KIN-TEK

The Calibration Specialists



Trace Source™ Permeation Devices

Permeate to Calibrate

Trace Source™ Permeation Tubes are used for blending low concentration gas standards such as those used to calibrate high sensitivity chemical analyzers. Permeation tubes emit a very small (nanoliters/minute), but very steady flow of the trace component compound. Mixing with a much larger flow of a diluent gas (liters/minute) forms the calibration mixture.



In a Trace Source™ Permeation Tube component compound contacts one side of a Teflon® membrane. Compound vapor slowly passes through the Teflon®. This vapor 'leak' is the emission rate of the permeation tube and is far too low flow to be controlled by conventional means.

The emission rate is determined by the geometry of the tube, permeability of the compound, Teflon® characteristics, and the partial pressure difference of component vapor across the membrane (this is usually the vapor pressure and is set by the temperature).

Trace Source™ tubes are currently available for over 500 compounds and concentrations from sub-ppb to over 50ppm can be created using disposable tubes.

Trace Source™ Disposable Permeation Tubes

Trace Source™ permeation tubes are short, pencil size, lengths of tubing partially filled with pure component compound and sealed. They are supplied in varying lengths and styles, chosen to fit specific application requirements. Standard tubes have been certified and are supplied with a certificate showing the rate of weight loss when the tube is held at its recommended operating temperature. Normal practice is for KIN-TEK to choose the type of tube best suited for your application.



The various types of tubes supplied are called HRT, SRT and SRT-2, EL-SRT or EL-SRT-2 and Wafer Tubes.

HRT and **SRT** are simply different types of Teflon®, chosen for their respective permeation characteristics and inertness to the component compound.

HRT tubes are made of PTFE Teflon® and usually have a higher permeation rate than a comparable **SRT** tube. **HRT** are generally used for water, common solvents and lower vapor pressure compounds.

SRT and **SRT-2** tubes are made of FEP Teflon® and are generally used for lower boiling compounds like hydrogen sulfide, sulfur dioxide, ammonia, etc., or to get lower emission rates from compounds that might normally be supplied in an **HRT** tube. The **SRT-2** tubes have twice the membrane thickness of the **SRT** tubes and consequently about one half the emission rate.

If a tube has the prefix **EL** it means that tube has an impermeable reservoir for the component compound. For high permeation rate compounds like chlorine or carbonyl sulfide KIN-TEK always tries to use an **EL** tube so the customer will get reasonable operating life from the tube. A 5cm **EL** gives over twice the life of a standard tube, while the operating life of a 1cm **EL** tube will be many times longer than the life of a standard tube.

Wafer tubes are used for very low emission rates. They are basically an impermeable reservoir with permeation only from the ends. Generally, these are very long life tubes.

Why Choose Permeation Tubes?

With Permeation Tubes you get TECHNICAL CAPABILITIES that aren't otherwise available. For example, make calibration gas mixtures at extremely low concentrations – ppm, ppb, pptr - or, perhaps higher concentration mixtures that would condense in a cylinder. Make mixtures containing very polar compounds (methanol or water), or very reactive compounds (HCl, Chlorine). One can even make mixtures containing compounds that react slowly with each other.

With Permeation Tubes you get SUPERIOR ACCURACY. The emission rate from a permeation tube is determined from fundamental physical measurements (weight loss, temperature, and flow) traceable to NIST. The user can re-verify the rate at any time.

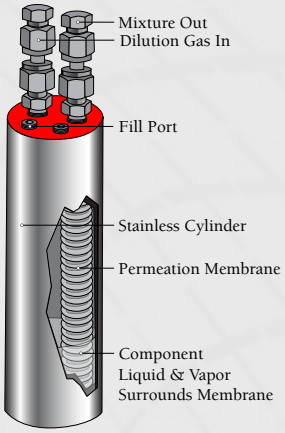
With Permeation Tubes the final CONCENTRATION IS ADJUSTABLE. The permeation tube emits a constant amount, so changing the dilution flow changes the final concentration. One tube, or one set of tubes can produce a whole range of concentrations.

With Permeation Tubes OPERATING COSTS ARE LOWER. Permeation tubes emit constantly, so the more you use a tube the lower the cost per sample. A single tube can be used to produce a whole range of mixtures. Storage space is reduced from a large room for cylinders to a small refrigerator for permeation tubes.

Permeation Tubes offer SAFETY AND CONVENIENCE. They are small, easy to handle and easy to transport. No wrestling large, heavy, dangerous gas cylinders. The tubes contain small amounts of the compound and they are very rugged.

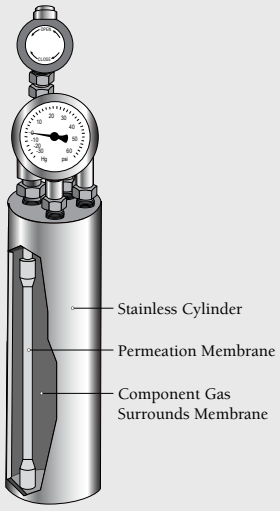
Trace Source™ Refillable Permeation Tubes

Trace Source™ Refillable Tubes are small stainless steel cylinders with a membrane sealed inside. In Refillable Permeation Tubes, the component compound surrounds the membrane and permeates to the inside, where it mixes with the dilution gas. Refillable Permeation Tubes are designed to be refilled without disturbing the permeation membrane.



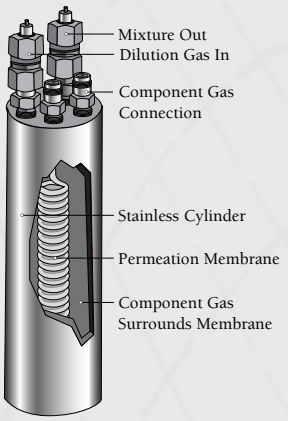
LFH Tube – Liquid Filled Tube

Used to generate moderate to high concentration mixtures of low vapor liquids and/ or solids such as Water, Benzene, various Sulfur compounds, and Formaldehyde.



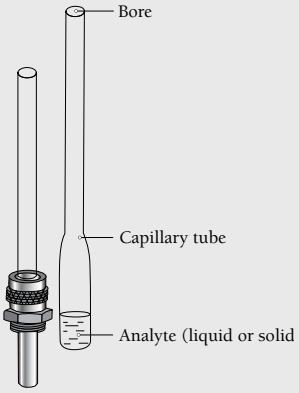
57S/FK Tube Prefilled Gas Tube

Prefilled Tubes are used for very low concentrations of very hazardous or highly reactive gases such as Arsine, Phosphine, Hydrogen chloride and similar gases. For continuous service they are most useful for 10 to 500ppb. Other concentration ranges are possible for intermittent use.



57H / 57S Tube Gas Fed Tube

Gas Fed Tubes are used for high vapor pressure compounds not usually available in permeation tubes such as Hydrogen, Methane, Ethylene, Carbon monoxide and similar gases. **57S** tubes give very low concentrations (ppb to about 10ppm). **57H** tubes give higher concentrations (~10 to >1000ppm). Gas Fed tubes require the FlexStream™ GF Module.



Diffusion Tubes

In Diffusion Tubes the component vapor flows through a capillary tube. Emission rates are typically higher than from disposable permeation tubes. They are very useful for SVOCs and similar low vapor pressure compounds. The emission rate is determined by the capillary tube bore and length, the operating temperature, and the component compound.

Trace Source™ Permeation Tubes

Operation

When the Trace Source™ Permeation Tube is held at constant temperature it emits a very small constant rate of pure component gas. This emission rate is measured in nanograms (or nanoliters) per minute. The emission rate of the permeation tube is varied by changing the temperature of the tube. In a Refillable Gas-Filled Permeation Tube, the emission rate is also varied by changing the pressure of the component gas inside the tube. To form low concentration gas mixtures, the emission of component gas from the permeation tube is mixed with a known flow of clean dilution gas. The mixture concentration from any tube can be adjusted by varying the dilution flow.

Accuracy

The accuracy of certification depends on the type of the tube, the component compound and the emission rate level. For most compounds, the accuracy of disposable tube is ~ +/-2%.

Certification

Each tube is numbered and laboratory certified at the temperature(s) specified by the customer. A certificate listing a description of the tube, its serial number and its emission rate is supplied with each certified tube traceable to the National Institute of Standards and Technology (NIST). Emission rate data for each tube is kept on file (for a minimum of 2 years) at the factory for future reference.

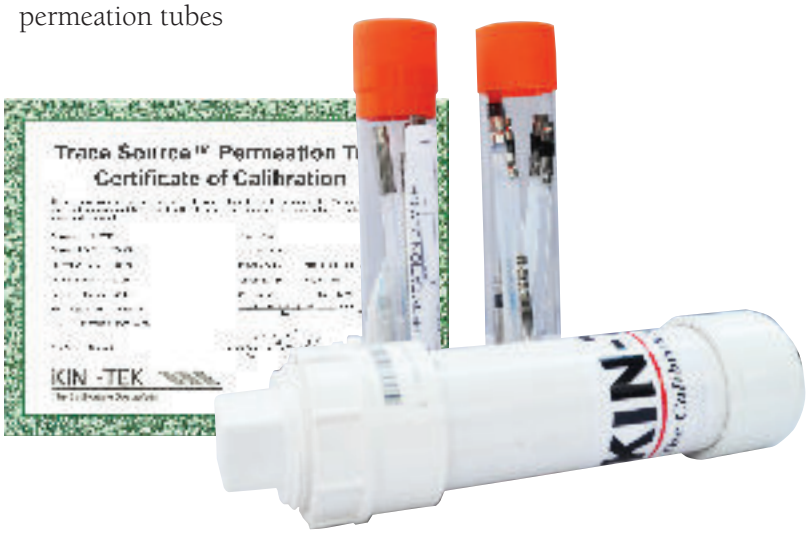
Applications

Generate low concentration (ppm-pptr) gas mixtures of:

- TICs
- Dopants
- VOCs
- HAPs
- Simulants
- Moisture
- Atmospheric Gases
- Sulfurs

Shipping/Packaging

KIN-TEK Permeation Tubes are packaged in small containers for easy shipment. A Certificate of Calibration, SDS, and Storage Information is supplied with certified permeation tubes



To request a quotation or place an order for a permeation tube, we need the following information.

Compound / CAS#
Concentration (ppmv)
Minimum Flow Rate (sccm)

KIN-TEK, founded by Jim McKinley in 1970, designs and builds calibration gas systems. KIN-TEK is committed to providing calibration gas standards that meet or exceed the expectations of our customers.

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