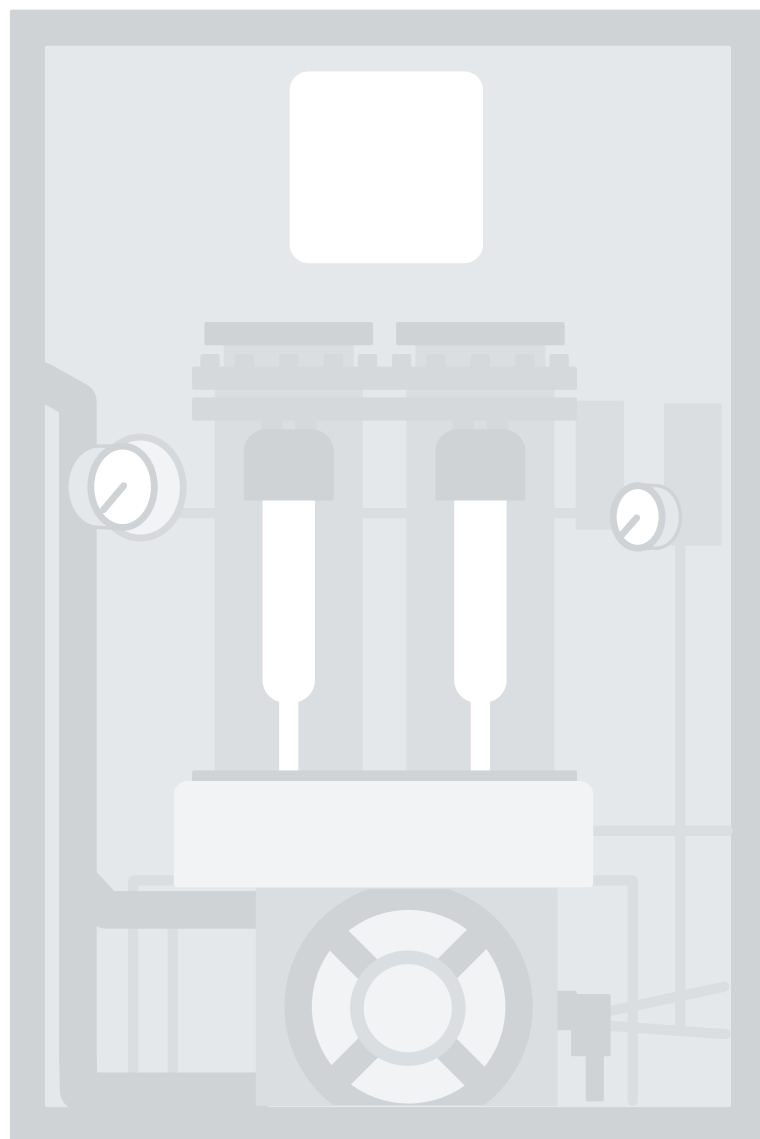


# Swagelok® Ammonia Sampler

Application Guide



Swagelok®

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## Swagelok® Ammonia Sampler

Ammonia is a chemical commonly found in nature and commonly used in industry. It is used as a cleaner, a fuel, a refrigerant, a precursor for producing other chemicals, to transport hydrogen, and in many other applications. However, by far the most common use for ammonia, encompassing almost 70% of global output, is fertilizer production.

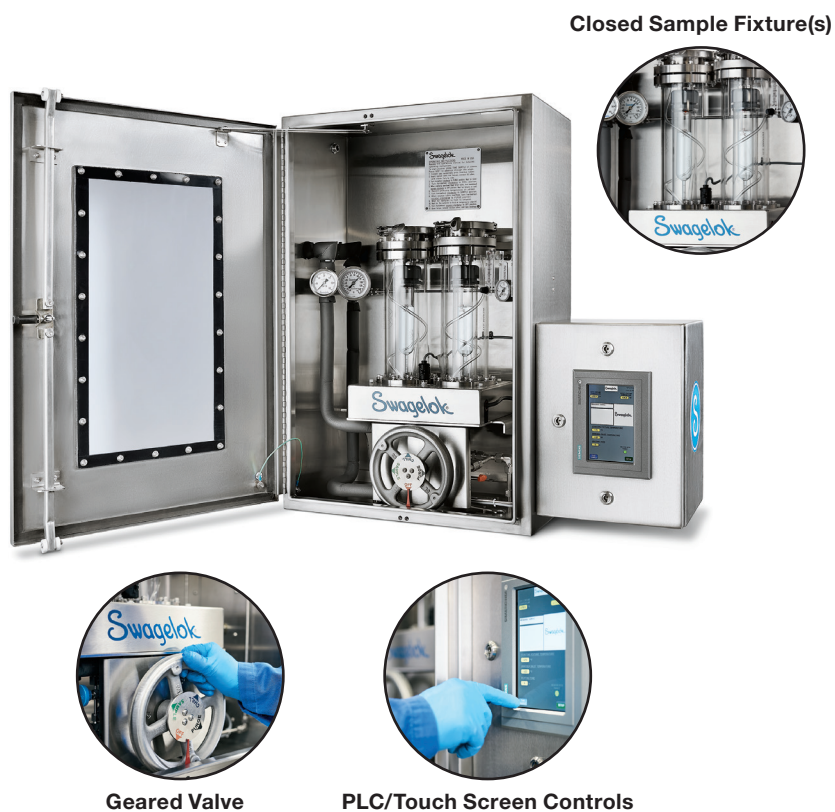
One concern for the production, storage, and transportation of ammonia is maintaining a minimum water content in the liquid ammonia, typically 0.2%. The Compressed Gas Association (CGA) method G2.2 test is often used to measure water content, but it comes with many challenges, including:

- The operator is exposed to ammonia liquid/vapor
- Extensive personal protective equipment (PPE) is required
- There is excessive sampling time
- The test relies on operator skill and judgment
- Sample results can be inconsistent and inaccurate

Swagelok has developed a closed-loop sampling unit that minimizes exposure to the operator and introduces consistency into the sampling operation. The Swagelok® ammonia sampler is designed to sample liquid ammonia, at or around its boiling point, to safely and reliably verify this minimum water content. Typically installed at the sample point, this sampler makes it unnecessary to transport ammonia samples within the facility.

The Swagelok ammonia sampler is a semiautomated system for liquid ammonia sampling consistent with the CGA G2.2 method. Easy to operate, our ammonia sampler allows the sample to be dispensed without exposing the technician while still providing visual confirmation of the process steps. The Swagelok ammonia sampler utilizes a closed-loop sample fixture to improve safety, semiautomation to improve ease of use, and a controlled heating cycle to reduce test time over the conventional CGA method.

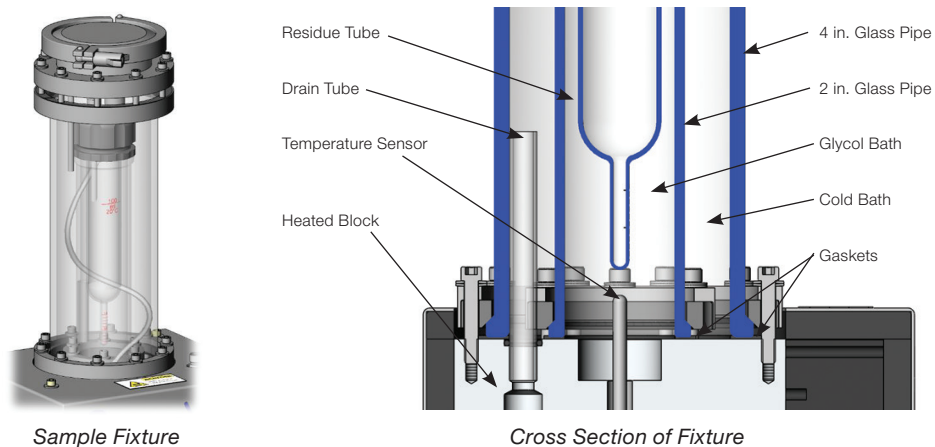
Typically, the ammonia levels in and around sampling cabinets are no higher than the surrounding environment. As a result, in most situations only basic PPE is required—gloves, goggles, etc. Respirators and chemical suits are not normally necessary.



## How Does the Swagelok Ammonia Sampler Operate?

The Swagelok ammonia sampler features a 100 mL or 250 mL residue tube installed in a fully enclosed sample fixture that isolates the operator from the ammonia. The residue tube is installed inside the center 2 in. glass pipe with the bottom section filled with a heat transfer fluid (glycol) to conduct heat to/from the residue tube.

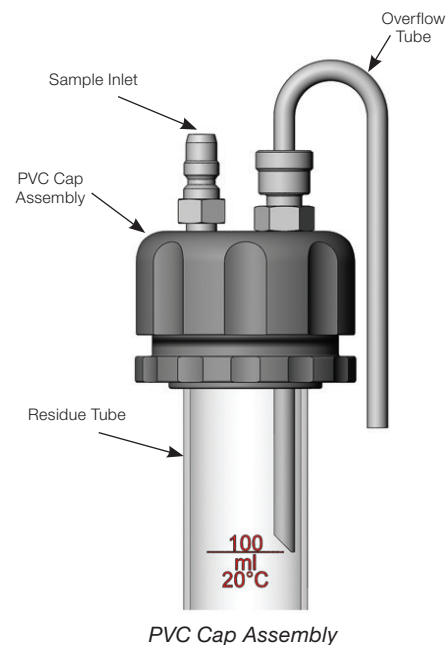
Cold ammonia is used to fill the space between the two glass pipes to create a cold bath that draws heat out of the fixture and residue tube to prevent aggressive boiling when the cold ammonia sample contacts the residue tube. As the cold bath fills, the ammonia will reach the top of an elevated drain tube and spill over to the drain connection, keeping the ammonia level from rising too high.



As shown, a PVC cap assembly is fitted to the residue tube to assist with the filling process. When dispensing the sample, the ammonia fills the residue tube until the level reaches the bottom of the included overflow tube. At that point, the gas trapped in the top of the residue tube prevents it from filling any further. The overflow spills into the cold bath, ensuring a consistent sample size.

Once the sample is dispensed, the cold bath is drained, and the heater is turned on. This heater warms the glycol and residue tube, evaporating the sample in a controlled manner. After the ammonia is completely evaporated, the remaining water is heated to 120°F (48°C)<sup>®</sup> and held at that temperature for 10 minutes<sup>®</sup>. At that point, the amount of remaining water can be measured, and the sample's water content can be calculated.

<sup>®</sup> These are default values that are user-configurable within the program.




## Features

- Minimizes operator exposure and the need for extensive PPE with a semiautomated closed fixture
- Cycles faster than traditional methods—typically a two-hour cycle time
- Has increased sampling consistency
- Eliminates NPT threaded connections
- Is easier to use and maintain than traditional methods
- Offers single-handle control and operation with a geared valve
- Uses PLC/touch screen controls that
  - provide an easy and intuitive operator interface
  - display on-screen step-by-step instructions
  - relay system outputs (heating, ready) for remote status monitoring
- Is hazardous area rated (Class 1, Div 2, Group B, or ATEX Zone 2)
- Is available with single or dual fixtures

## Materials of Construction

Component	Manufacturer Model	Material Grade/ASTM Specification
Shut-off and switching valve	Swagelok 40T/40G series	316 SS with PTFE seats See Swagelok <i>One-Piece Instrumentation Ball Valves—40G Series and 40 Series</i> catalog, <a href="#">MS-02-331</a>
Shut-off valve	Swagelok 60 series	316 SS with PTFE seats and Grafoil® seals See <i>Ball Valves, General Purpose and Special Application</i> catalog, <a href="#">MS-01-146</a>
Check valve	Swagelok CH series	316 SS with EPDM O-rings See Swagelok <i>Check Valves, C, CA, CH, CP, and CPA Series</i> catalog, <a href="#">MS-01-176</a>
Flow control valve	Swagelok O and 1 series	316 SS with PFA packing See Swagelok <i>Integral-Bonnet Needle Valves, O, 1, 18, 20, and 26 Series</i> catalog, <a href="#">MS-01-164</a>
Regulator	Swagelok KPR series	316 SS with PCTFE seat See Swagelok <i>Pressure Regulators, K Series</i> catalog, <a href="#">MS-02-230</a>
Pressure indicator	Swagelok B and M model pressure gauges	316 SS gauge case with a safety gas lens See Swagelok <i>Pressure Gauges, Industrial and Process—PGI Series</i> catalog, <a href="#">MS-02-170</a>
Thermowell	Swagelok TTW series	316 SS See Swagelok <i>Temperature Measurement Devices—Bimetal Thermometers and Thermowells</i> catalog, <a href="#">MS-02-353</a>
Thermometer	Swagelok bimetal thermometer	304 SS case and stem with a safety glass lens See Swagelok <i>Temperature Measurement Devices—Bimetal Thermometers and Thermowells</i> catalog, <a href="#">MS-02-353</a>
Tube fittings	Swagelok	316 SS/A276 or A182 See Swagelok <i>Gageable Tube Fittings and Adapter Fittings</i> catalog, <a href="#">MS-01-140</a>
Weld fittings	Swagelok Micro-Fit®	316L VIM-VAR See Swagelok <i>Weld Fittings—Ultrapure, Specially Cleaned, and Industrial</i> catalog, <a href="#">MS-01-149</a>
	Swagelok tubular	316L SS See Swagelok <i>Stainless Steel Tubular Fittings—(Fractional) Ultrapure and Chemically Cleaned and Passivated</i> catalog, <a href="#">MS-02-125</a>
Quick-connect	Swagelok QF series	316 SS with EPDM seals See Swagelok <i>Quick-Connects—QC, QF, QM, and QTM Series</i> catalog, <a href="#">MS-01-138</a>
Tubing	Swagelok	316/316L SS See Swagelok <i>Stainless Steel Seamless Tubing and Tube Support Systems—Fractional, Metric, and Imperial Sizes</i> catalog, <a href="#">MS-01-181</a>
Resistance temperature detectors (RTD)	Omega PR-21 series	See Omega catalog
Flowmeter	Dwyer VF series	See Dwyer catalog
Other wetted materials	Swagelok	316 SS, 6061 aluminum, borosilicate glass, EPDM, PVC Type 1, vinyl tubing
Enclosure	Swagelok	304 SS with clear PVC window
Brackets, hardware, etc.	Swagelok	300 series SS, nylon, aluminum

## Technical Data

Maximum Recommended Ammonia Inlet Pressure
Single fixture sampler: 58 psig (4.0 bar; 4.1 kg/cm <sup>2</sup> ; 0.40 MPa)
Dual fixture sampler: 232 psig (16.0 bar; 16.3 kg/cm <sup>2</sup> ; 1.60 MPa)
With optional inlet regulator: 2200 psig (172 bar; 175 kg/cm <sup>2</sup> ; 17.2 MPa)
Ammonia Temperature
Minimum temperature: -44°F (-42°C)
Maximum recommended temperature: -28°F (-33°C) <sup>①</sup>
Required Pressure Range
Class 1 Division 2 sampler: 50 to 500 psig (3.4 to 34.4 bar; 3.5 to 35.1 kg/cm <sup>2</sup> ; 0.34 to 3.44 MPa)
ATEX sampler: 90 to 110 psig (6.2 to 6.7 bar)
Minimum Ambient Temperature
Minimum temperature: -4°F (-20°C)
-22°F (-30°C) is possible with low temperatures option (only available for Class 1, Division 2) <sup>②</sup>
Maximum Ambient Temperature
Class 1, Division 2: 122°F (50°C)
ATEX: 104°F (40°C)
Power Requirements
120 volt sampler: 120 V AC, 1 Ø, 50 to 60 Hz, 5.5 A
230 volt sampler: 230 V AC, 1 Ø, 50 to 60 Hz, 2.9 A
Hazardous Area Classification
ATEX-compliant sampler: ATEX, Zone 2,  II 3 G Ex db ec nA nC IIC T3 Gc
North American sampler: Class 1, Division 2, Group B

① For possible use at higher temperatures, please contact your local authorized Swagelok sales and service center.

② Not available with ATEX sampler.

Contact your local authorized Swagelok sales and service center for more information.

### Swagelok Ammonia Sampler Testing

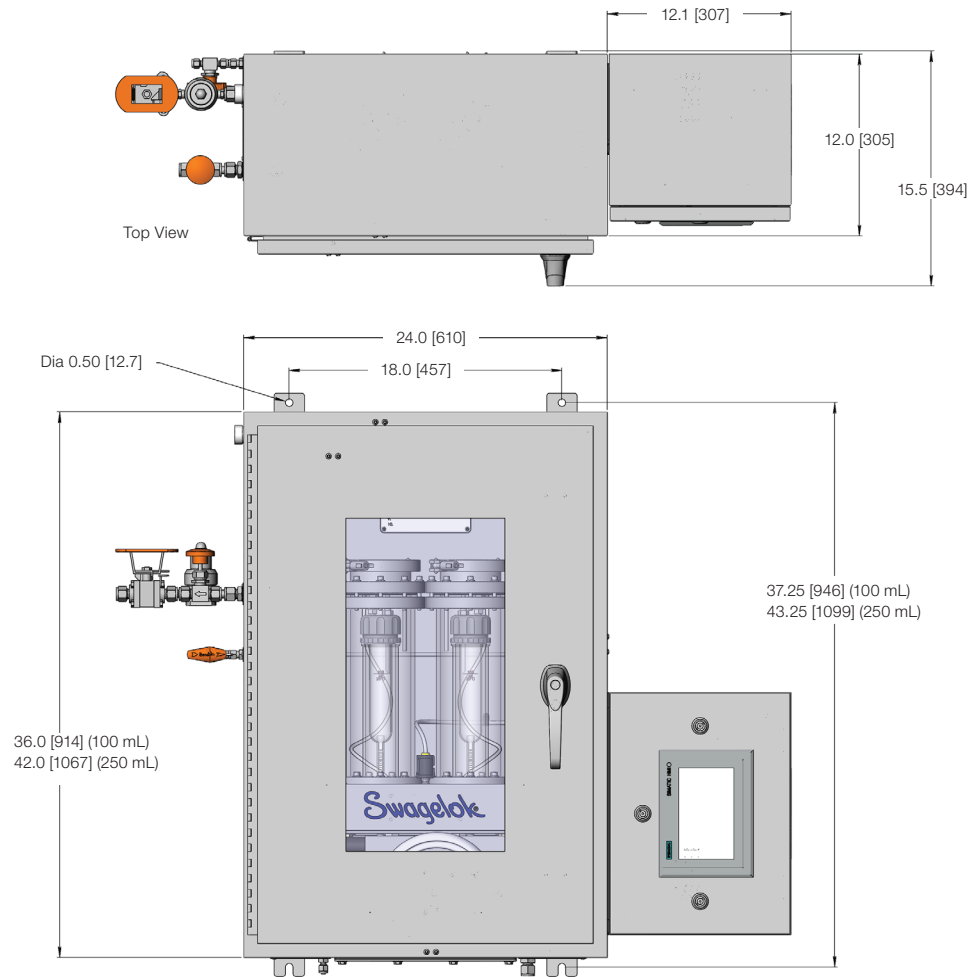
Every Swagelok ammonia sampler is helium tested for leaks to atmosphere with a maximum acceptable leak rate of  $1 \times 10^{-3}$  std cm<sup>3</sup>/sec.

### Swagelok Ammonia Sampler Cleaning and Packaging

All Swagelok components used in the Swagelok ammonia sampler are cleaned in accordance with Swagelok *Standard Cleaning and Packaging (SC-10—Specification SCS-00010 Revision C)*, [MS-06-62](#).

## Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.





## Ordering Information

Build a Swagelok ammonia sampler ordering number by combining the designators in the sequence shown below.

**1** **2** **3** **4** **5** **6** **7** **8** **9**  
**SAS - D 100 - C P CS - 120 EX - R**

### 1 Swagelok Ammonia Sampler

### 2 Number of Samplers

S = 1  
D = 2

### 3 Sample Size

100 = 100 mL  
250 = 250 mL

### 4 Pressure Range (see table below)

Inlet Pressure Range				
Range	psig	bar	kg/cm <sup>2</sup>	MPa
A	15	1	1	0.1
B	30	1.6	1.6	0.16
C	60	2.5	2.5	0.25
D	100	4	4	0.4
E	160	6	6	0.6
F	200	10	10	1
G	300	16	16	1.6
H	400	25	25	2.5

### 5 Pressure Units

P = psig  
B = bar  
K = kg/cm<sup>2</sup>  
M = MPa

### 6 Temperature Units

CS = Celsius  
FS = Fahrenheit  
DS = Dual scale

### 7 Voltage

120 = 120 VAC  
230 = 230 VAC

### 8 Hazardous Area

EX = ATEX  
FM = C1D2

### 9 Options

C = Calibration certs  
L = Low temperature<sup>①</sup>  
R = Inlet regulator  
N = Canadian Registration  
Number

<sup>①</sup> Not available with ATEX samplers.





#### Safe Product Selection

**When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.**

#### **WARNING**

**Do not mix/interchange Swagelok products or components not governed by industrial design standards, including Swagelok tube fitting end connections, with those of other manufacturers.**

## Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit [swagelok.com](http://swagelok.com) or contact your authorized Swagelok sales and service center.