

## PERMEATION TUBES

for

### Arsine, and Other Toxic, Highly Reactive Gases

**Series 57 Prefilled Permeation Tubes** are used in KIN-TEK Gas Standards Generators to create gas standards ranging from <50 ppb to 5 ppm for arsine and other hydride gases, as well as highly reactive gases such as HCl, HBr, and oxygen. Because the high vapor pressure of these compounds make them unsuitable for use in disposable permeation tubes, **KIN-TEK** developed **Series 57 Prefilled Permeation Tubes**. These permeation tubes are capable of safely using the gas phase of high vapor pressure compounds.



Prefilled Series 57 Perm Tube

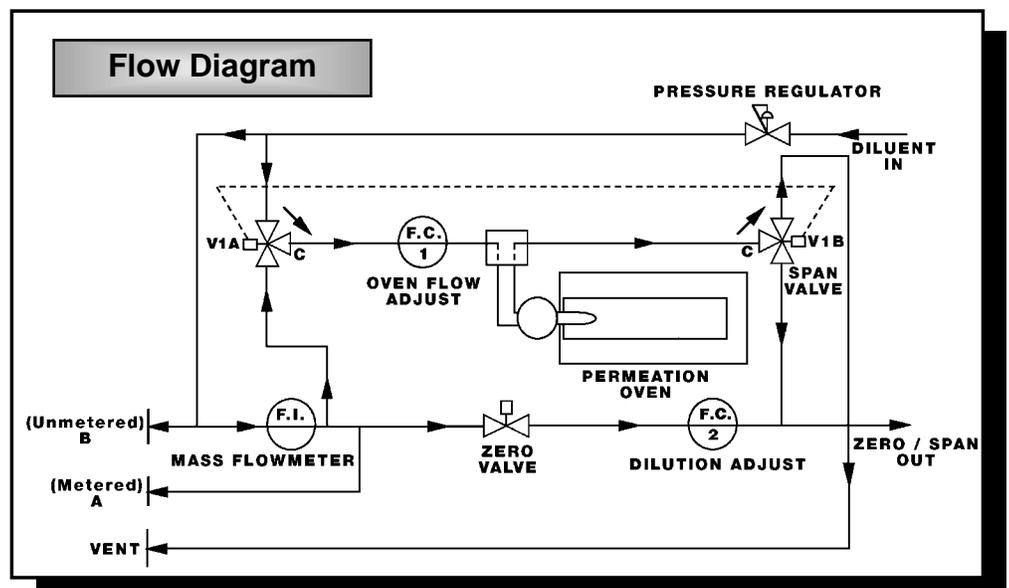
#### DESCRIPTION

**Series 57 Prefilled Permeation Tubes** are small stainless steel cylinders (6" h. x 1 3/4" dia.) with a permeation tube membrane sealed inside. These small, stainless cylinders are prefilled with a small amount (<4 grams) of pure gas under 50 psig. The gas surrounds the permeation tube membrane, permeates into the permeation tube, and mixes with a small portion of dilution gas that flows from the Gas Standards Generator through the inside of the permeation tube membrane. The Gas Standards Generator then introduces this mixture into a much larger flow of dilution gas to form a low concentration gas standard.

Each **Series 57 Prefilled Permeation Tube** is given a serial number and is laboratory certified. The certification data, which includes the permeation rate vs. the operating temperature of the tube, are recorded and graphed. A copy of the graph along with an operating manual is shipped with each tube. Additional copies of the graph are available upon request.

Calibration  
for these  
gases:

- Arsine
- Hydride Gases
- HCl
- HBr
- Oxygen
- CO



## BENEFITS

The **Series 57 Prefilled Permeation Tube** design provides a safe calibration method for highly toxic and reactive compounds that cannot be used in a disposable permeation tube. With this method, the calibration standard is mixed at the point of use, which means the standard is fresh. This minimizes the possibility of contamination or deterioration of the test compound, and so provides a much more accurate, repeatable standard. Because the total amount of toxic material is smaller than that contained in a gas cylinder and because the risk of deterioration is less, the **Series 57 Prefilled Permeation Tube** is a safer, more reliable standard.

Since a single **Series 57 Prefilled Permeation Tube** provides calibration for many different detection points, it eliminates the necessity of storing large numbers of gas cylinders to test each different detection point. Storing fewer gas cylinders also lowers the safety hazard risks and reduces cylinder storage and drayage expenses.

## OPERATION

When a **Series 57 Prefilled Permeation Tube** is installed in a KIN-TEK Gas Standards Generator, it is held at a constant temperature causing the gas surrounding the permeation tube membrane to permeate into the membrane at a known rate, measured in nanoliters per minute. The Gas Standards Generator introduces a portion of dilution flow into the permeation tube, then adds this mixture back into the larger, main dilution flow to form the calibration standard. The concentration of the calibration standard that is formed is controlled by the permeation rate of the gas into the membrane and the flow rate of the dilution gas. (*See flow diagram.*)

The permeation rate of the gas is controlled by the temperature of the **Series 57 Prefilled Permeation Tube**. Increasing the temperature of the permeation tube increases the permeation rate. The Gas Standards Generator provides precise temperature and dilution flow control to allow accurate adjustment of these parameters. In most Gas Standards Generators, the temperature of the permeation tube and the dilution flow rate can be adjusted by the user. This can extend the concentration range of the permeation tube up to 5 ppm and allows multi-point calibration using just one tube. The **Series 57 Prefilled Permeation Tube** gives the user the capability of generating accurate, custom, calibration standards.

## STORAGE

To reduce the risk of handling even a small amount of these highly toxic, reactive gases, **Series 57 Prefilled Permeation Tubes** are equipped with a specially designed purge kit, which enables the user to store the permeation tube in contact with an inert gas, and to purge to a safe vent any toxic material that may accumulate in the walls of the permeation tube during storage.

NOTE: As the tube is used and the amount of gas contained in the **Series 57 Prefilled Permeation Tube** decreases, the permeation rate of the tube will change a predictable amount. Therefore, the tube can be used for a fixed period of time during which the accuracy will remain within known limits (e.g.,  $\pm 1\%$  or  $\pm 5\%$ ) before rate recalculation is necessary. Some typical emission rate change data are shown in Table 1.

EMISSION RATE CHANGE	Emission (nl/min.)	1	10	100	1000
	Operation (days)				
	30	negligible	0.1%	<1%	7%
	90	negligible	0.25%	2%	22%
	180	negligible	0.5%	5%	---
	360	<0.1%	1%	10%	---

Table 1