

CALIBRATION GAS STANDARDS



PERMEATION DEVICES AND CALIBRATION GAS GENERATORS

From VICI Metronics

VICI Metronics, Inc. in Poulsbo, Washington is the leading manufacturer of devices and instruments that are used in the generation of calibration gas standards, including Dynacal® and G-Cal permeation tubes and Dynacalibrator® and G-Cal calibration gas generators. Their product line also includes gas purifiers and contaminant traps, as well as explosives, narcotics, and chemical warfare dopants for TSA airport security (ammonia, DCM, and BHT), law enforcement, border patrol, military, and other trace detection industry professionals.

CALIBRATION GAS STANDARDS

The purpose of a calibration gas standard is to establish a reference point for the verification of an analysis. Permeation tube rates can be certified using standards traceable to NIST by the most basic and accurate laboratory procedure – measuring the gravimetric weight loss over a known period of time at a known temperature. Permeation rate data is already established for hundreds of different compounds, and rates for new compounds can be easily certified using NIST-traceable standards.

ADVANTAGES

Calibration devices from VICI Metronics offer several advantages over cylinder-supplied gas calibration standards. Multi-component gas mixtures can be easily generated with NIST traceability employing established EPA and ASTM protocols by using the appropriate combination of permeation devices. The technique also allows the removal

of a single component from a gas mixture by simply removing the appropriate permeation device.

A wide range of concentrations can be generated by simply varying the dilution flow rate and/or the set point temperature. In addition, the small size and inherent stability of perm tubes allow us to inventory thousands for delivery from stock. Because of the size and the limited quantity of chemical fill, we can offer overnight delivery via air express.

By contrast, bottled trace level (ppb and ppm) standards can be very expensive, and calibrations requiring multiple components over a wide range of concentrations require a large number of gas cylinders, consuming valuable lab space. Problems can also arise from degradation of the standard within the cylinder, from changes in cylinder pressure, and from interaction of calibration components and surfaces.



DYNACAL® PERMEATION DEVICES

- Ideal for lab environments
- Require a temperature-controlled environment
- Inexpensive calibration solution
- Smaller than G-Cal devices
- More accurate than G-Cal devices

Dynacal permeation devices are small, inert capsules containing a pure chemical compound in a two phase equilibrium between its gas phase and its liquid or solid phase. At a constant temperature, the device emits the compound through its permeable portion at a constant rate. Devices are typically inserted into a carrier flow to generate test atmospheres for calibrating gas analyzer systems, testing hazardous gas alarms, or conducting long-term studies of effects on materials or biological systems – in short, any situation requiring a stable concentration of a specific trace chemical.



TUBULAR DEVICES



EXTENDED LIFE TUBULAR



WAFER DEVICES

TUBULAR DEVICES

The tubular device, or “perm tube”, is a sealed permeable cylinder containing the desired permeant reference material. Release of the chemical occurs by permeation through the walls of the PTFE tube for the entire length between the impermeable plugs. A wide range of rates – typically from 5 ng/min to 50,000 ng/min – can be achieved by varying the length and thickness of the tube. These are the most widely used of the various permeation devices.

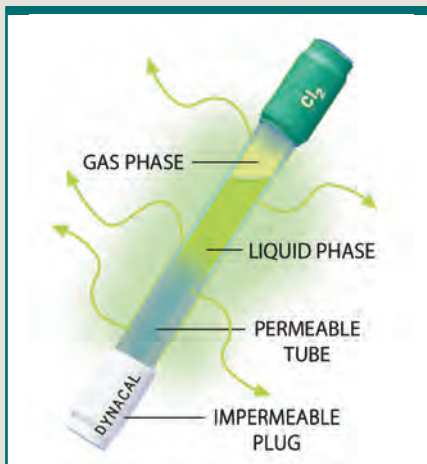
EXTENDED LIFE TUBULAR DEVICES

Our unique extended life tubular (XLT) device is a standard perm tube coupled to an impermeable stainless steel reservoir. This design offers a range of permeation rates corresponding to a tubular device, but has a significantly enhanced lifetime – by a factor of 3 for a 5 cm (active length) device or a factor of 12 for a 1 cm device.

WAFER DEVICES

Wafer devices have only a small permeable window, or wafer, so permeation rates are typically lower than rates for tubular devices. Since permeation occurs only through the polymeric wafer, the permeation rate is controlled by varying the wafer material, the thickness of the wafer, and the diameter of the permeation opening. Gases whose high vapor pressure at normal permeation temperatures prevent their containment in a tubular device can be contained in a wafer device. Wafer devices are available in different styles to allow use in calibrators made by various manufacturers.

PARTS OF A TUBULAR DEVICE



COMPOUNDS AVAILABLE IN DYNACAL PERM DEVICES

Literally hundreds of compounds are available in our permeation devices. This list is merely representative of the range we offer. Contact us if you don't see what you're looking for.

- | | |
|----------------------|---------------------|
| Ammonia | Isopropyl alcohol |
| Benzene | Mercury |
| Carbon disulfides | Methanol |
| Carbon tetrachloride | Methyl bromide |
| Chlorine | MTBE |
| Dichloromethane | Nitrogen dioxide |
| Dimethyl sulfide | Octane |
| Ethanol | Sulfur dioxide |
| Ethylene oxide | Sulfur hexafluoride |
| Freon | Thiophene |
| Formaldehyde | Toluene |
| Hydrogen cyanide | Vinyl acetate |
| Hydrogen fluoride | Water |
| Hydrogen sulfide | Xylenes |
| Iodine | |

SEE ALSO

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DYNACALIBRATOR® CALIBRATION GAS GENERATORS

- **New** optional second dilution stage for dilution ratios as high as 1,000,000:1
- Base units deliver precise concentrations from ppb to high ppm
- Choice of base configurations, with manual or automated flow control and metering
- Trace gas source provided by Dynacal® permeation devices
- Proprietary temperature control system accurate to $\pm 0.01^\circ\text{C}$

VICI Metronics Dynacalibrators facilitate verification of the accuracy of analytical data from air pollution monitoring, industrial hygiene surveys, odor surveys, and other instruments measuring gas concentration. All models calibrate to NIST traceable standards.

Base designs utilize our Dynacal® permeation devices to generate and deliver precise concentrations ranging from ppb to high ppm for

hundreds of different compounds. Permeation chambers are big enough to accommodate several devices for higher output concentrations or multi-component mixtures.

The new dual-stage dilution option (available on the automated models below) expands this range by six orders of magnitude. Units can even be configured without an oven, for cylinder gas dilution.

MODEL 120 PORTABLE DYNACALIBRATORS

- Completely portable
- Pump powered by rechargeable battery or a 12 VDC source (inverter with cigarette lighter plug provided)
- Available temperature control from 5°C above ambient to 100°C
- Utilizes permeation devices – no bulky cylinders

Standard features on Model 120 include a glass or PTFE permeation chamber with screw cap access, solid state proportional temperature controller with digital readout of set point and chamber temperature, heater switch with LED indicator, flowmeter and flow control valve, span and overflow outlets, 12 VDC internal pump, activated charcoal scrubber, and molded fiberglass case.

MODEL 150 DYNACALIBRATORS

- Temperature control with an accuracy of $\pm 0.01^\circ\text{C}$ from 5°C above ambient to 110°C
- Ultra compact
- PPB to high PPM range
- Optional Hastelloy C permeation chamber

At only 6" wide x 15" deep x 7" high and 10.5 pounds, the Dynacalibrator Model 150 is a compact calibrator capable of delivering the precise concentrations you require. A passivated glass-coated stainless steel permeation chamber houses the permeation device(s). (Carrier and dilution flow rates must be supplied and measured externally.) The digital temperature controller maintains the chamber temperature at a set point with an accuracy of $\pm 0.01^\circ\text{C}$, traceable to NIST standards. The wide range of temperature settings (5°C above ambient to 110°C) means the end user can generate a wide range of volumetric concentrations for both low and high vapor pressure chemical compounds, establishing or changing the desired volumetric concentration by simply varying the carrier flow.

MODEL 120



Non-CE, use restricted within the EU.

MODEL 150







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Dynacal permeation tubes..... p. 219



DYNACALIBRATOR BASE CONFIGURATIONS

Base configurations are customized to meet user requirements for dilution gas and carrier gas flow capacities.

Automated	Manual
<ul style="list-style-type: none"> • User sets either the flow rate or the concentration via touch screen • Required temperature and concentration or flow rate are set and controlled automatically • External gas source 	<ul style="list-style-type: none"> • Concentrations are calculated manually • Required temperature and flow rates are set manually • Internal pump or external gas source
<p>MODEL 235 – Basic</p> <ul style="list-style-type: none"> • Provides continuous dilution • Maintains a constant carrier flow through the permeation chamber  <p style="text-align: right;">CE</p>	<p>MODEL 230 – Basic</p> <ul style="list-style-type: none"> • Provides continuous dilution • Maintains a constant carrier flow through the permeation chamber  <p style="text-align: right;">CE</p>
<p>MODEL 345 – Intermediate/Extended concentration range</p> <ul style="list-style-type: none"> • In the zero mode, scrubbed dilution flow is delivered to the outlet, allowing the end user to establish zero before sampling • Full range of mode capability <p style="text-align: right;">CE</p>	<p>MODEL 340 – Intermediate</p> <ul style="list-style-type: none"> • Zero function as described at left <p style="text-align: right;">CE</p> <hr/> <p>MODEL 450 – Extended concentration range</p> <ul style="list-style-type: none"> • Mode switch selects among standby (through), zero, span 1 (low concentration), and span 2 (high concentration) modes <p style="text-align: right;">CE</p>
<p>MODEL 505 – Dual chamber</p> <ul style="list-style-type: none"> • Two separate permeation chambers with independent temperature control systems • Chamber 1 and chamber 2 can run independently, or be used together to combine trace components • Solenoid valves allow the carrier flows to be switched from the dilution stream to a vent port, allowing chamber 1, chamber 2, chamber 1 + chamber 2, or zero  <p style="text-align: right;">CE</p>	<p>MODEL 500 – Dual chamber</p> <ul style="list-style-type: none"> • Two separate permeation chambers with independent temperature control systems • Chamber 1 and chamber 2 can run independently, or be used together to combine trace components. • Solenoid valves allow the carrier flows to be switched from the dilution stream to a vent port, allowing chamber 1, chamber 2, chamber 1 + chamber 2, or zero  <p style="text-align: right;">CE</p>



G-CAL PERMEATION DEVICES

- Excellent for use in the field
- Can be operated at room temperature
- Can handle Arsine and Phosphine
- Longer lifetime than Dynacal devices

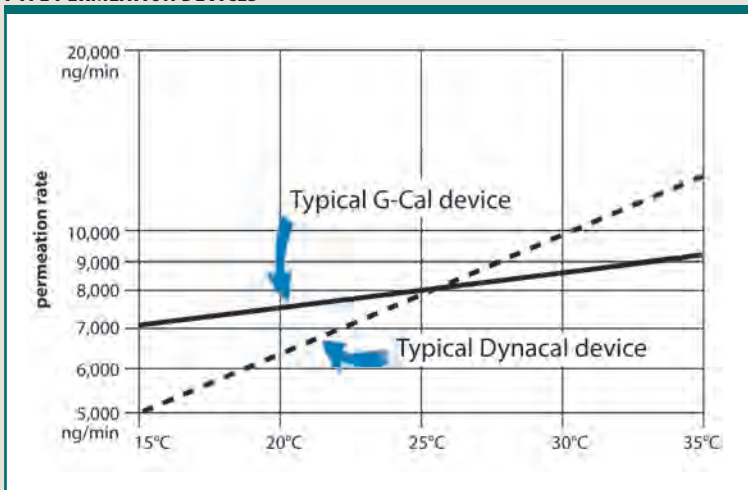
G-Cal permeation tubes offer a proven and repeatable means of generating desired gas or vapor concentrations. The permeant gas escapes through the proprietary membrane system and mixes with a carrier gas (nitrogen is the most common) at a controlled flow rate to obtain a known mixture in ppm or ppb. 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 through the polymeric membrane used in G-Cal devices changes only 1-3% per degree C, eliminating the need for a temperature-controlled chamber. Most G-Cal devices are guaranteed for 12 months operating life.



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 100 ng/min to 50,000 ng/min. Each G-Cal device is individually calibrated and verified to generate a given mass output per unit time (ng/min) at a set point temperature. A graph which shows an estimated permeation rate vs. temperature from 0 to 50°C is included with each device.

COMPARISON OF G-CAL PERMEATION DEVICES AND DYNACAL PTFE PERMEATION DEVICES



COMPOUNDS AVAILABLE IN G-CAL PERM TUBES

Literally hundreds of compounds are available in our permeation devices. This list is merely representative of the range we offer. Contact us if you don't see what you're looking for.

Ammonia	Hydrogen Sulfide
Arsine *	Methane *
Benzene	Methanol
Carbon Dioxide *	Methyl Mercaptan
Carbon Monoxide *	Nitric Oxide *
Carbonyl Sulfide	Nitrogen Dioxide
Chloroform	Nitrous Oxide *
DMMP	Phosphine *
Dichloromethane	Propylene Oxide
Dimethyl Sulfide	Sulfur Dioxide
Dimethyl Formamide	Sulfur Hexafluoride
Ethyl Chloride	Thiophene
Ethyl Mercaptan	Toluene
Ethylene Oxide	Water
Freons	Xylenes
Hydrogen Fluoride	

* Available only in G-Cal permeation devices.

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G-CAL CALIBRATION GAS GENERATORS

- Portable and rugged – ideal for field use
- Ambient temperature from 15°C to 45°C
- Built-in pump
- Carrier gas flow rates from 100-1000 or 200-4000 cc/min
- Models with oven for constant temperature control at cold field sites

G-Calibrators are rugged portable units specifically designed to be used with our patented Series 23 G-Cal permeation devices to generate known concentrations (ppb to ppm) of various gases and liquid vapors. This combination offers the easiest method of calibrating toxic gas detection equipment, gas analyzers, and chromatographs commonly used in chemical, petrochemical, paper, power, and related industries.

Due to its patented permeation technology, the permeation rate

of a G-Cal device remains fairly stable when exposed to changing temperatures. For most applications, this feature eliminates the need for the temperature-controlled oven.

Models with an oven have a single fixed temperature point (35° - 50°C). Models powered by a 12 VDC NiCad rechargeable battery also include a 110 VAC external charger.

All G-Calibrators have stainless steel fittings and FEP tubing throughout.

G-Calibrators

NON-CE. USE RESTRICTED IN EU

<i>Flow range</i>	<i>Battery</i>	<i>Oven</i>	<i>Prod No.</i>
100-1000 cc/min	1.5 VDC	no	2301
	12 VDC NiCad	no	2310-10
		yes	2330-10
200-4000 cc/min	12 VDC NiCad	no	2310-20
		yes	2330-20