

Ammonia (NH₃) Gas Concentration Analyzer

PICARRO

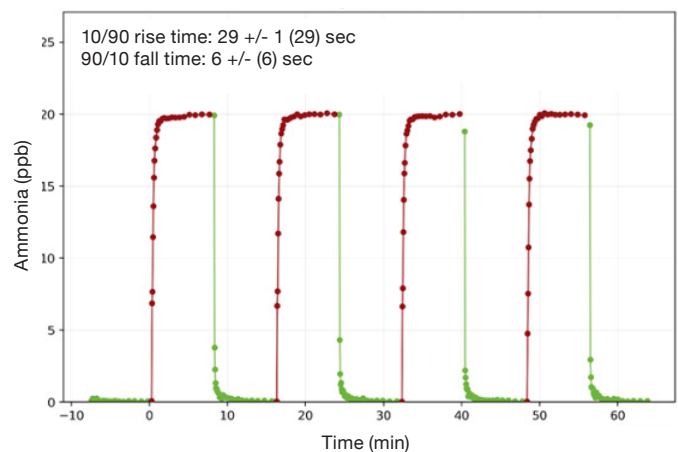


- Fast, continuous, real-time measurements
- Superb sensitivity, precision and accuracy
- Month-long stability for infrequent validation
- Water (H₂O) and Carbon Dioxide (CO₂) measurements for correction and validation
- Small footprint, field or lab deployable with no consumables required

The Picarro **PI2103 Gas Concentration Analyzer** delivers ultra-precise and stable measurements of ammonia (NH₃) gas. The analyzer features a parts-per-trillion (ppt) lower limit of detection, and impressive stability with negligible drift over a full month of continuous operation. Coated (SilcoNert®) components in the critical gas pathway reduces the propensity of NH₃ molecules to adsorb onto pathway surfaces, improving the measurement response time and eliminating measurement biases. An additional carbon dioxide (CO₂) measurement is used for **surrogate validation**, simplifying and replacing the need for complex calibration procedures using difficult to use standards (see pg. 2).

The Picarro analyzer is an ideal solution for applications that require real-time, responsive measurement of ammonia (Figure 1) and/or high levels of sensitivity and stability. These include, but are not limited to, urban and atmospheric air quality monitoring, studies of particulate matter formation, livestock emission quantification, vehicle emission quantification, indoor air quality and others. The analyzer has a small footprint, low power requirements, and can be unpacked and installed within minutes, whether in a laboratory or in the field.

Ammonia Response Time



Figures 1 - Typical response time of PI2103 analyzer for a 10-90% and 90-10% 20 ppb ammonia challenge.

The PI2103 analyzer can operate for months without user interaction, and concentration trending data is continuously archived to the analyzer's internal hard drive. The analyzer can be configured to automatically export measurement data via Ethernet, RS-232 interface, Analog 4-20mA or Modbus outputs.

Picarro's cavity ring-down spectroscopy (CRDS) delivers a best-in-class combination of precision, accuracy, low drift, and ease-of-use.

PI2103 Performance Specifications	Typical Performance***	Specifications****
Lower Detection Limit (3 σ , 300 sec)	0.03 ppb	<0.09 ppb
Zero Drift* (peak-to-peak, 50-minute average)	± 0.04 ppb (72 hrs)	$\pm 0.15/\pm 0.5$ ppb (72 hrs/1 month)
Precision (1 σ , 1 sec)	0.19 ppb	0.50 ppb + 0.1% of reading
Precision (1 σ , 10 sec)	0.058 ppb	0.17 ppb + 0.05% of reading
Precision (1 σ , 300 sec)	0.010 ppb	0.03 ppb + 0.02% of reading
Measurement Interval	1 sec	1 sec
Response Time (0–20 ppb)** (Rise/Fall Time 10–90%/90–10%)	<2 min	<2 min
Measurement Range	Guaranteed range 0–500 ppb Operational range 0–10 ppm Extended range 0–50 ppm (Optional)	Guaranteed range 0–500 ppb Operational range 0–10 ppm Extended range 0–50 ppm (Optional)

* Picarro analyzers do not require a zero reference gas or zero cartridge to operate or meet specifications.

** Rise/Fall time will decrease as test concentration increases.

*** Typical performance is defined as the median of testing results from 49 sequentially built G2103 analyzers. Results available upon request.

**** Specifications and an instrument-specific testing report (Certificate of Compliance) provided with every analyzer purchase.

PI2103 Surrogate Gas Validation

Calibrating any gas-phase analyzer using ammonia standards is challenging. Carbon dioxide (CO₂) is a commercially available gas that has an absorption spectrum adjacent to ammonia, making it an excellent surrogate gas for the validation of accuracy and linearity. Successful validation on a Picarro PI2103 using CO₂ removes the need for calibration with NH₃ standards. To learn more about Picarro's novel and robust approach to surrogate gas validation, please contact a Picarro sales representative or application scientist at: sales@picarro.com

PI2103 System Specifications

Measurement Technique	Cavity Ring-Down Spectroscopy (CRDS)
Measurement Cell Temp. and Pressure Control	$\pm 0.005^\circ\text{C}$; ± 0.0002 atm
Sample Temperature	-10 to 45°C
Sample Flow Rate and Pressure	>1.5 slm at 760 Torr; 300 to 1000 Torr (40 to 133 kPa)
Sample Humidity	<99% R.H. non-condensing @ 40°C, no drying required
Ambient Temperature Range	10 to 35°C (operating); -10 to 50°C (storage)
Ambient Humidity	<85% R.H. non-condensing
Other Gases Measured (expected precision)	H ₂ O (<200 ppm 1 σ , 10 sec), CO ₂ (<10 ppm 1 σ , 10 sec)
Accessories	Included: Pump (external), keyboard, mouse, Optional: LCD monitor, 16-port SilcoNert® coated sampling manifold
Data Outputs	RS-232, Ethernet, USB, analog 0–10 V, Modbus (optional), 4–20mA (optional)
Fittings	¼" Swagelok® SS fittings (recommended ¼" OD PFA Tubing)
Dimensions	Analyzer: 17" w x 8.38" h x 24.4" d (43.2 x 21.3 x 62 cm), including feet External Pump: 7.5" w x 4" h x 11" d (19 x 10.2 x 28 cm)
Installation	Benchtop or 19" rack mount chassis
Weight	Less than 55 lbs (25 kg) for analyzer and 14.3 lbs (6.5 kg) for external pump
Power Requirements	100–240 VAC; 47–63 Hz (auto-sensing); <375 W at start-up (total). Steady-state operation: 120 W (analyzer), 150 W (pump).

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