

G-Cal Permeation Devices

- Excellent for use in the field
- Operate at room temperature
- Available with arsine and phosphine



Description

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.

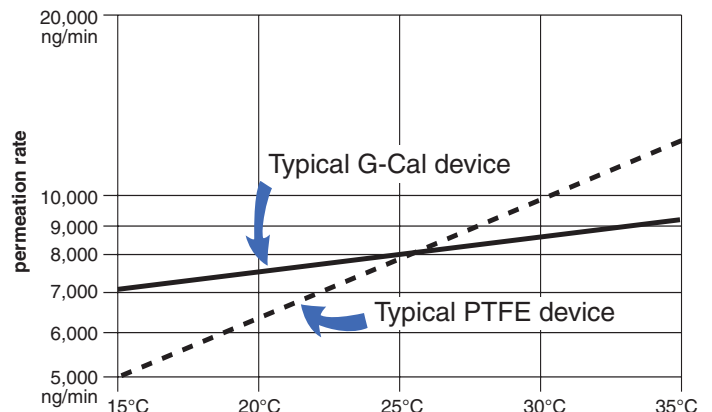
G-Cal devices exhibit the lowest temperature sensitivity among available similar products. The permeation rate of the polymer used in G-Cal devices changes only 1-3% per degree C, eliminating the need for a temperature-controlled chamber.

Over 100 different substances are available, including arsine, phosphine, and gas phase devices such as CO, NO, and methane. Available permeation rates range from less than 200 ng/min to 30,000 ng/min. 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 to 50°C is included with each device.

Model number (last digit)	Rate range (ng/min)	Size (approximate)
0	100 to 2,999	1 1/2" diameter x 9" long
1	10 to 99	1" x 4 1/2" or 1" x 3 1/2"
2	100 to 4,999	1" x 4 1/2" or 1" x 3 1/2"
3	5,000 to 14,999	1" x 6 1/2"
4	15,000 to 50,000	1 1/2" x 6 1/2"

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

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 left. Use this formula to calculate the permeation rate your application requires:

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

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 next page.

For 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	
* Arsinine	.313	GC23-7620	(a,b)
Benzene	.313	GC23-7162,3	
Boron Trichloride	.209	GC23-7882	
Bromine	.153	GC23-7482	
iso-Butyl Alcohol	.330	GC23-7952,3	
iso-Butyl Mercaptan	.271	GC23-7191,2,3	
* Carbon Dioxide	.556	GC23-7380	(b)
Carbon Disulfide	.321	GC23-7231,2,3,4	(a)
* Carbon Monoxide	.874	GC23-7040	(b)
Carbon Tetrachloride	.159	GC23-7242,3	
Carbonyl Sulfide	.406	GC23-7141,2,3,4	
Chlorine	.346	GC23-7032,3	(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	
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	(b)
Ethylene Oxide	.555	GC23-7471,2,3	
Ethyl Mercaptan	.394	GC23-7201,2,3	
Ethyl Methyl Sulfide	.322	GC23-7461,2	
Formaldehyde-para	.814	GC23-7942	(c)
Hexane	.284	GC23-7302,3	
Hydrogen Chloride	.671	GC23-7870	(b)
Hydrogen Fluoride	1.223	GC23-7612	(a)
Hydrogen Sulfide	.718	GC23-7001,2,3,4	(a)
Hydrazine	.763	GC23-7932	(a)
* Menthol	.195	GC23-7962,3	
Methane	1.526	GC23-7070	(b,e)
Methanol (Methyl Alcohol)	.763	GC23-7832	
Methyl Bromide	.257	GC23-7992,3	
Methyl Chloride	.484	GC23-7652,3	

Substance	K	Model	Notes
Methyl Ethyl Sulfide	.322	GC23-7461,2	
Methyl Mercaptan	.509	GC23-7111,2,3,4	
Methyl Iodide	.172	GC23-7591,2	(a)
* Nitric Oxide	.815	GC23-7060	(a,b,f,g)
Nitrogen Dioxide	.532	GC23-7052,3,4	(a)
* Nitrous Oxide	.556	GC23-7670	(a,b,f)
* Oxygen	.764	GC23-7580	(b,f)
Phosgene	.247	GC23-7891,2	(a)
* 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	
Sulfur Hexafluoride	.167	GC23-7401,2,3	
Thiophene	.290	GC23-7901,2,3	
Toluene	.266	GC23-7312,3	
Vinyl Chloride	.392	GC23-8051,2	(a)
Water	1.358	GC23-7322,3,4	(d)
m-Xylene	.230	GC23-7772,3	
o-Xylene	.230	GC23-8081,2	
p-Xylene	.230	GC23-8091,2	

Notes

- (a) Shipped by surface freight only
 - (b) Gas phase device
 - (c) Requires heating to 80°C
 - (d) Requires heating: 50° to 80°C, depending on desired rate
 - (e) Maximum rate 500 ng/min
 - (f) Maximum rate 1000 ng/min
 - (g) Requires the use of Oxygen-free gas
- * Available only in G-Cal permeation tubes; not available in Dynacal tubes or devices

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