# $N_2O$, $CH_4$, $CO_2$, $NH_3$ and $H_2O$ Gas Concentration Analyzer

PICARRO


- Simultaneously measures five gases in air: $N_2O$, $CH_4$, $CO_2$, $NH_3$, and $H_2O$
- Parts-per-billion sensitivity brings excellent rate-of-rise quantification
- Rapid response time and continuous measurements provide data at high temporal resolution
- Integrates easily with chamber systems. Field-proven platform
- Automatically corrects data for presence of water vapor

The **Picarro G2508 gas concentration analyzer** radically simplifies soil flux studies by simultaneously measuring five gases— $N_2O$, $CH_4$, $CO_2$, $NH_3$, and $H_2O$—to provide a complete picture of greenhouse gas soil emissions. Greenhouse gas exchange between soil and the atmosphere is a critical step in the global nitrogen and carbon cycles. The G2508 easily integrates with soil chambers, and there is no need to assemble and synchronize separate gas analyzers to observe the behavior of all the major greenhouse gases. The G2508 employs precise cavity ring-down spectroscopy (CRDS) technology to measure gas concentrations to parts-per-billion (ppb) sensitivity with negligible drift. And unique Picarro algorithms provide automatic water correction of $N_2O$, $CH_4$, and $CO_2$.

**G2508 Performance Specifications and Typical Performance in Air**

| Specification | $N_2O$ | $CH_4$ | $CO_2$ | $NH_3$ | $H_2O$ |
|---|---|---|---|---|---|
| **Precision Raw** (1σ) | <25 ppb + 0.05% of reading **Typical = 5.0 ppb*** | <10 ppb + 0.05% of reading **Typical = 0.3 ppb*** | <600 ppb + 0.05% of reading **Typical = 240 ppb*** | <5 ppb + 0.05% of reading **Typical = 0.16 ppb*** | <500 ppm |
| **Precision 1 min** (1σ) | <10 ppb + 0.05% of reading **Typical = 1.1 ppb*** | <7 ppb + 0.05% of reading **Typical = 0.1 ppb*** | <300 ppb + 0.05% of reading **Typical = 74 ppb*** | <3 ppb + 0.05% of reading **Typical = 0.07 ppb*** | <250 ppm |
| **Precision 5 min** (1σ) | <5 ppb + 0.008% of reading **Typical = 0.6 ppb*** | <5 ppb + 0.02% of reading **Typical = 0.1 ppb*** | <200 ppb + 0.05% of reading **Typical = 38 ppb*** | <1 ppb + 0.05% of reading **Typical = 0.04 ppb*** | <100 ppm |
| **Guaranteed Spec Range** | 0.3–200 ppm | 1.5–12 ppm | 380–5000 ppm | 0–300 ppb | 0–3 % |
| **Operating Range** | 0–400 ppm | 0–15 ppm | 0.02–2 % | 0–2 ppm | 0–7 % |
| **Measurement Rate** | <8 seconds | <8 seconds | <8 seconds | <8 seconds | <8 seconds |
| **Typical Gas Response** (Rise-Fall 10-90%, 90-10%) | ~8 seconds | ~8 seconds | ~8 seconds | See Note below | See Note below |
| **Report Dry Mole Fraction** | Yes | Yes | Yes | No | N/A |

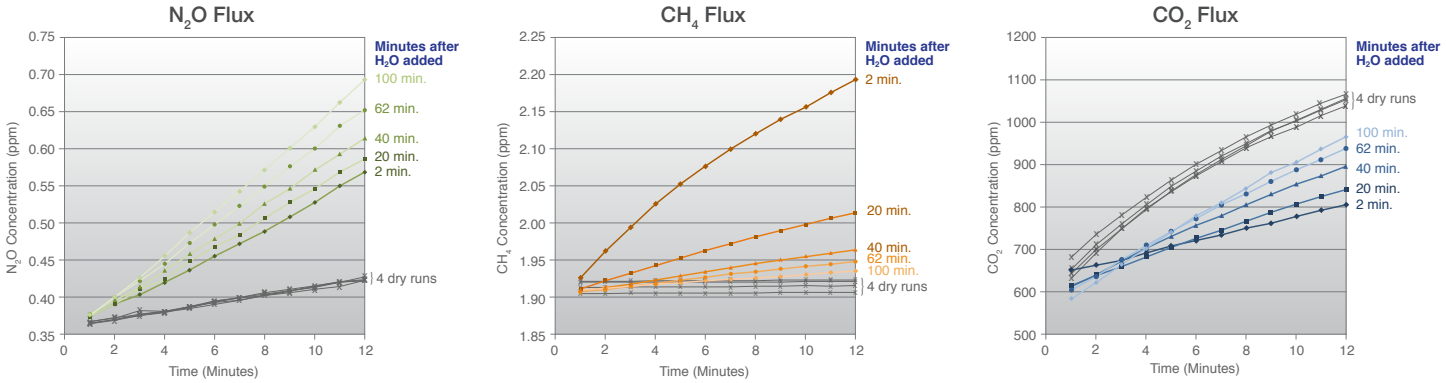
**Note:** The response of $H_2O$ and $NH_3$ are limited by the adsorption of these species to the surfaces of the experimental apparatus. While the analyzer will accurately measure the concentration of $NH_3$ and $H_2O$ within the cavity, calculating the actual flux of $NH_3$ and $H_2O$ from the soil with these measurements will be convolved by the adsorption dynamics within the system.

* Typical performance is defined as the median of testing results from 50 sequentially built G2508 analyzers. As measured for typical ambient concentrations.

**Analyzer specificity:** Picarro's CRDS technology utilizes extremely narrow spectral regions, which greatly reduces the likelihood of interference from other gas species when compared to other spectral measurement techniques. However, in real-world samples, interferences can happen. Picarro has included interference detection software and has tested and characterized the effects of the following species for this analyzer:

| G2508 Trace Gases | $N_2O$ Sensitivity |
|---|---|
| Carbon Dioxide | None - Automated correction good to 20,000 ppm $CO_2$ |
| Methane | None - Automated correction good to 200 ppm $CH_4$ |
| Ammonia | None - Automated correction good to 2 ppm $NH_3$ |
| Ethane | 0.2 ppb $N_2O$/ppm $C_2H_6$ tested up to 120 ppm |
| Ethylene | 0.5 ppb $N_2O$/ppm $C_2H_4$ tested up to 16 ppm |
| Acetylene | Not for use with acetylene experiments |
| Background Gas | Designed for use in ambient air, not for use with highly varying or enriched $N_2$, $O_2$, $H_2$, or He |
| ChemDetect™ Software | Unique Picarro algorithms detect and flag data which may be inaccurate due to spectroscopic interference |

| G2508 System Operation Parameters | Specifications |
|---|---|
| Ambient Temperature | 10 to 35°C |
| Ambient Humidity | <85% RH, non-condensing |
| Sample Pressure | 300 to 1,000 Torr (40 to 133 kPa) |
| Sample Flow Rate | ~230 sccm |
| Sample Humidity | <99% RH, non-condensing, Water correction tested to 25°C dew point |
| Sample Temperature | -10 to 45°C |
| Cavity Temperature Control | +/-0.005°C |
| Cavity Pressure Control | +/-0.0002 atm |
| Closed-loop/Recirculation Capability | Compatible with Picarro Closed System Pump A0702 |
| Inlet Fittings | ¼" Swagelok® |
| Dimensions | 17" w x 7" h x 17.5" d (43.2 x 17.8 x 44.6 cm) not including 0.5" feet |
| Weight | 50 lbs (22.6 kg) |
| Power Requirements | 100–240 VAC; 47– 63 Hz (auto-sensing); < 375 W at start-up (total).<br>Steady-state operation: 120 W (analyzer), 150 W (pump). |
| Installation | Benchtop (standard) or 19" rack mount chassis (optional) |
| Accessories | Included: Keyboard, mouse. Optional: LCD monitor. Excluded: Vacuum pump |
| Options | A0702, Picarro Closed System Pump<br>S0528, $O_2$ sensor for $O_2$ measurements and correction in varying $O_2$ environments<br>S0517, Extended $CH_4$ operating range up to 800 ppm |




**Simulated rain event in closed-system chamber lab study:** Concentration time series for dry and wet dirt measurements of $N_2O$, $CH_4$ and $CO_2$ are shown. After adding water, $N_2O$ emission rate triples in 2 min and continues to rise, while $CH_4$ emission rate spikes and then decreases, and $CO_2$ emission rate is suppressed but recovers slowly. Contact Picarro for more details and the latest data related to this study.

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