

# Small Sample Introduction Module 2

For high-precision isotopic and concentration measurements of small, discrete gas samples

# PICARRO

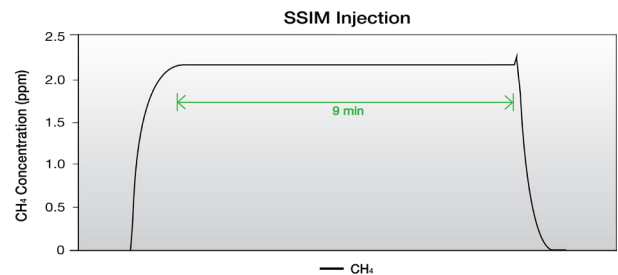


- The Small Sample Introduction Module is the solution to your small sample volume problems. Use the built-in dilution feature to measure volumes less than a single mL.
- Flexibility to Introduce samples via syringe or gas-bag
- Single sample or semi-automatic processing of up to 8 samples using Picarro's 16-Port Manifold
- Built-in dilution system enables optimal concentration targeting for isotopic analysis
- Automatically measure reference gases between samples
- Software flexibility provides automated work-flows and data reporting

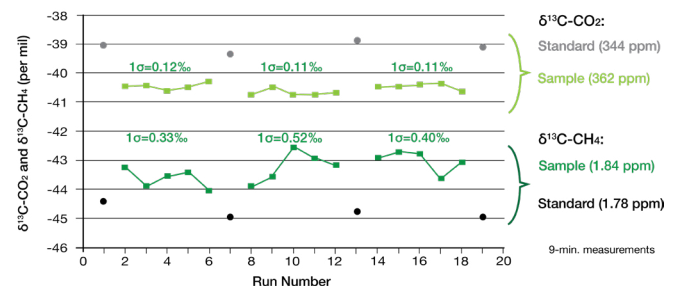
The **Picarro A0314 Small Sample Introduction Module 2 (SSIM2)** is Picarro's front end that transforms our continuously-sampling analyzers into instruments capable of measuring small, discrete gas samples. The SSIM2 is an excellent solution for soil, plant sciences or other headspace gas studies that provide samples in limited volumes. This front end may be used with Picarro's isotopic and concentration-only analyzers.

No special parts required, connections are made with readily available off-the-shelf parts. Sample input use standard Swagelok® fittings. Users can easily introduce samples from bags, flasks, or attach a septum holder for syringe injection. The SSIM2 may be paired with the Picarro 16-Port Distribution Manifold to enable semi-automatic analysis of up to eight sample containers.

The unique design of the SSIM2 allows for efficient purge cycles, leading to minimal sample carry over, reducing memory effects and improving precision. 20 mL gas samples travel from the SSIM2 chamber into the CRDS analyzer at reduced flow rates, enabling sampling times of 4 or 9 minutes. The steady plateau is then analyzed and averaged automatically by the SSIM2 software package—data review and feedback are instant. The figure in the following column (top right) shows an example of a stable concentration plateau of ~2 ppm CH<sub>4</sub> on the SSIM2 and G2508<sup>[1]</sup> concentration analyzer. The plateau has a 1σ standard deviation of ~0.0005 ppm.



Such stability leads to excellent performance on a sample-to-sample basis. The following graph depicts typical precision of five replicates on a G2201-*i* isotopic analyzer, capable of measuring  $\delta^{13}\text{C-CO}_2$  and  $\delta^{13}\text{C-CH}_4$ .



The mechanical design and software features compliment each other, allowing for a suite of additional measurement options. The SSIM2 can be configured to introduce reference gases for sample bracketing, the number of sample replicates can be adjusted, and the built-in dilution feature can be used to dilute high-concentration isotopic samples and/or standards.

<sup>[1]</sup>The SSIM2 is designed to work with the G2131-*i*, G2201-*i* and G2210-*i* analyzers. However, many G2xxx series analyzers (e.g., G2508) can be modified to operate at the reduce flow-rate. Contact sales to learn more.

A0314 SSIM2 Isotopic Performance			
Specification	Isotopologue	Value	Analyzer
Guaranteed Precision*	$\delta^{13}\text{C}$ in $\text{CO}_2$	<0.5‰ @ 500 ppm <0.2‰ @ 1,500 ppm <0.1‰ @ 3,000 ppm	G2201- <i>i</i> , G2131- <i>i</i>
	$\delta^{13}\text{C}$ in $\text{CH}_4$	<1.5‰ @ 1.8 ppm <0.3‰ @ 10 ppm	G2201- <i>i</i>
A0314 SSIM2 Concentration Performance			
Specification	Concentration	Value	Analyzer
Guaranteed Precision*	$\text{CO}_2$	<1 ppm @ 400 ppm	G2201- <i>i</i> , G2131- <i>i</i> , G2508
	$\text{CH}_4$	<3 ppb @ 2 ppm	G2201- <i>i</i> , G2508
	$\text{N}_2\text{O}$	<1.5 ppb @ 330 ppb	G2508
Sample Dilution**	$\text{CO}_2$	Bag: ~4%/Syringe: 0.6%	G2201- <i>i</i> , G2131- <i>i</i> , G2508
	$\text{CH}_4$	Bag: ~7%/Syringe: 0.6%	G2201- <i>i</i> , G2508
	$\text{N}_2\text{O}$	Bag: ~8%/Syringe: 2%	G2508

\* 1- $\sigma$  of five replicates (using 9-minute measurement time)

\*\* The dead-volume effect, after a purge cycle, leads to a small degree of dilution with zero-air. This influences the accuracy of concentration readings but has no effect on the concentration or isotopic precision. The method of sample delivery (bag/syringe) determines the extent of this dilution effect. See App Note AN038 for details on how to minimize sample dilution.

NOTE: This dead-volume effect is not to be mistaken with the built-in dilution function of the SSIM, designed to handle a larger range of dilutions.

A0314 SSIM2 System Specifications	
Minimum Sample Volume Per Measurement	20 mL directly into the SSIM2 23 mL through the 16-Port Manifold
Sample Throughput	10 or 15 minutes, replicate-to-replicate (Corresponds to 4- or 9-minute measurement time)
Connections	1/8" Swagelok®
Dimensions	SSIM2: 8.5" w x 4" h x 9" d (21.6 x 10.2 x 22.9 cm) Pump: 7.5" w x 4" h x 11" d (19 x 10.2 x 28 cm)
Weight	SSIM2: 6.25 lbs (2.8 kg) Pump: 14.3 lbs (6.5 kg)
Power Requirements	SSIM2: power USB 2.0 of the analyzer <3 watts additional power drawn through analyzer Pump: 35 watts steady state
Gas Requirements	Zero air as carrier gas Standards in zero air at appropriate concentrations