

# In-line Gas Diffusion TKN and Ammonia by Gas Diffusion SFA

SEGMENTED FLOW ANALYSIS (SFA) SERIES

**Cartridge Part Number: 330094CT**

**Channel Part Number: 330109**

## Scope and Application

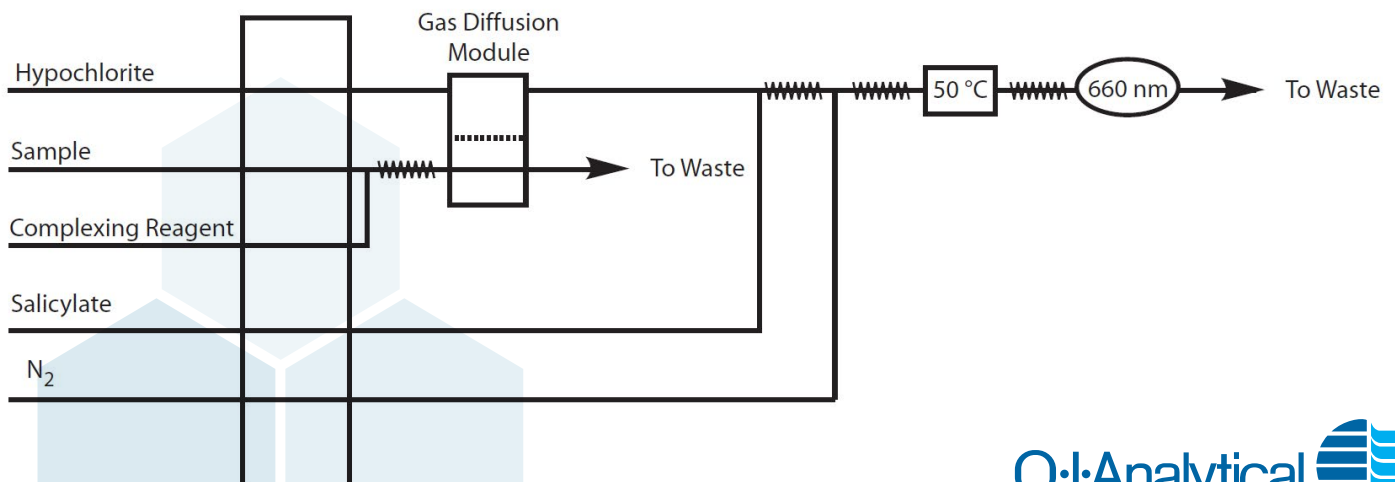
This method is used for determining Total Kjeldahl Nitrogen (TKN) in drinking water, surface water, municipal and industrial wastewater, according to EPA 351.2 (Reference 6). A gas diffusion step is used to separate TKN from particulates, ions, and copper-containing digest matrices.

This method can also be used to determine ammonia nitrogen according to USEPA method 350.1.

## Method Performance

<b>Range</b>	0.01 - 20 mg/L N
<b>Rate</b>	40 samples/hour
<b>Precision</b>	< 2% at 100 µg/L
<b>Method Detection Limit (MDL)</b>	0.001 mg/L N as ammonia

The range may be extended to analyze other concentrations by changing the size of the sample loop. The quality of the analysis is assured through reproducible calibration and testing of the Flow Injection Analysis (FIA) system. A general flow diagram of the Segmented Flow Analysis (SFA) system is shown below (see Figure 1 for a detailed flow diagram).



## Reagents and Calibrants

Chemical Name	CAS #	Chemical Formula	Part Number
Ammonium sulfate	7783-20-2	$(\text{NH}_4)_2\text{SO}_4$	
Brij-35, 21% solution	9002-92-0		326126
Copper sulfate pentahydrate	7758-99-8	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	
Kleenflow™ Basic			A001252
Potassium sulfate	7778-80-5	$\text{K}_2\text{SO}_4$	
Sodium citrate dihydrate	6132-04-3	$\text{C}_6\text{H}_8\text{O}_7\text{Na}_3 \cdot 2\text{H}_2\text{O}$	
Sodium hydroxide	1310-73-2	$\text{NaOH}$	
Sodium hypochlorite	7681-52-9	$\text{NaOCl}$	
Sodium nitroferricyanide dihydrate		$\text{Na}_2\text{Fe}(\text{CN})_5\text{NO} \cdot 2\text{H}_2\text{O}$	
Sodium salicylate	54-21-7	$\text{NaC}_7\text{H}_5\text{O}_3$	
Sulfuric acid, concentrated	7664-93-9	$\text{H}_2\text{SO}_4$	
Water, deionized		$\text{H}_2\text{O}$	

## Summary of US EPA Method 351.2

US EPA Method 351.2 summarizes the method and interferences as follows below (Reference 6).

### Method

- Digest TKN samples prior to analysis in the presence of sulfuric acid, potassium sulfate, and a copper catalyst at a final temperature of 380 °C. Free ammonia and organic nitrogen compounds convert to ammonium sulfate under these conditions. See Appendix B for digestion procedure.
- A digestion step is not carried out when analyzing ammonia singly by USEPA 350.1.
- The sample pH is raised to a pH of >11, and the ammonia molecules generated pass through a gas diffusion membrane and are absorbed into an alkaline hypochlorite solution to form chloramine.
- The chloramine reacts with salicylate to form indophenol blue in an amount that is proportional to the ammonia concentration. Sodium nitroferricyanide intensifies the blue color. Measure the absorbance at 660 nm (Reference 7).
- Assure the analysis quality through reproducible calibration and testing of the flow analysis system.

### Interferences

- Eliminate suspended particulates and ionic interferences by selectively diffusing ammonia through hydrophobic, microporous, polypropylene membrane.
- Filter turbid samples and digests prior to analysis.
- Samples with background absorbance do not interfere because color will not diffuse.
- Heavy metals in the sample and digest matrices may interfere by precipitating. Remove these interferences through complexation with citrate.
- Residual chlorine must be removed by pretreatment of the sample with sodium thiosulfate before analysis.

Figure 2. Ammonia Calibration Curve

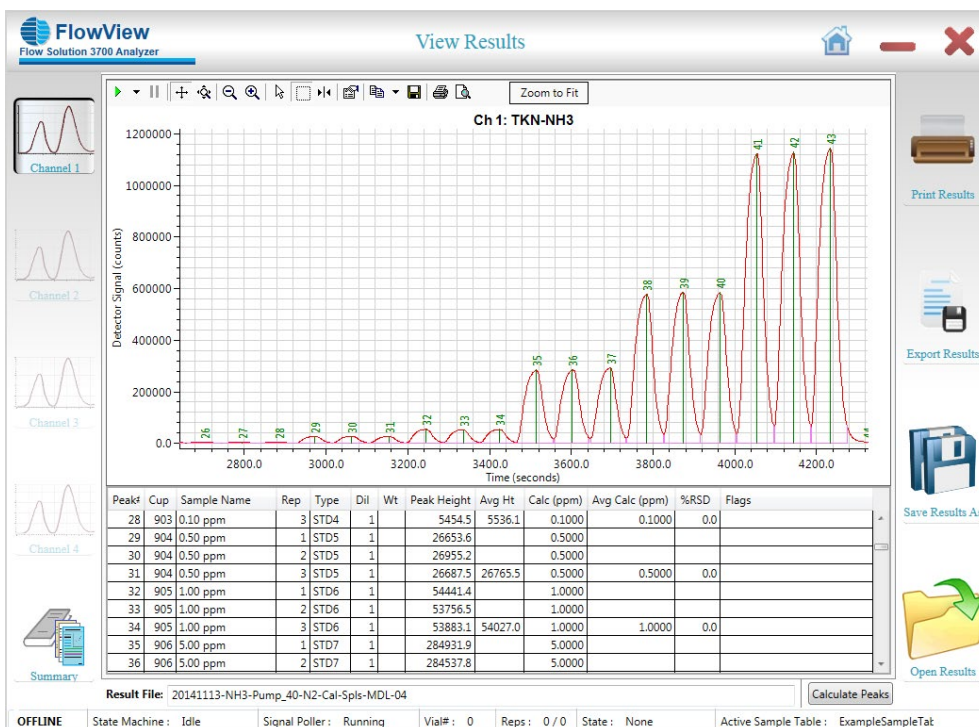
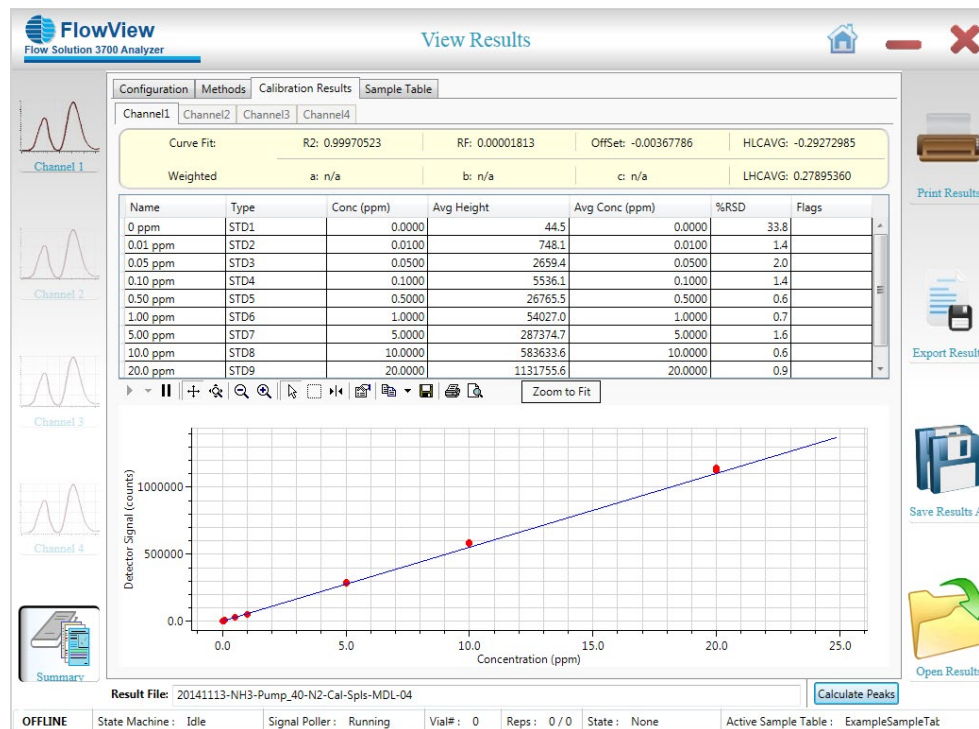


Figure 3. Calibration Curve and Statistics



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