FLOWMETERS

COMPACT

Conversion charts supplied with air and water flows for all floats versus glass with corresponding pressure drops

- **Maintain concept of correlation for other fluids***
- **Simple construction** permits interchangeability of plain ends with joints**

These economical Gilmont rotameters are recommended when the maximum precision of Gilmont's Calibrated and Correlated Flowmeters is not required. They are the best combination of acceptable accuracy and low price. With direct reading scales of 100 mm in length, they are accurate to ± 5% or ± 2 mm of scale length (whichever is the greater).

This accuracy for a direct reading meter is achieved by maintaining close tolerances of the precision bore tubes and selectivity of high precision ground glass spheres. These close tolerances permit exceptionally high flow ranges using only a single ball in each tube. On the size 10 meter the scale is mostly exponential with a remarkable range of over 500 to 1 on the water scale!

These new meters are manufactured with the same degree of care as our high precision units and have the following features:

- **Stainless steel float provided on every size to increase range (except for Size No. 10). See p. 9.**
- **Specially designed Teflon® stops that can be used with or without joints.**
- **Permanent ceramic scales and white background for easy reading.**
- **Fluid comes in contact with only glass and Teflon.**
- **Precision-bore ends combined with stops to simplify disassembly and cleaning.**
- **Standard taper joints that may be purchased separately and added at any time.**
- **Supplied with chart to convert scale readings to correlate with fluids other than water or air.**
- **Available with plastic shields (see page 12 for Shielded Compact Flowmeters).**
- **Also available in kit form.**

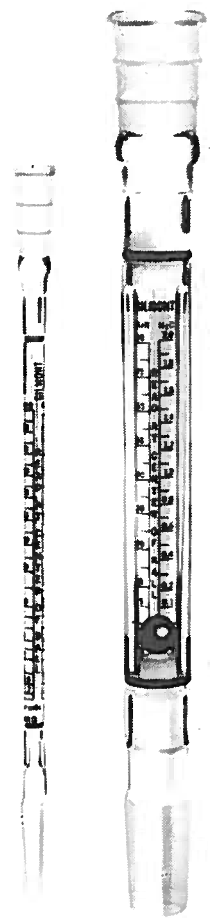
NOTE: Extremely dry gases, at low flows, may cause erratic readings due to electrostatic charge build-up. See Microflowmeter, page 13 for polonium ionizing bar.

***Reference: Instr. & Control Sys. V. 34, P. 2070 (Nov. 1961)**

**U.S. Patent No. 3,183,713

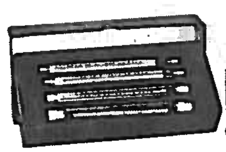
®T.M. DuPont

SEE APPENDIX FOR REPRINT



F-2000 F-2500

Shown with respective joint sets attached.



F8500 Kit of Sizes 10, 11, 12 to 13 . . .

DIRECTIONS

The direct reading scales are for either air or water flowing and measured at the standard conditions of 1 atmosphere and 70°F. Each scale is appropriately marked and instructions on the tube indicate that readings are to be taken at the center of the ball. Note that on sizes 13-15, the scale figures are given in liters/minute.

To obtain accurate readings the ball and tube must be scrupulously clean, especially for the smaller sizes. When cleaning the meter care should be exercised not to lose the ball; however, replacement balls have been selected to maintain specified degree of accuracy. In replacing the clean ball avoid contact with the fingers, especially with size No. 10. The use of a clean slip of paper will be found convenient in performing this operation as follows: with the ball resting on the paper and the lower stop in place on the tube, place the open top of the tube vertically over the ball and simultaneously invert the tube with the paper held in place—then insert the top stop and the tube is ready for use.

When combined with the joints, extreme care should be exercised in disassembly since the stops will remain in the joint. Thus, disconnect the top joint first, and carefully roll the ball onto a suitable surface by inverting the tube. When used with joint sets, it is recommended especially on the smaller sizes, that short lengths of flexible tubing (such as Tygon or Teflon) be used on each end to hold the joint securely to the flowmeter.

For the transitional region between the linear and exponential scales, an average value based on the combined values from each set of equations may be used as a fair approximation; however, when more accurate results are required, the correlation method described for the Calibrated and Correlated Flowmeters (directions on *pages 8 & 9*) is recommended. This procedure is also recommended for any part of the scale when maximum accuracy is desired.

The chart supplied with each meter enables one to convert flow readings directly to values of the diameter ratio, R, required for the correlation. For liquid flows on the size Nos. 10 and 11, the correlated values should be multiplied by an additional Correction factor of (1-R/100), and by (1-R/250) for No. 12. For gas flows see page 8 (No. 11 is same as 1 and No. 13 same as 3).

APPROXIMATION EQUATIONS

CORRECTION FOR GAS FLOW

Linear Range / **Exponential Range††**

Gas flow from Air flow

Linear: $q^0_G = q^0_A \sqrt{\frac{.00120}{\rho^0_G}}$ Exponential: $q^0_G = q^0_A \frac{.0181}{\mu^0_G}$

Correction for temperature and pressure

Linear: $q'_G = q^0_G \sqrt{\frac{P}{760} \frac{530}{T}}$ Exponential: $q'_G = q^0_G \frac{P}{760}\left[\frac{530}{T}\right]^{1.5}$

where, q^0_A = std. air flow as read from meter
q^0_G = std. gas flow in same units
ρ^0_G = density of gas in gms/ml at std. cond.
μ^0_G = viscosity of gas in centipoises at std. cond.
q'_G = gas flowing at P and T, but volume reduced to measurement at std. cond.
P = absolute pressure in mm. of Hg.
T = absolute temperature in °R = °F + 460

CORRECTION FOR LIQUID FLOW

Linear Range / **Exponential Range ††**

Liquid flow from Water flow

Linear: $q^0_L = q^0_W \sqrt{\frac{2.53-\rho^0_L}{1.53\,\rho^0_L}}$ Exponential: $q^0_L = q^0_W \frac{2.53-\rho^0_L}{1.53\,\mu^0_L}$

Correction for temperature

Linear: $q'_L = q^0_L \sqrt{\frac{2.53-\rho'_L}{2.53-\rho^0_L}\frac{\rho'_L}{\rho^0_L}}$ Exponential: $q'_L = q^0_L \frac{2.53-\rho'_L}{2.53-\rho^0_L}\frac{\rho'_L}{\rho^0_L}\frac{\mu^0_L}{\mu'_L}$

For liquids, the effect of pressure is negligible.

where, q^0_W = std. water flow as read from meter
q^0_L = std. liquid flow in same units
ρ^0_L = density of liquid in gms/ml at std. temp.
ρ'_L = density of liquid in gms/ml at temp. T
μ^0_L = viscosity of liquid in centipoises (cp) at std. temp.
μ'_L = viscosity of liquid in cp at temp. T
q'_L = liquid flowing at temperature T, but volume reduced to measurement at std. temp.

†† **Reference:** Gilmont & Roccanova Instr. & Control Sys. V. *39*, P. 89 (Mar. 1966)

COMPACT FLOWMETER, PLAIN ENDS — SET OF JOINTS†

RANGES ml/min††

SIZE	AIR	WATER	CAT.NO.	PRICE	FLOAT DIAM	TUBE O.D.	TUBE LENGTH	$	CAT.NO.	PRICE
10	0.2-90	.002-1.1	F-2000		.0468	5/16"	5⅛"	10/30	F-1121	
11	1-280	.01-4.0	F-2100		.0625	5/16"	5⅛"	10/30	F-1121	Confirm
12	20-2100	0.4-40	F-2200		.125	5/16"	5⅛"	12/30	F-1221	
13	200-14,000	2-300	F-2300		.250	7/16"	5⅛"	14/35	F-1321	Latest
14	1000-36,000	10-850	F-2400		.375	11/16"	5½"	19/38	F-1421	Pricing
15	3000-77,000	30-1900	F-2500		.500	15/16"	5½"	24/40	F-1521	
Kit	#10 to #13		F-8500							
Kit	#14 & #15		F-9500							

†Consists of one inner and outer joint plus two O-Rings (See page 8)

†† Flow ranges stated above may be extended by factors of from 2 to 3 by using heavier floats. See Spare Parts List.

SPARE PARTS LIST

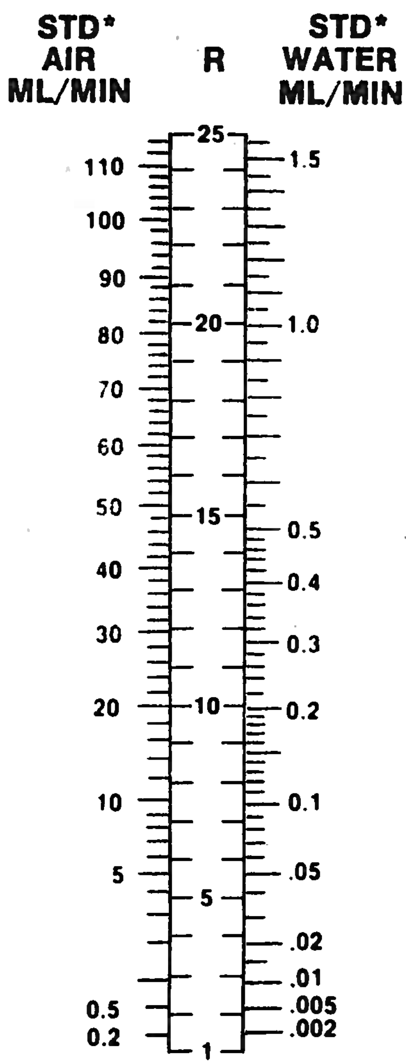
Approximate Multiplying Factor for Floats (see p.9): Gases	Water	SIZE NO. Description & (ρ_f)	10 Cat.No.	10 Price	11 Cat.No.	11 Price	12 Cat.No.	12 Price	13 Cat.No.	13 Price	14 Cat.No.	14 Price	15 Cat.No.	15 Price
		Teflon Stop, Top	F-2004		F-1104		F-1204		F-1304		F-2404		F-2504	
		Teflon Stop, Bottom	F-2005		F-1105		F-1205		F-1305		F-1405		F-1505	
		Flowmeter Tube	F-2031		F-2131		F-2231		F-2331		F-2431		F-2531	
1	1	Float, Glass (2.53)	F-2032		F-1132		F-1232		F-1332		F-1432		F-1532	
1.78	2.14	Float, 316 S.S. (8.02)			F-1132-S		F-1232-S		V-2119-S		F-1432-S		F-1532-S	
2.56	3.19	Float, Tantalum (16.6)			F-1132-T		F-1232-T		F-1332-T					
2.43	3.01	Float, Tungsten C. (14.9)									F-1432-TC		F-1532-TC	

GILMONT INSTRUMENTS, INC.

Compact Flowmeters
Conversion Chart of flow readings to R values

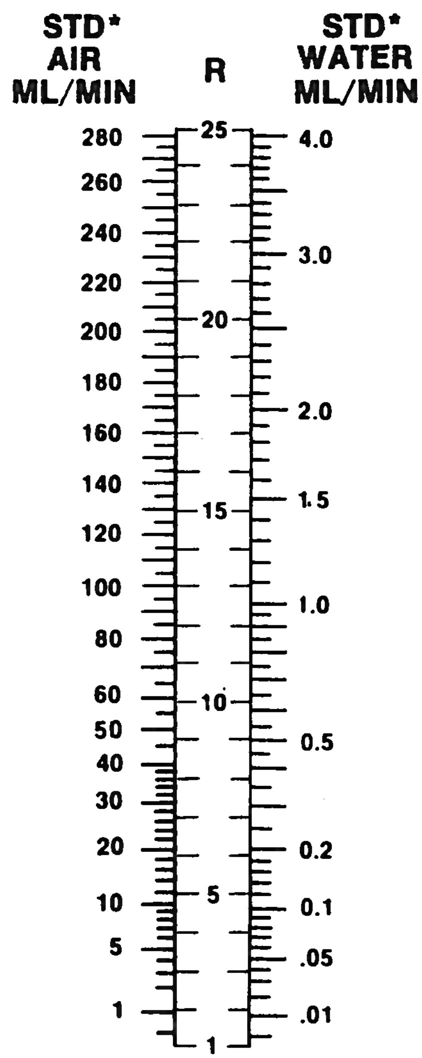
SIZE NO. 10

D_t = .0468″
W_t = .00224 GM



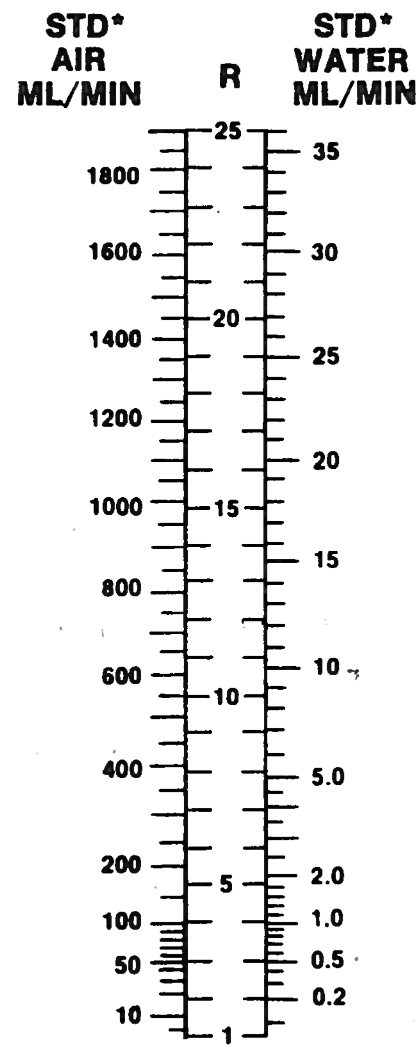
SIZE NO. 11

D_t = .0625″
W_t = .00530 GM



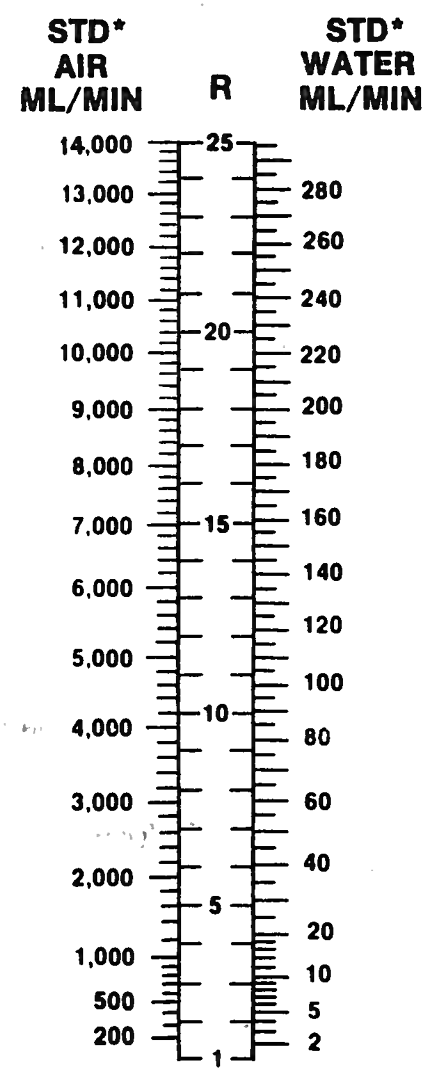
SIZE NO. 12

D_t = 0.125″
W_t = 0.0424 GM



SIZE NO. 13

D_t = 0.250″
W_t = 0.339 GM



* MEASURED AND FLOWING AT 1 ATM. AND 70° F.

ρ_t = 2 53 GM/ML