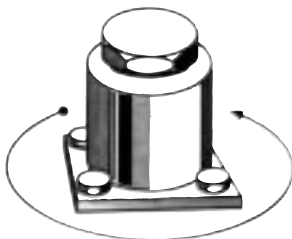
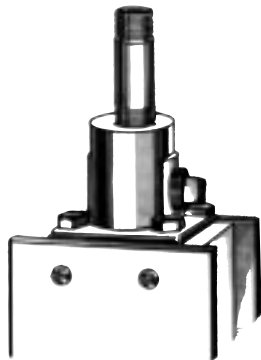
END FITTINGS



SAFEGUARD ROTAMETERS--FEATURES



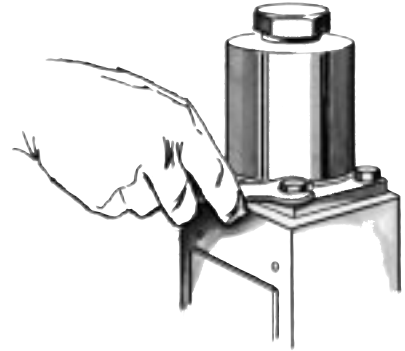
Universal End Fittings are designed so the user can easily make changes in the field to adapt to any piping orientation, vertical or horizontal. All that is required is relocating the pipe plug.



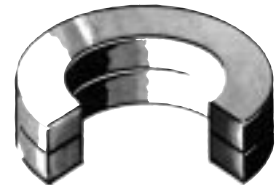
Bar stock end fittings rotate 360°. Easiest possible installation.



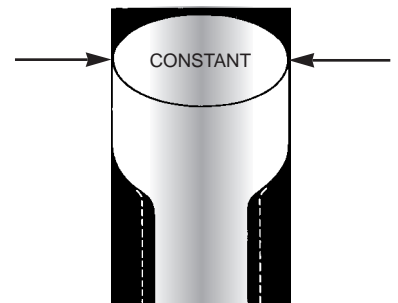
Figure 1. The 20-5000 Series "Safeguard" Rotameter (formerly 20-4000)



Packing glands are adjustable from outside case. No disassembly required.



Uses packing gland construction with selection of packing materials. Provides excellent tube seal.



Belled-end tube design, permits using tubes with different capacity ratings in same meter body.

APPLICATIONS AND SPECIFICATIONS

APPLICATIONS

“Safeguard” Rotameters are recommended for the accurate measurement and on-the-spot indication of the rate of flow of liquids or gases in pipelines. Excellent reproducibility is attained through a wide range of fluid flows - available as low as 120 cc/min on standard stock units, and special tube and float combinations going as low as 50 CC/min. They are installed directly in pipelines up to 1 1/2 inches in diameter. In sizes larger than this, and for flows over 92 gpm, bypass rotameters, as detailed in Bulletin 20-4100-68, are recommended. “Safeguard” Rotameters operate on the variable-area principle.

SPECIFICATIONS

CONNECTION SIZES AVAILABLE: 1/2", 1" and 1 1/2"

CONNECTIONS: Horizontal or vertical, see page 13... flanged connections available, threaded in all sizes.

SIZES AND CAPACITIES: See subsequent pages for sizes, dimensions, capacities and complete sizing data.

ACCURACY: ±2% of full scale, standard. ±1% of full scale with special calibration.

MAXIMUM TEMPERATURE: 250°F

PRESSURE RATINGS: See Tables 1 thru 6

MATERIALS: Cases: Stainless steel (1/2", 1" & 1 1/2") standard

Windows: Polycarbonate

Window Frames: Stainless steel

End Fittings: Stainless steel, steel, cast iron, brass, polyvinyl chloride (Hastelloy and ductile iron available on request)

Meter Tube: Borosilicate glass

Float: Stainless steel and other corrosion-resistant materials

Gaskets: Teflon; Anchor 443 optional

Packing: Hypalon with Teflon shields; Neoprene optional

Glands: Stainless steel or cast iron

SCALES: Detachable (standard) or etched on glass (optional).

Millimeter reference with calibration charts, or direct reading in any units, 0-100 with factor tag. 125 mm or 250 mm scale length (for industrial applications) and 600 mm scale length (for precision applications).

TUBES: “Belled-end” design permits metering tubes of different capacities to be used with a single Rotameter. Positive tube seating and full surface-to-surface contact. Two types available - “HCF” high-capacity fluted with guided float and “R” type conical tapered with free float.

FLOATS: Streamlined, semi-viscosity compensating, maximum viscosity compensating.

MOUNTING: In vertical position directly in pipelines, on front or back of instrument panel, or on operating machinery

MODIFICATIONS

Orientation of universal end fittings can be specified independent of one another, i.e., one vertical connection and the other a horizontal connection.

250 mm scale length meter available as simple glass metering tube with hose connections for capacities up to 90 gpm. 250 mm scale length meter is also used in bypass arrangement with main orifice for high flows in pipelines 1 1/2" and above.

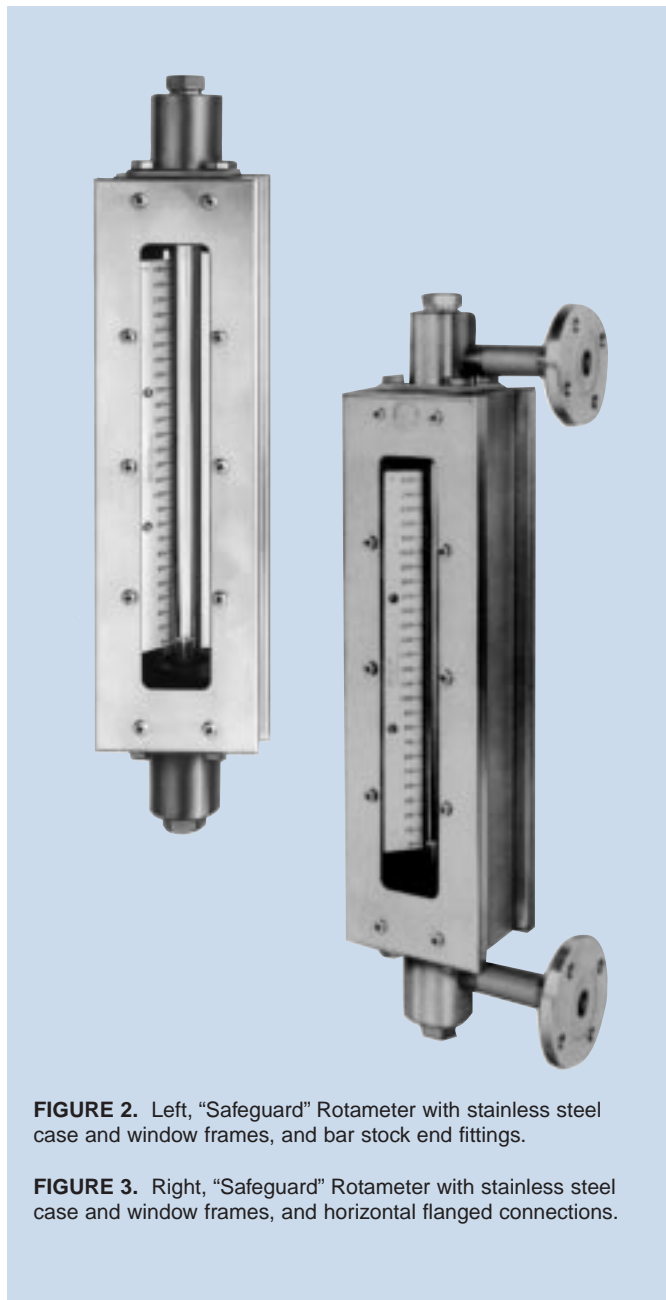


FIGURE 2. Left, “Safeguard” Rotameter with stainless steel case and window frames, and bar stock end fittings.

FIGURE 3. Right, “Safeguard” Rotameter with stainless steel case and window frames, and horizontal flanged connections.

HOW TO SELECT SERIES 20-5000

A. If the operating specific gravity is 1.0, the operating viscosity is 1.0 centistoke, and the float material is stainless steel, establish desired operating capacity in gallons per minute (gpm), and select proper size Rotameter directly from Tables 1 thru 6 on pages 6, 7 and 8.

B. If the specific gravity is other than 1.0 and/or the viscosity is other than 1.0 centistoke (cs) at operating conditions, and the float material is stainless steel or Hastelloy C, establish:

- 1) The specific gravity at operating temperature (G_{OT})
- 2) Viscosity at operating temperature (V_{OT}) in centistokes (cs)
- 3) Maximum flow at operating temperature (Q_{OT}) in gallons per minute (gpm)

Use the following procedure. The example given will serve as a guide.

Example: Liquid to be handled-Oil

Specific Gravity at operating Temperature
(G_{OT}) = 0.85

Viscosity at Operating Temperature
(V_{OT}) = Varying - 2 to 13 cs

Maximum Flow (Q_{OT}) = 5 gpm

STEP 1.

Determine Conversion Factor (f) from Table 7, page 12. Select factor corresponding to G_{OT} and the proper float material, stainless steel or Hastelloy C.

Example: f = 0.915 (for stainless steel float using a G_{OT} of 0.85)

STEP 2.

Determine Sizing Flow (Q_s), using $Q_s = f \times Q_{OT}$

Example: $Q_s = 0.915 \times 5 = 4.57$ gpm

STEP 3.

Determine Sizing Viscosity (V_s), using $V_s = f \times V_{OT}$ (the highest viscosity in a varying viscosity range is used to determine correct float selection).

Example: $V_s = 0.915 \times 13 = 11.89$ cs

STEP 4.

Use the sizing values to select the proper Rotameter size from Curves B or C, pages 10 and 11.

Example: Viscosity varies (2 to 13 cs.). Refer to Curve C, page 11,

SYMBOLS

G_{OT} = Specific Gravity of liquid to be metered at operating temperature

V_{OT} = Kinematic Viscosity of liquid to be metered at operating temperature (in centistokes, cs)

Q_{OT} = Maximum Flow anticipated at operating temperature (in gallons per minute, gpm)

f = Conversion Factor

Q_s = Sizing Flow (in gallons per minute, gpm)

V_s = Sizing Viscosity (in centistokes, cs)

“Selection Curve for Viscosity-Compensating Floats, Type GV.”
Select Size 6 with 1-27-G-10 tube and 1-GV-4 float.

To determine if float fully compensates over the liquid viscosity range, establish viscosity ceiling by referring to Table 4 and calculate as follows:

$$\text{Viscosity Ceiling} = \frac{15 \text{ cs}}{\sqrt{0.85}} = 16.2$$

Therefore, the float selected will be viscosity compensating over the specified range of 2 to 13 cs.

(If the viscosity is fixed and below 50 cs, Curve A could be used for selection of tube and float. Curve A does not utilize viscosity compensating floats; however, a smaller meter size could possibly be used for greater economy.)

PRODUCT MODEL NUMBERING SYSTEM EXPLANATION

All variable area meters begin with 20, followed by a 4 digit number identifying the type of unit, type of connection, as well as connection orientation, scale length and special features. The first number of the model number indicates the class of instrument:

First Digit Code (General Category)

5000 Series Safeguard with packing and gland

The second number on a Rotameter number refers to the connection, either flanged or threaded, as well as connection orientation - vertical, horizontal, etc. Code for connections is shown below. In all cases, threaded connections are odd numbers and flanged connections even numbers.

Second Digit Code (All Meters Except Purge Meters)

- 1 - Inlet and outlet horizontal NPT
- 2 - Inlet and outlet horizontal flanged
- 3 - Inlet and outlet vertical NPT
- 4 - Inlet and outlet vertical flanged
- 5 - Vertical inlet, horizontal outlet NPT
- 6 - Vertical inlet, horizontal outlet flanged
- 7 - Horizontal inlet, vertical outlet NPT
- 8 - Horizontal inlet, vertical outlet flanged

Third Digit Code (scale length in inches)

- | | |
|-------------------------|----------------------|
| 1 - 1 1/2" scale length | 4 - 4" scale length |
| 2 - 24" scale length | 5 - 5" scale length |
| 3 - 3" scale length | 7 - 7" scale length |
| | 0 - 10" scale length |

The Fourth Digit Code is "0" unless the unit has special features, in which case the fourth digit will be "1". The "1" does not indicate *what* is special; the specialty will be defined in the meter description.

Example:

Model Number 20-5350

This number describes a variable area (20) Safeguard meter with packing and gland (5), threaded NPT vertical inlet and outlet connections (3), 5" scale length (5), and no special features (0).

HOW TO SELECT SERIES 20-5000 "SAFEGUARD" ROTAMETERS FOR GAS SERVICE

A. If the gas to be handled is air at STP (70°F., 14.7 psia) establish desired operating capacity in cubic feet per minute (cfm), and select proper size Rotameter from Table 1 thru 6 on pages 6, 7 and 8.

B. If the gas is not air at STP, establish:

- 1) Operating Temperature (T_O) in degrees F
- 2) Operating Pressure (P_O) in psig
- 3) Maximum Flow.

If maximum flow is given in *volumetric units*, convert to cubic feet per minute (cfm). If maximum flow is given in *gravimetric units*, convert to pounds per minute (ppm).

C. For *Imperfect Gases*, do the following:

Example: Gas to be metered - Ammonia
Operating Temperature (T_O) = 100°F.
Operating Pressure (P_O) = 35 psig
Maximum Flow = 32.0 scfm

STEP 1.

Determine specific gravity of gas to be metered at operating temperature and pressure (G_{OTP}) as follows. Refer to published data for the specific volume or density at OTP.

Example: From a table of the thermodynamic properties of ammonia, the specific volume at OTP is 6.88 cubic feet per pound.

If data lists densities in pounds per cubic foot,

$$G_{OTP} = \frac{\text{Density in lbs./cu. ft.}}{.0749}$$

If data lists specific volume in cubic feet per pound,

$$G_{OTP} = \frac{13.34}{\text{Specific volume in cu. ft./lb.}}$$

Example: $G_{OTP} = \frac{13.34}{6.88} = 1.94$

STEP 2.

Determine sizing flow (Q_S)

a. If maximum flow is in *standard* units (scfm), refer to Table 10 for specific gravity at STP of gas to be metered and proceed as follows:

Example: $G_{STP} = .596$ (from Table 10 for ammonia)

$$Q_S = \text{scfm} \times \sqrt{\frac{G_{STP}}{G_{OTP}}}$$

Example: $Q_S = 32.0 \times \frac{.596}{\sqrt{1.94}} = 13.7 \text{ cfm}$

b. If maximum flow is in *actual* units (acfm), use

$$Q_S = \text{acfm} \times \sqrt{G_{OTP}}$$

c. If maximum flow is in *weight* units (ppm), use

$$Q_S = \text{ppm} \times \frac{13.34}{\sqrt{G_{OTP}}}$$

STEP 3.

Refer to Tables 1 thru 6 on pages 6, 7 and 8, and select proper Rotameter size.

Example: Refer to Table 2 and select a size #4-HCFb Rotameter with a 43-J float

D. For Perfect Gases, do the following:

Example: Gas to be metered - Argon
Operating Temperature (T_O) = 70°F.
Operating Pressure (P_O) = 30 psig

Specific Gravity at STP (G_{STP}) = 1.380

Maximum Flow = 76 scfm

Pressure drop not to exceed 15" W.C.

STEP 1.

Select conversion factors for Operating Pressure (f_1) from Table 8, Operating Temperature (f_2) from Table 9 and Specific Gravity at STP (f_3) from Table 10.

Example: $f_1 = 0.573$ from Table 8 (for 30 psig)

$f_2 = 1.0$ from Table 9 (for 70°F.)

$f_3 = 1.175$ from Table 10 (for Argon)

STEP 2.

Determine sizing flow (Q_S)

a. If the maximum flow is in *standard* units (scfm), use

$$Q_S = \text{scfm} \times f_1 \times f_2 \times f_3$$

Example: $Q_S = 76 \text{ scfm} \times 0.573 \times 1.0 \times 1.175$

$$Q_S = 51.1 \text{ cfm}$$

b. If the maximum flow is in *actual* units (acfm), use

$$Q_S = \text{acfm} \times \frac{(P_O + 14.7) \times 530}{14.7 (T_O + 460)} \times f_1 \times f_2 \times f_3$$

c. If the maximum flow is in *weight* units (ppm), determine the specific volume at STP (VOL_{STP}) from Table 10 and use:

$$Q_S = \text{ppm} \times VOL_{STP} \times f_1 \times f_2 \times f_3$$

STEP 3.

Refer to Tables 1 thru 6 on pages 6, 7 and 8 and select proper Rotameter size.

Example: Refer to Table 4. A size #8 Rotameter with 1 $\frac{1}{2}$ - 25-G-10 tube and 1 $\frac{1}{2}$ -GV-4 float will handle 54.6 cfm at STP with a maximum pressure drop of 10.3" W.C.

(If pressure drop is not critical, greater economy could be realized by referring to Table 2 and note that a #5-HCFb Rotameter with a 50-J float will give 53.3 cfm at STP with a maximum pressure drop of 33" W.C.)

SYMBOLS

STP	= 70°F & 14.7 psia
OTP	= Operating Temperature and Pressure
T_O	= Operating Temperature in degrees F
P_O	= Operating Pressure in lbs. per sq. inch gage (psig)
f₁	= Conversion Factor for Pressure
f₂	= Conversion Factor for Temperature
f₃	= Conversion Factor for Specific Gravity at STP
Q_S	= Sizing Flow in cubic feet per minute (cfm) air at 14.7 psia & 70°F
G_{STP}	= Specific Gravity of Gas to be metered at STP
G_{OTP}	= Specific Gravity of Gas to be metered at OTP
VOL_{STP}	= Specific Volume of Gas to be metered at STP

CAPACITY TABLES

(All meters have 10 to 1 flow range)



TABLE 1. Capacities for Series 20-5000 Rotameters with 250 mm Scale “R” Conical Tapered Tubes

gpm Water @ 70°F 250mm	cfm Air @ 70°F and 14.7 psia 250mm	Group* and Conn. Size	Meter Size	Tube No.	Float	Max. Pressure Drop in W.C.	Max. Recommended Pressure† psig @ 200°F
					Type No.		
0.0316	0.160	B 1/2"	01-RL	01-RLb	R-015	1.1	350
0.0363	0.172				R-014	1.3	
0.0471	0.232				R-013	1.8	
0.0535	0.262				R-012	2.4	
0.0625	0.300		1-RL	1-RLb	R-14	1.0	350
0.0737	0.353				R-13	1.1	
0.0870	0.405				R-12	1.6	
0.1090	0.503				R-11	2.7	
0.1440	—				R-10	4.5	
0.180	0.82		2-RL	2-RLb	R-22	2.3	350
0.226	—				2-C	3.6	
0.241	1.05				R-21	3.6	
0.309	1.33	R-20			5.6		
0.303	—	2-B			5.6		
0.390	—	2-A			8.9		

Note: Do not use capacities in Table 1 for 125 mm scale; see Note 3 and 4.



TABLE 2. Capacities for Series 20-5000 Rotameters with 250 mm Scale³ “HCF” High Capacity Fluted Tubes.

0.330	1.4	B 1/2"	3	3-HCFb	3-F-11	.84	350			
0.543	2.2				3-F-9	2				
0.757	3.1				3-F-7	3				
1.26	5.36				34-J	7				
1.48	6.21				33-J	8				
1.72	7.37				32-J	11				
1.99	8.76				31-J	13				
2.28	9.94				30-J	17				
2.79	11.7				4	4-HCFb		44-J	12	300
3.26	13.6							43-J	15	
3.77	16.2	42-J	19							
4.34	18.7	41-J	25							
5.09	21.7	40-J	32							
5.98	24.9	C 1"	5	5-HCFb	54-J	11	300			
7.49	31.0				53-J	14				
8.72	39.9				52-J	18				
10.6	45.0				51-J	24				
12.5	52.6				•50-J	33				
14.8	61.3	6	6-HCFb	6-HCFb	64-J	25	250			
17.1	70.1				•63-J	32				
20.1	85.6				•62-J	42				
23.4	99.5				•61-J	57				
28.3	120.0				•60-J	80				
34.7	140.0	D 1 1/2"	8	8-HCFb	83-J	27	130			
38.9	159.0				•82-J	32				
46.0	192.0				•81-J	40				
54.7	230.0				•80-J	54				
60.3	249.0	9	9-HCFb	9-HCFb	•93-J	45	90			
68.3	278.0				•92-J	53				
78.9	325.0				•91-J	66				
91.7	381.0				•90-J	88				

* Tubes and floats that can be used in one Rotameter case.

† These floats are not recommended for gas service unless operating pressure (downstream) exceeds 30 psig.

Note: 1 - Tempered tubes are available for higher pressure ratings.

2 - Floats on this page are not recommended for high viscosity applications.

3 - Capacities listed in Table 2 may be used for 125 mm scale length up to Size 9; Tube No. HCFYb. Also see Note 4, page 7.



TABLE 3. Capacities for Series 20-5000 Rotameters with 250 mm⁴ Scales and GS Semi-Viscosity

gpm Water @ 70°F	cfm Air @ 70°F and 14.7 psia	Group* and Conn. Size	Meter Size	Tube No.	Float No.	Visc. Ceiling cs. **	Max. Press. Drop in W.C.	Max. Recommended Pressure psig @ 200°F
.79	3.28	B 1/2"	4	1/2-20-G-10	1/2-GS-2	.7	3.7	300
1.00	4.11				1/2-GS-4	.8	6.0	
1.25	5.16				1/2-GS-6	.9	9.6	
1.59	6.55	B 1/2"	4	1/2-37-G-10	1/2-GS-2	.8	7.1	300
1.99	8.20				1/2-GS-4	.9	11.2	
2.45	10.10				1/2-GS-6	1.0	17.2	
3.40	14.0	C 1"	5	3/4-31-G-10	3/4-GS-2	2.0	5.2	300
4.28	17.6				3/4-GS-4	2.3	8.2	
5.26	21.7				3/4-GS-6	2.5	12.9	
6.85	28.2	C 1"	6	1-27-G-10	1-GS-4	3.0	11.0	250
8.73	35.9				• 1-GS-6	4.0	20.8	
11.0	45.3				1-GS-4	2.5	18.7	
14.0	57.6	C 1"	6	1-41-G-10	• 1-GS-6	3.0	30.5	250
17.3	71.2				1-GS-4	2.5	18.7	
19.8	81.5				• 1-GS-6	3.0	30.5	
23.4	96.4	D 1 1/2"	8	1 1/2-25-G-10	1 1/2-GS-4	6.0	12.9	135
26.9	111.0				1 1/2-GS-6	7.0	16.5	
36.3	150				1 1/2-GS-4	5.0	14.9	
47.8	197	D 1 1/2"	9	2-24-G-10	• 1 1/2-GS-6	8.0	19.9	135
23.4	96.4				2-GS-6	10.0	24.2	
26.9	111.0				2-GS-6	10.0	32.8	
36.3	150	D 1 1/2"	9	2-31-G-10	2-GS-6	10.0	24.2	90
47.8	197				2-GS-6	10.0	32.8	

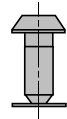


TABLE 4. Capacities for Series 20-5000 Rotameters with 250 mm⁴ Scales and GV Viscosity Compensating Floats.

.64	2.65	B 1/2"	4	1/2-20-G-10	1/2-GV-2	2.5	3.4	300
.81	3.35				1/2-GV-4	4.0	5.5	
1.03	4.24				1/2-GV-6	4.5	8.8	
1.32	5.44	B 1/2"	4	1/2-37-G-10	1/2-GV-2	3.5	5.7	300
1.66	6.84				1/2-GV-4	4.5	9.1	
2.07	8.52				1/2-GV-6	5.0	14.5	
2.65	10.9	C 1"	5	3/4-31-G-10	3/4-GV-2	9.0	4.5	300
3.36	13.8				3/4-GV-4	10.0	6.9	
4.23	17.4				3/4-GV-6	11.0	11.4	
5.24	21.6	C 1"	6	1-27-G-10	1-GV-4	15.0	8.3	250
6.76	27.8				1-GV-6	20.0	14.4	
8.7	35.8				1-GV-4	24.0	13.8	
11.2	46.1	C 1"	6	1-41-G-10	• 1-GV-6	25.0	22.9	250
13.2	54.4				1 1/2-GV-4	28.0	10.3	
15.4	63.6				1 1/2-GV-6	36.0	14.2	
18.3	75.4	D 1 1/2"	8	1 1/2-25-G-10	1 1/2-GV-4	28.0	12.5	130
21.1	87.0				1 1/2-GV-6	36.0	16.8	
27.2	113				2-GV-6	55.0	18.9	
36.2	149	D 1 1/2"	9	2-24-G-10	2-GV-6	55.0	18.9	90
27.2	113				2-31-G-10	• 2-GV-6	55.0	

* Tubes and floats that can be used in one Rotameter case.

** Tabulated values of viscosity ceiling applicable only for fluids with SP GR 1.0

For other specific gravities : Viscosity ceiling = $\sqrt{\frac{\text{tabulated value}^{**}}{\text{specific gravity}}}$

• These floats are not recommended for gas service unless operating pressure (downstream) exceeds 30 psig.

Note: 4 - Capacities listed in Tables 3 and 4 may be used for 125 mm scale length; Tube Suffix No. G-5.

CAPACITY TABLES

(All meters have 10 to 1 flow range)



TABLE 5. Capacities for Series 20-5020 “Safeguard” Rotameters with 600 mm Scales and

gpm Water @ 70°F		cfm Air 70°F & 14.7 psia		Group*	Meter Size	Tube No.	Float No.	Visc. Immun. Ceiling cs. **	Pressure Drop in W.C.	Max. Recommended Pressure† psig @ 200°F
Max.	Min.	Max.	Min.							
2.19	0.21	9.03	0.9	B	4	4-HCFxB	1/2-HGNV-2		6.10	300
2.78	0.27	11.4	1.1				1/2-HGNV-4			
3.47	0.34	14.3	1.4				1/2-HGNV-6			
4.49	0.45	18.9	1.8	C	5	5-HCFxB	3/4-HGNV-2	2.0	5.70	300
5.68	0.58	23.9	2.3				3/4-HGNV-4	2.3		
7.20	0.90	30.2	3.7				3/4-HGNV-6	2.5		
12.3	1.2	50.8	5.0	C	6	6-HCFxB	1-HGNV-4	2.5	17.0	250
15.8	1.8	66.0	7.4				• 1-HGNV-6	3.0		
24.5	2.4	101.0	10.1	D	8	8-HCFxB	1 1/2-HGNV-4	5.0	14.3	130
28.2	3.3	117.0	14.0				• 1 1/2-HGNV-6	8.0		
52.8	5.2	218.0	21.0				9	9-HCFxB		



TABLE 6. Capacities for Series 20-5000 “Safeguard” Rotameters with 600 mm Scales and Stainless Steel Viscosity Compensating and Flute-Guided Floats.

1.83	0.18	7.50	0.75	B	4	4-HCFxB	1/2-HGV-2	3.5	5.2	300
2.36	0.23	9.68	0.96				1/2-HGV-4	4.5	8.3	
2.98	0.29	12.2	1.2				1/2-HGV-6	5.0	13.1	
3.61	0.36	15.2	1.5	C	5	5-HCFxB	3/4-HGV-2	9.0	4.9	300
4.64	0.47	19.5	1.9				3/4-HGV-4	10.0	7.9	
5.90	0.72	24.7	3.0				3/4-HGV-6	11.0	12.7	
9.70	0.97	40.0	4.0	C	6	6-HCFxB	1-HGV-4	24.0	12.6	250
12.6	1.4	52.4	5.9				• 1-HGV-6	25.0	21.4	
19.1	1.9	78.5	7.8	D	8	8-HCFxB	1 1/2-HGV-4	28.0	12.1	130
22.2	2.4	92.2	9.9				1 1/2-HGV-6	36.0	16.3	
36.7	3.6	151.0	15.0				9	9-HCFxB	• 2-HGV-4	
40.1	4.0	165.0	16.0	• 2-HGV-6	55.0	24.7				

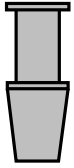
* Tubes and floats that can be used in one Rotameter case.

** Tabulated values of viscosity ceiling applicable only for fluids with SP GR 1.0.

$$\text{For other specific gravities: Viscosity ceiling} = \frac{\text{tabulated value}^{**}}{\sqrt{\text{specific gravity}}}$$

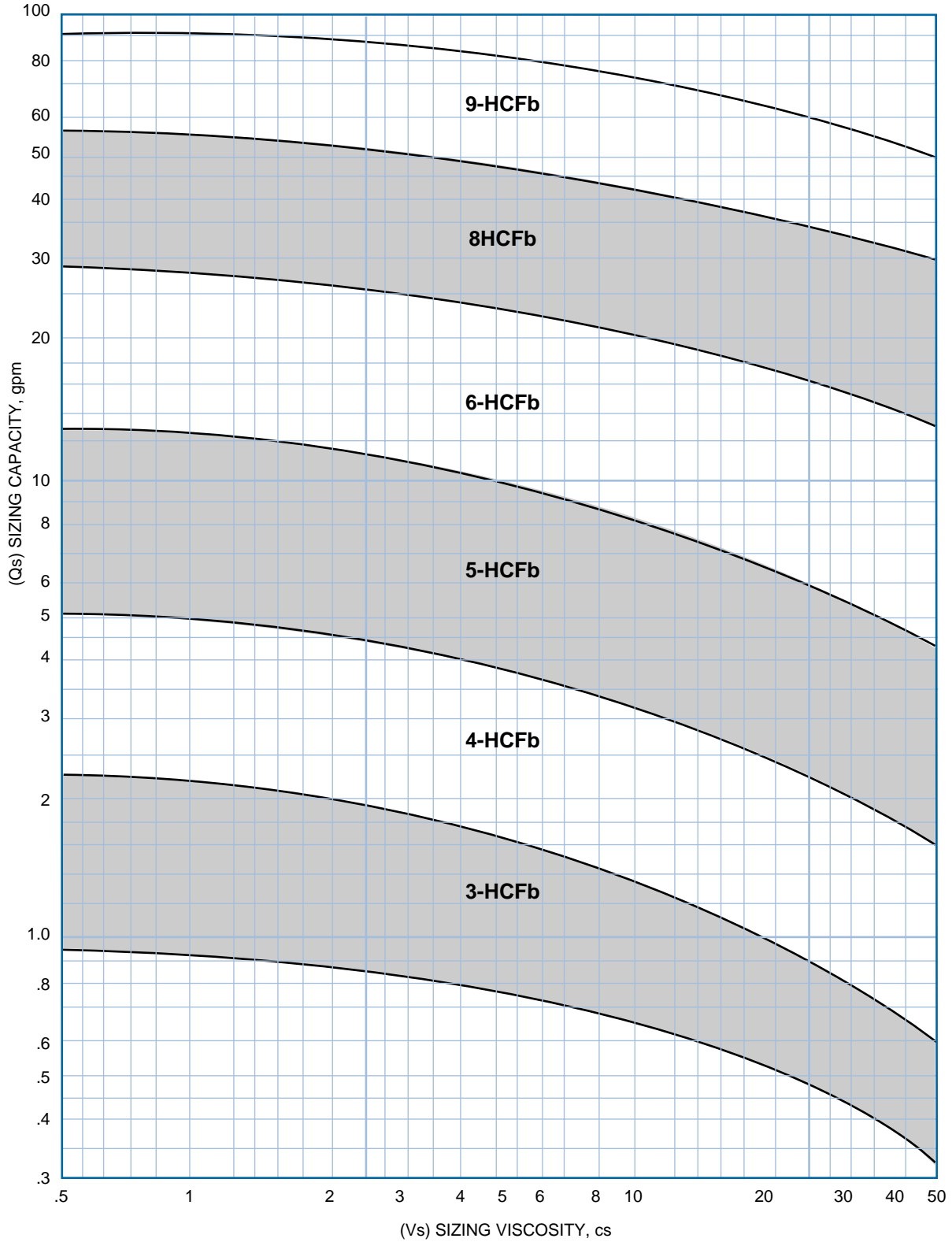
• These floats are not recommended for gas service unless operating pressure (downstream) exceeds 30 psig.

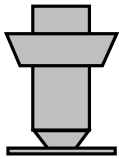
† Gas Service: Maximum pressure allowable is 50% of rating shown in tables 5 & 6.



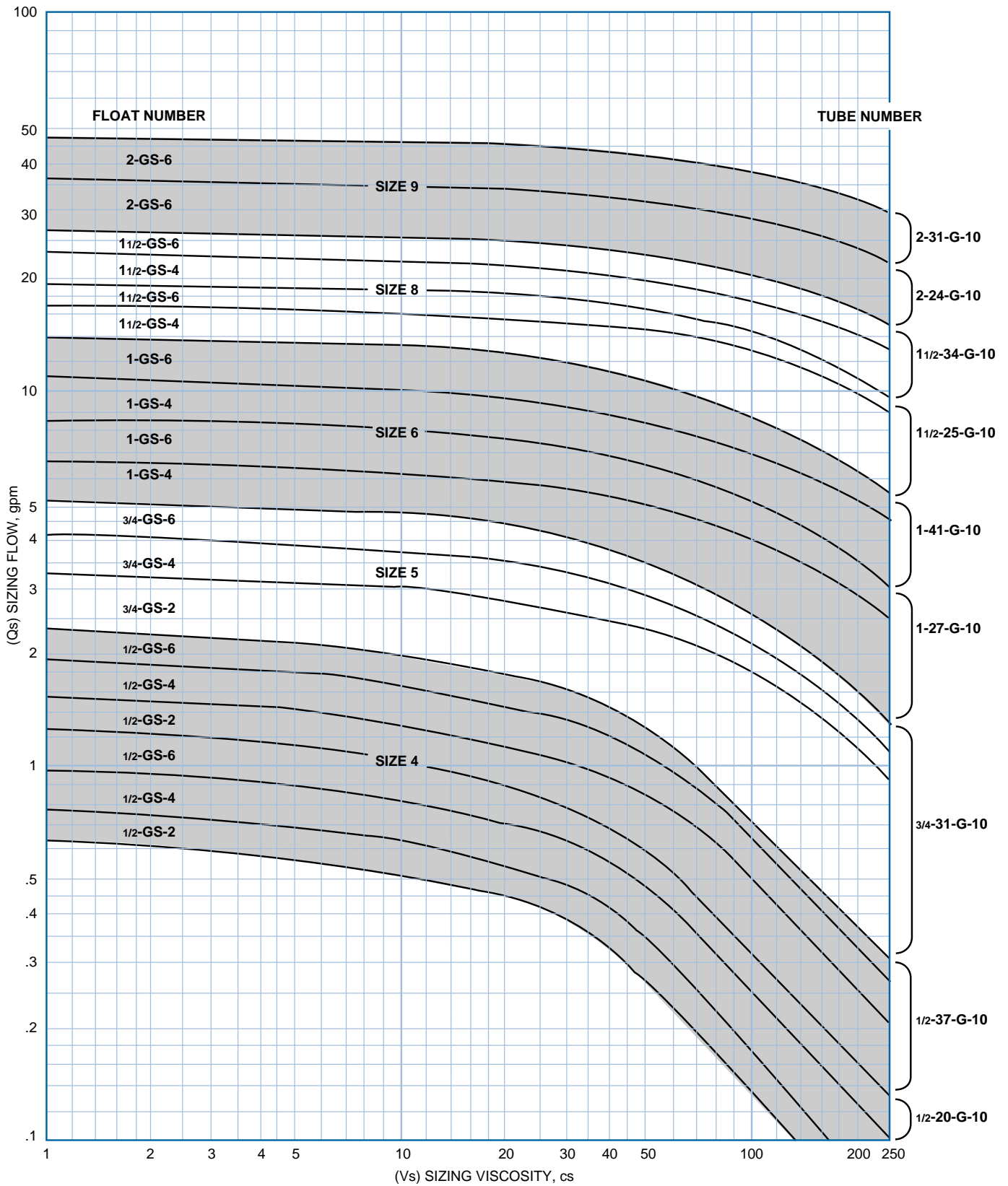
SELECTION CURVES

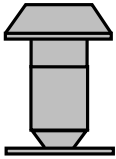
CURVE A. Selection Curve for Non-Viscosity
Compensating Streamlined Floats, Type HCF.



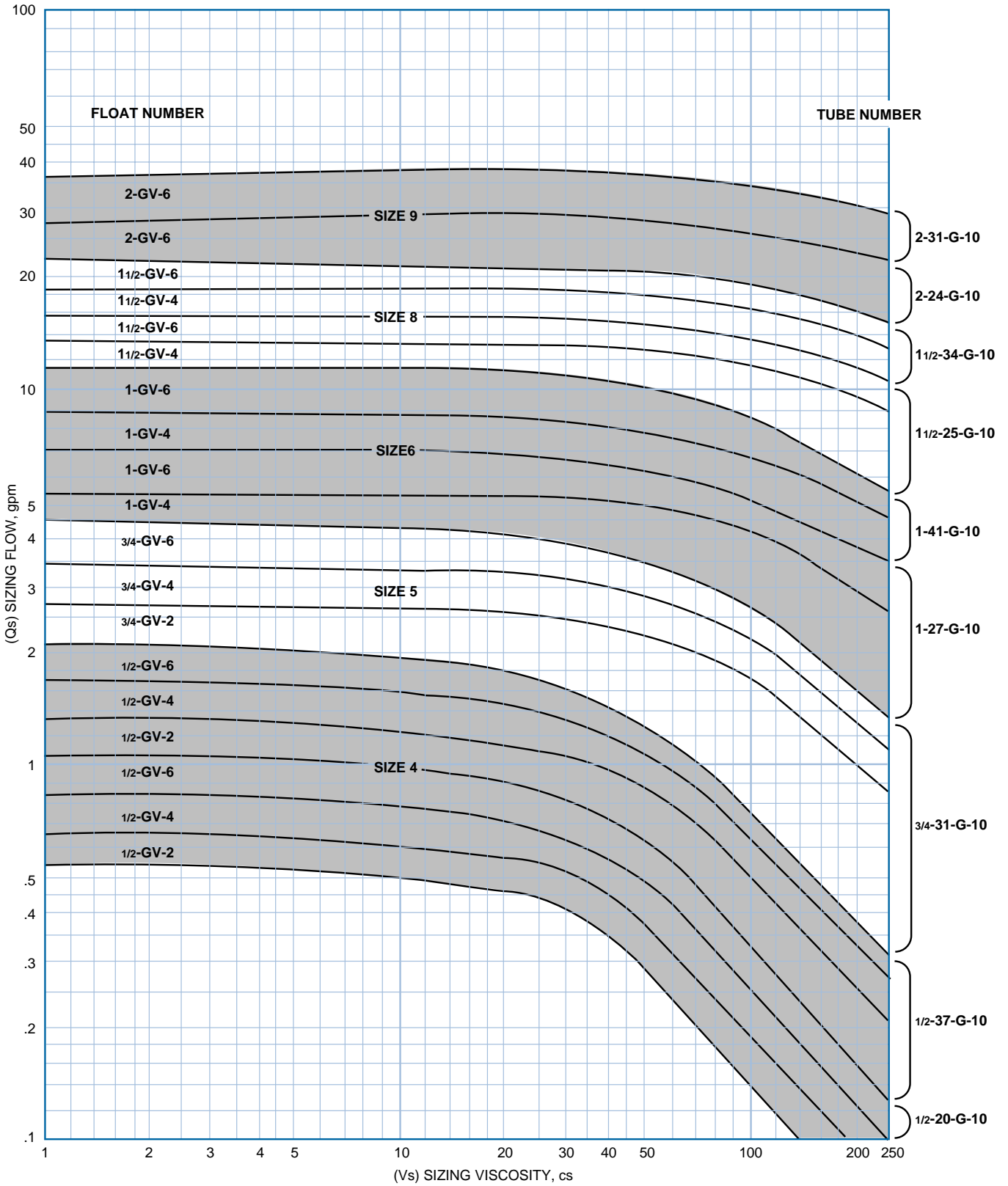


CURVE B. Selection Curve for Semi-Viscosity Compensating Floats, Type GS.





CURVE C. Selection Curve for Maximum Viscosity Compensating Floats, Type GV.



CONVERSION AND CORRECTION FACTORS

TABLE 7.

Conversion Factors (f) for Series 20-5000 "Safeguard" Rotameters. Stainless Steel and Hastelloy C Floats.

LIQUID SP. GR. (G _{OT})	CONVERSION FACTORS (f)	
	STAINLESS STEEL	HASTELLOY "C"
0.60	0.75	0.71
0.62	0.77	0.72
0.64	0.78	0.73
0.66	0.79	0.75
0.68	0.81	0.76
0.70	0.82	0.77
0.72	0.83	0.78
0.74	0.84	0.79
0.76	0.86	0.80
0.78	0.87	0.82
0.80	0.88	0.83
0.82	0.89	0.84
0.84	0.91	0.85
0.86	0.92	0.86
0.88	0.93	0.87
0.90	0.94	0.88
0.92	0.95	0.89
0.94	0.97	0.91
0.96	0.98	0.92
0.98	0.99	0.93
1.00	1.00	0.94
1.05	1.03	0.96
1.10	1.06	0.99
1.15	1.08	1.01
1.20	1.11	1.04
1.25	1.14	1.06
1.30	1.17	1.09
1.35	1.19	1.11
1.40	1.22	1.14
1.45	1.25	1.16
1.50	1.27	1.19
1.55	1.30	1.21
1.60	1.32	1.23
1.65	1.35	1.26
1.70	1.37	1.28
1.75	1.40	1.30
1.80	1.43	1.33
1.85	1.45	1.35
1.90	1.48	1.37
2.00	1.53	1.42

TABLE 8. Pressure Correction Factors (f₁)

OPERATING PRESSURE, psig												
0	2	4	6	8	10	15	20	25	30	35	40	50
1.000	0.938	0.887	0.843	0.805	0.771	0.704	0.651	0.609	0.573	0.544	0.518	0.477

OPERATING PRESSURE, psig												
60	70	80	90	100	120	140	160	180	200	220	240	260
0.444	0.417	0.394	0.375	0.359	0.330	0.308	0.290	0.275	0.262	0.250	0.240	0.231

$$f_1 = \sqrt{\frac{14.7}{14.7 + \text{psig}}}$$

TABLE 9. Temperature Correction Factors (f₂)

OPERATING TEMPERATURE, DEGREES F												
0	10	20	30	40	50	60	70	80	90	100	110	120
0.932	0.942	0.952	0.962	0.971	0.981	0.991	1.000	1.009	1.018	1.028	1.037	1.046

OPERATING TEMPERATURE, DEGREES F												
130	140	150	160	170	180	190	200	210	220	230	240	250
1.055	1.064	1.072	1.081	1.090	1.099	1.107	1.116	1.124	1.133	1.141	1.149	1.157

$$f_2 = \sqrt{\frac{460 + ^\circ\text{F}}{530}}$$

TABLE 10. Specific Gravity Correction Factors (f₃)

GAS	SPECIFIC VOLUME at 14.7 psia & 70°F CU. FT./LB. (VOL _{STP})	SP. GR. at 14.7 psia & 70°F** (G _{STP})	$\sqrt{\text{SP. GR.}}$ f ₃
ACETYLENE	14.72	0.907	0.952
*AIR	13.34	1.000	1.000
AMMONIA	22.40	0.596	0.772
*ARGON	9.67	1.380	1.175
BUTANE	6.44	2.071	1.439
CARBON DIOXIDE	8.73	1.529	1.236
*CARBON MONOXIDE	13.80	0.967	0.983
*CHLORINE	5.37	2.486	1.577
ETHANE	12.72	1.049	1.024
ETHYLENE	13.68	0.975	0.987
*HELIUM	96.70	0.138	0.372
*HYDROGEN	192.00	0.0695	0.264
*HYDROGEN CHLORIDE	10.52	1.268	1.126
METHANE	24.10	0.554	0.744
*NITROGEN	13.80	0.967	0.983
NITROUS OXIDE	8.72	1.530	1.236
*OXYGEN	12.07	1.105	1.051
PROPANE	8.59	1.554	1.246
SULPHUR DIOXIDE	5.89	2.264	1.505

*Perfect Gases

**Referred to air at 14.7 psia and 70°F

DIMENSIONS

(For model numbers refer to page 4)

TABLE 11. Horizontal Threaded & Flanged Connections

METER SIZE	CONN. SIZE (in.)	ALL OTHER MATERIAL FITTING MATERIAL						FIG'D METERS	ALL METERS	
		B	SCALE LENGTH							
			125 mm		250 mm		600mm			
A	C	A	C	A	C	D	E			
01-3R*	1/2"	15/16	125/16	151/4	161/2	201/8	301/4	333/4	31/2	33/4
3 & 4	1/2"	15/16	115/8	151/4	165/8	201/8	301/4	337/8	31/2	43/16
5 & 6	1"	11/2	121/2	173/8	171/2	221/4	315/16	361/16	4	59/16
8 & 9**	1 1/2"	21/8	153/8	22	203/8	27	341/2	41	5	71/8

*No. 01-1R 600 mm Safeguard meter

**No. 8-9 600 mm "E" Dim. = 77/32"

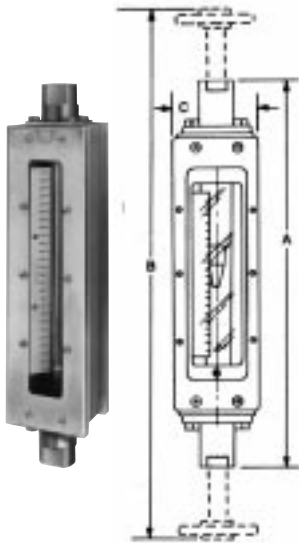
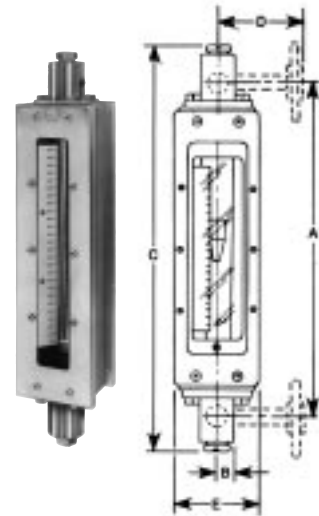


TABLE 12. Vertical Threaded & Flanged Connections

METER SIZE	CONN. SIZE (in.)	THREADED CONNECTIONS		FLANGED CONNECTIONS		ALL METERS
		SCALE LENGTH		SCALE LENGTH		
		125 mm	250 mm	125 mm	250 mm	
A	A	B	B	C		
01-3R	1/2	147/16	185/8	18	227/8	33/4
3 & 4	1/2	141/4	191/4	18	227/8	43/16
5 & 6	1	161/16	211/16	191/2	243/8	59/16
8 & 9	1 1/2	203/8	253/8	26	305/8	71/8

Specifications contained herein are subject to change without notice. Since it is impossible to anticipate or control the many different conditions under which this information and our products may be used, McCrometer cannot guarantee the applicability and accuracy of the information, or the suitability of our products in any given situation.

ADDITIONAL SK FLOWMETERS

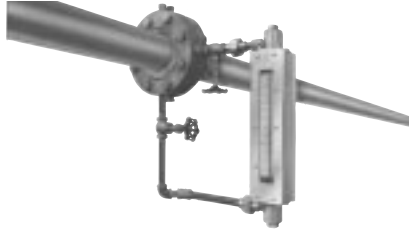
GLASS TUBE ALARM

Magnetic alarm rotameter. This is a glass-tube "Safeguard" rotameter with a magnetic alarm system mounted above the rotameter in a weathertight housing. The alarm system is vibration resistant and reset is automatic. Both high and low flow alarm switches are available. "Explosion-proof" housings are also available for use when conditions make this type applicable.



Request Bulletin 18A.

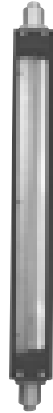
BYPASS ROTAMETERS



Series 20-5100-68 Bypass Rotameters are designed to measure fluid rate of flow in pipes 1 1/2 in. or larger by providing a bypass flow directly proportional to the main flow. All components supplied by McCrometer can be adapted for horizontal flow or for vertical flow, upward or downward. Scales read in terms of main line flow. Request Bulletin 20-4100-68.

60 MM LABORATORY ROTAMETERS

Series 20-5120 Rotameters are designed for measuring rate of flow of liquids and gases where a high degree of accuracy is required. The 600 mm scale length can be direct reading in flow units. Metering tube is either Linear or Log. Request Bulletin 20-1900.



FLO-THRU TRANSMITTING/INDICATING ROTAMETERS

Series 9300-ET metal tube rotameters measure rates of flow (up to 100 gpm) at pressures to 1500 psig at 400°F. They provide a 4 to 20 mA signal which is directly proportional to the flow rate over the full scale range of the meter. Available in NPT connections or 150, 300 or 600 lb. flanges in 1/2", 1", 1 1/2" and 2" sizes.



Request Bulletin 20-9300-ET and 20-9300.

METAL TUBE ROTAMETERS

Series 20-9500 rotameters are used for high-pressure or hazardous liquid and gas flows where glass tubes are not desirable. Capacities range from .64 to 371 gpm and standard accuracy is ±2%F.S. (±1% optional). These rotameters can handle pressures up to 2500 psig at 400°F.



Request Bulletin 19.

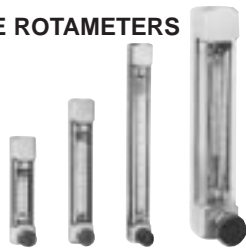
ALARM ROTAMETERS

Series 20-9650 alarm rotameters feature a magnetic follower and alarm system which can activate audible and visual alarms or an automatic shutoff in case of abnormally high or low flows. Both weathertight (pictured) and explosion-proof (Class 1, Group D, Div. I Service) housings are available.



Request Bulletin 18A.

PURGE ROTAMETERS



Series 7000 Rotameters feature stainless steel construction. Series 20-7010 has a 1 1/2 in. scale and is used for flows up to 12 gph. Series 20-7030 has a 3 in. scale and is used for flows up to 20 gph. Series 20-7050 Rotameters provide flow ranges up to 28 gph water. For higher flow (up to 4.6 gpm), use Series 20-7055.

Request Bulletin 20-7000 and 20-7055.

HIGH-PRESSURE PURGE ROTAMETERS

Series 20-9500 metal tube purge rotameters are used for measuring low flows of fluids and gases at high pressures. This unit operates on the same principle as the standard metal tube meter and has a weathertight extension housing which can be rotated 360°. This rotameter is designed for flow capacities up to 6.6 gpm and can handle pressures up to 1500 psig at 200°F.



Request Bulletin 20-9500.

BALL FLOW INDICATORS

For simple, inexpensive indication of flow, McCrometer offers a complete line of sight flow indicators including ball, rotary and flapper types. Series 20-6100 ball flow indicators are available in capacity ranges from 2 to 190 gpm.



Request Bulletin 20-6100.