G-CAL PERMEATION DEVICES

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DESCRIPTION

Patented G-Cal permeation tubes offer a proven and repeatable means of generating a desired gas or vapor concentration. The permeant gas escapes through the proprietary membrane system and mixes with a carrier gas at a controlled flow rate to obtain a known mixture in ppm or ppb. Applications include calibration of gas monitoring systems and chromatographs, accuracy check of gas detectors, and generation of known test atmospheres for a specific application.

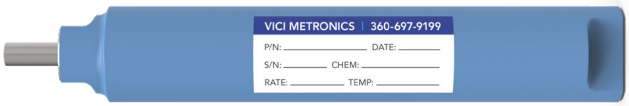
G-Cal devices exhibit the lowest temperature sensitivity among available similar products. The permeation rate of the polymer used in G-Cal devices changes only 1-3% per °C, eliminating the need for a temperature-controlled chamber. Each G-Cal device is individually calibrated and verified to generate a given output (ng/min) vs. temperature. A graph which shows permeation rate vs. temperature from 0°C to 50°C is included with each device.

BENEFITS

- Excellent for use in the field
- Operate at room temperature
- Individually calibrated and verified

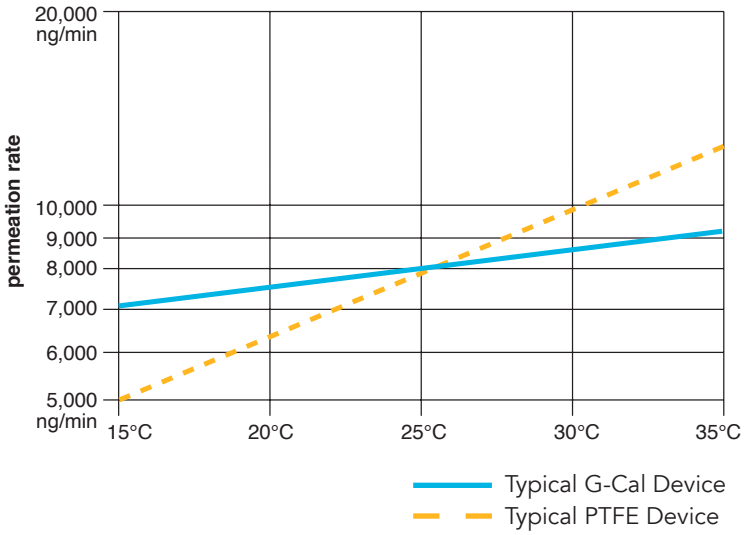
OPTIONS

- Over 100 different substances
- Permeation rates ranging from less than 200 ng/min to over 30,000 ng/min



TEMPERATURE SENSITIVITY

Comparison of G-Cal permeation devices and Dynacal PTFE permeation devices:



DEVICE SELECTION

Devices for most substances are available with various permeation rates as indicated by the model number digits in the table at right. Use this formula to calculate the permeation rate your application requires:

$$\text{Permeation rate P in ng/min} = \frac{C \times F}{K}$$

Where C is the desired concentration in ppm, F is the carrier gas flow rate in mL/min, and K is the molar constant from the substance charts on the following pages.

MODEL # (last digit)	RATE RANGE (ng/min)	SIZE (approximate)
0	200 to 2,999	1.5" D x 9" L
2	200 to 4,999	1" x 4.5" OR 1" x 3.5"
3	5,000 to 14,999	1" x 6.5"
4	15,000 to 30,000	1.5" x 6.5"

Permeation rates and sizes shown are approximate. Overlapping may occur.

EXAMPLE: if a concentration of 20 ppm of H2S (Model GC23-700_) is desired with a flow rate of 300 mL/min of air:

$$\frac{20 \times 300}{0.718} = 8356 \text{ ng/min}$$

Therefore, G-Cal Model GC23-7003 with a permeation rate in the range of 5,000 to 14,999 is the appropriate choice.

SUBSTANCE	K	MODEL	NOTES
Acetone	.421	GC23-7762,3	
Acetonitrile	.596	GC23-7912, 3	
Ammonia	1.437	GC23-7011, 2, 3, 4	A
Arsine	.313	GC23-7620	B, C, D
Benzene	.313	GC23-7162, 3	A
iso-Butyl Alcohol	.330	GC23-7952, 3	
iso-Butyl Mercaptan	.271	GC23-7191, 2, 3	
Carbon Dioxide*	.556	GC23-7380	D
Carbon Disulfide	.321	GC23-7231, 2, 3, 4	C
Carbon Monoxide*	.874	GC23-7040	D
Carbon Tetrachloride	.159	GC23-7242, 3	
Carbonyl Sulfide	.406	GC23-7141, 2, 3, 4	A
Chloroform	.346	GC23-7032, 3	
Di-Methyl Methyl Phosphonate	.197	GC23-7082	
Dichloromethane	.288	GC23-8021, 2	
Dimethyl Disulfide (DMDS)	.259	GC23-7091, 2, 3	A
Dimethyl Formamide	.334	GC23-7332	
Dimethyl Sulfide (DMS)	.394	GC23-7101, 2, 3, 4	
Ethanol (Ethyl Alcohol)	.531	GC23-7822	
Ethyl Benzene	.230	GC23-8061, 2	
Ethyl Chloride	.379	GC23-7642, 3	
Ethylene	.872	GC23-7130	D
Ethylene Oxide	.555	GC23-7471, 2, 3	A
Ethyl Mercaptan	.394	GC23-7201, 2, 3	
Ethyl Methyl Sulfide	.322	GC23-7461, 2	
Formaldehyde-para	.814	GC23-7942	E
Hexane	.284	GC23-7302, 3	
Hydrogen Sulfide	.718	GC23-7001, 2, 3, 4	A, C
Hydrazine	.763	GC23-7932	C
Menthol	.195	GC23-7962, 3	
Methane	1.526	GC23-7070	D, G
Methanol (Methyl Alcohol)	.763	GC23-7832	
Methyl Ethyl Sulfide	.322	GC23-7461, 2	
Methyl Mercaptan	.509	GC23-7111, 2, 3, 4	A
Methyl Iodide	.172	GC23-7591, 2	C
Nitric Oxide*	.815	GC23-7060	C, D, H, I
Nitrogen Dioxide	.532	GC23-7052, 3, 4	A, C
Nitrous Oxide*	.556	GC23-7670	C, D, H

SUBSTANCE	K	MODEL	NOTES
Phosphine*	.719	GC23-7630	
iso-Propyl Alcohol	.407	GC23-7852	
Propylene Oxide	.421	GC23-8002	
iso-Propyl Mercaptan	.321	GC23-7221, 2, 3	
n-Propyl Mercaptan	.321	GC23-7211, 2, 3	
Sulfur Dioxide	.382	GC23-7021, 2, 3, 4	A
Thiophene	.290	GC23-7901, 2, 3	
Toluene	.266	GC23-7312, 3	
Vinyl Chloride	.392	GC23-8051, 2	C
Water	1.358	GC23-7322, 3, 4	F
m-Xylene	.230	GC23-7772, 3	
o-Xylene	.230	GC23-8081, 2	
p-Xylene	.230	GC23-8091, 2	

**Available only in G-Cal permeation tubes; not available in Dynacal tubes or devices.*

NOTES: A. Stocked in various rates **B.** Stocked in 500 and 1000 ng/min **C.** Shipped by surface freight only **D.** Gas phase device **E.** Requires heating to 80°C **F.** Requires heating: 50-80°C, depending on desired rate **G.** Maximum rate 500 ng/min **H.** Maximum rate 1000 ng/min **I.** Requires use of Oxygen-free gas

METHANE G-CAL

We offer Methane G-Cals at two permeation rates: 500 ng/min or 5000 ng/min. Based on customer demand we may also offer other permeation rates and we welcome special requests. Lead time is 6-8 weeks. Please note that the Methane G-Cal at 5000 ng/min has a larger body than our standard G-Cals. Be sure to verify that your system can accommodate this larger size, and contact us for assistance.

CERTIFIED

Part Number: GC23-7070-C25

Rate: 500 ng/min ± 30%
Certified at 25°C ± 5% accuracy

Rate: 5000 ng/min ± 30%
Certified at 25°C ± 5% accuracy
Size: 7.5" Length x 1.5" Diameter

UN-CERTIFIED

Part Number: GC23-7070-U25

Rate: 500 ng/min ± 30% at 25°C

Rate: 5000 ng/min ± 30% at 25°C
Size: 7.5" Length x 1.5" Diameter