# APEL-RIEMER ENVIRONMENTAL, INC

*REFERENCE GASES AND ATMOSPHERIC CHEMISTRY*


## Certificate of Analysis

**Gas-phase Calibration Standard**

*This gas-phase standard is intended to be used as a reference material for the calibration of instruments.*

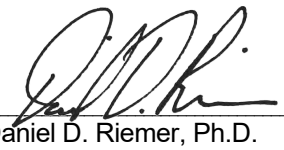
Statement about preparation and traceability:

Standards are gravimetrically prepared in high-pressure aluminum cylinders (Luxfer, Inc., Riverside, California). Cylinders are cleaned and treated to eliminate contamination and ensure inertness. Standards are prepared in N150 cylinders (~4000 Liters calibration gas), N033 cylinders (~800 Liters calibration gas), or N006 cylinders (~125 Liters calibration gas at a pressure of 2000 psia UHP nitrogen. Valves are high purity stainless steel (Ceodeux, Lintgen, Luxembourg) with a CGA-350 fitting. Pure compounds as liquids and gases are obtained from a number of sources. All lot numbers are cataloged. The gravimetric preparation is performed using calibrated microbalances (Mettler-Toledo, Columbus, Ohio) and microsyringes (Hamilton, Reno, Nevada and SGE, Austin, Texas) for measuring the compounds and cylinder balances (Mettler-Toledo, Columbus, Ohio) for the balance gas. Balances are calibrated with NIST traceable weights.

We prepare each cylinder individually. Accuracy is better than +/- 5%. Analysis confirms the accuracy of the gravimetric preparation. We use a series of NIST, NIST-traceable, NPL, and in-house gravimetric standards to perform the instrument calibrations.

Stability varies depending on the compound, concentration, and cylinder size. Many compounds are stable for several years.

The calibration gas mixture in cylinder D381974 is certified from the analysis date for 24 months.



Daniel D. Riemer, Ph.D.

June 9, 2026

Date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Cylinder: D381974
Cylinder Date: 2025/11
Valve: CGA350 SS 1132024 23-15
Lot No.: 26127.1
Cylinder Pressure: 2000 psia
Analysis Date: June 9, 2026

Multi-component calibration mixture in ultra-pure nitrogen

| Compound | CAS# | Concentration (ppb) | Uncertainty |
|---|---|---|---|
| Ethanol | 64-17-5 | 1015 | ±5% |
| Acetonitrile | 75-05-8 | 1011 | ±5% |
| Acetone | 67-64-1 | 1051 | ±5% |
| Acrylonitrile | 107-13-1 | 1023 | ±5% |
| Isoprene | 78-79-5 | 1023 | ±5% |
| Methacrolein | 78-85-3 | 1060 | ±5% |
| Methyl Ethyl Ketone | 78-93-3 | 1025 | ±5% |
| Benzene | 71-43-2 | 1024 | ±5% |
| *o*-Xylene | 95-47-6 | 988 | ±5% |
| α-Pinene | 80-56-8 | 974 | ±5% |
| Octamethylcyclotetrasiloxane (D4) | 556-67-2 | 1029 | ±5% |
| 1,2,4-Trimethylbenzene | 95-63-6 | 1025 | ±5% |
| Decamethylcyclopentasiloxane (D5) | 541-02-6 | 1057 | ±5% |
| β-Caryophyllene | 87-44-5 | 104.6 | ±5% |

Uncertainty is a conservative estimate of the combination of the uncertainties of the gravimetric preparation and analysis.

## Chromatogram

100-meter DB-1, 0.25 mm id, 3.1 mL $min^{-1}$ Helium carrier gas – constant flow
Temperature Program: 35°C, 3.5 min → 4.5°C $min^{-1}$ → 180 °C, 6 min