

# Thermo Scientific Orion ISE Calibration: Preparing Ammonia Standards Using Serial Dilutions

Water Analysis Instruments, Thermo Fisher Scientific

## Key Words

Ammonia ion selective electrode (ISE), serial dilutions, ammonia, ammonia standards preparation, Thermo Scientific™ Orion™ high performance ammonia electrode, Orion standard ammonia electrode, standard preparations, ISE calibration, ammonia ISE calibration.

## Goal

The following application note describes how to prepare ammonia standards through serial dilutions. Ammonia standards are used to calibrate the Thermo Scientific Orion high-performance or standard ammonia ISE.

## Key Markets and Industries

Agriculture, chemical and petrochemical, consumer products, drinking water, education, environmental, food and beverage, industrial water, pharmaceutical and biomedical, QA/QC, R&D, seawater, soil, water and wastewater.



## Introduction

The Thermo Scientific Orion Ammonia Ion Selective Electrode (ISE) allows fast, simple, economical and accurate measurements of dissolved ammonia in water and wastewater samples. To calibrate the Orion Ammonia ISE, calibration standards must be prepared.

Serial dilution is the best method for the preparation of standards. Serial dilution means that an initial standard is diluted, using volumetric glassware, to prepare a second standard solution. The second standard is similarly diluted to prepare a third standard, and so on, until the desired range of standards has been prepared.

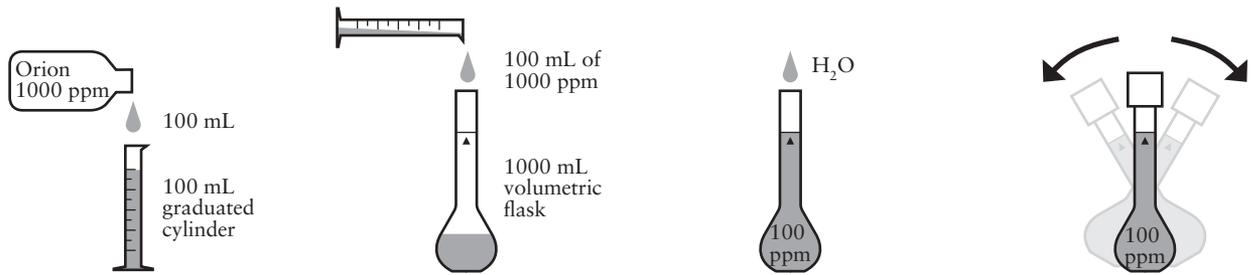
## Glassware and Solutions

- Four 1000 mL volumetric flasks
- Deionized/distilled water
- 100 mL graduated cylinder
- 10 mL volumetric pipette (for Option 2)
- Ammonia standard, 1000 mg/L (ppm) ammonia as nitrogen (N) (Orion 951007)
- Ammonia ISA (Orion 951211) or low-level ammonia ISA (Orion 951210) for 9512BNWP
- Low-level ammonia ISA (Orion 951210) or Alkaline ISA (Orion 951011) for 9512HPBNWP

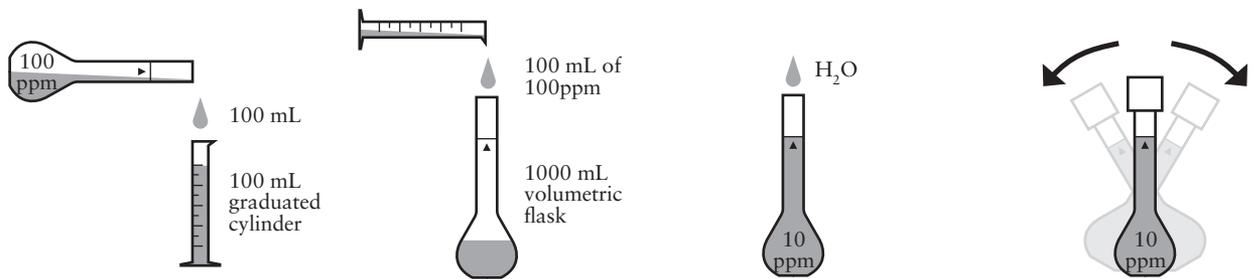
## Ammonia Standards Preparation using Serial Dilutions

### Option 1: Using a graduated cylinder

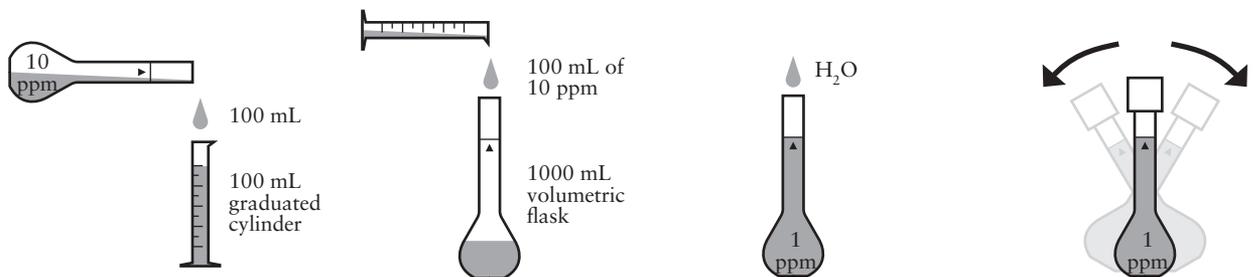
1. Prepare a *100 ppm ammonia standard* by measuring 100 mL of the 1000 ppm ammonia as nitrogen (N) standard (Orion 951007) using a graduated cylinder. Add the 100 mL measured to a 1000 mL volumetric flask. Add 900 mL of distilled/deionized (DI) water, diluting to the mark indicated on the flask. Mix the solution well.



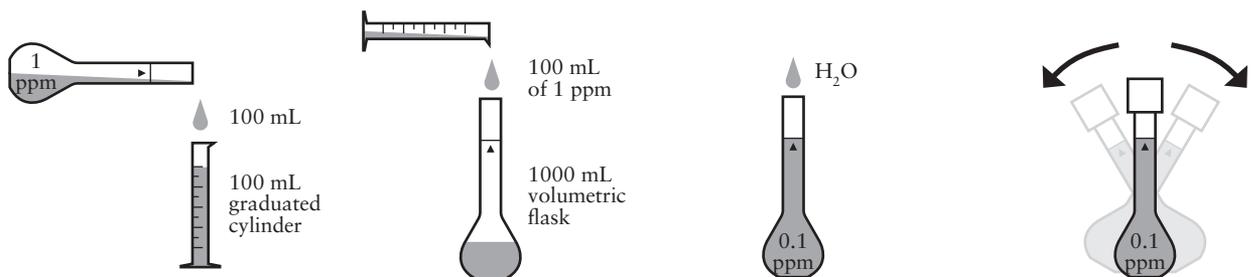
2. Prepare a *10 ppm ammonia standard* by measuring 100 mL of the 100 ppm ammonia standard from Step 1 using a graduated cylinder. Add the 100 mL measured into a 1000 mL volumetric flask. Add 900 mL DI water, diluting to the mark indicated on the flask. Mix the solution well.



3. Prepare a *1 ppm ammonia standard* by measuring 100 mL of the 10 ppm ammonia standard from Step 2 using a graduated cylinder. Add the 100 mL measured into a 1000 mL volumetric flask. Add 900 mL DI water, diluting to the mark indicated on the flask. Mix the solution well.



4. Prepare a *0.1 ppm ammonia standard* by measuring 100 mL of the 1 ppm ammonia standard from Step 3 using a graduated cylinder. Add the 100 mL measured into a 1000 mL volumetric flask. Add 900 mL DI water, diluting to the mark indicated on the flask. Mix the solution well.



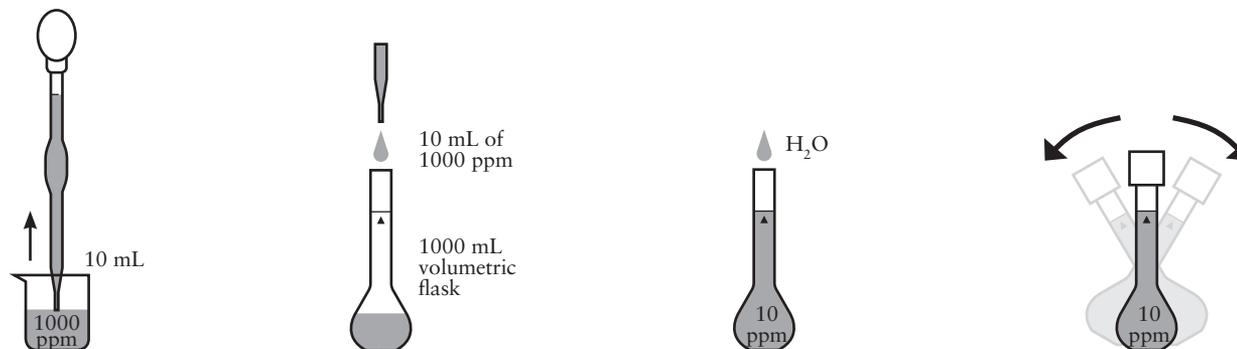
5. Cap the volumetric flasks.

## Ammonia Standards Preparation using Serial Dilutions (alternate method)

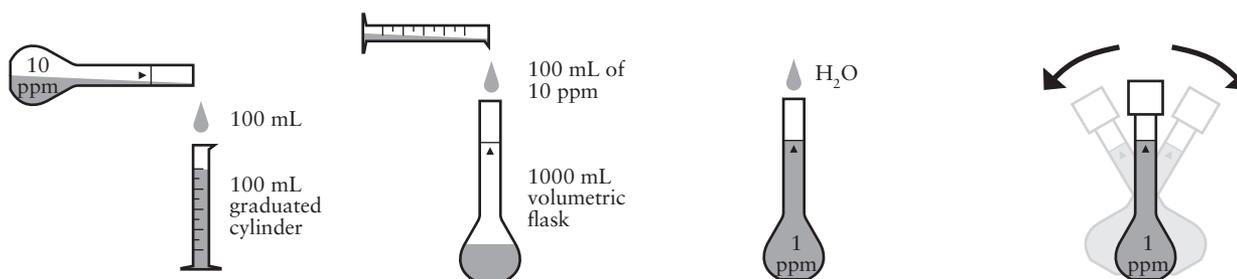
### Option 2: Using a volumetric pipette and a graduated cylinder

Please Note: A serial dilution could be started by making a 10 ppm ammonia standard and diluting from that point, but the initial 10 mL measurement of the 1000 ppm ammonia standard must be very accurate. With the smaller volume measurement there is greater potential for error.

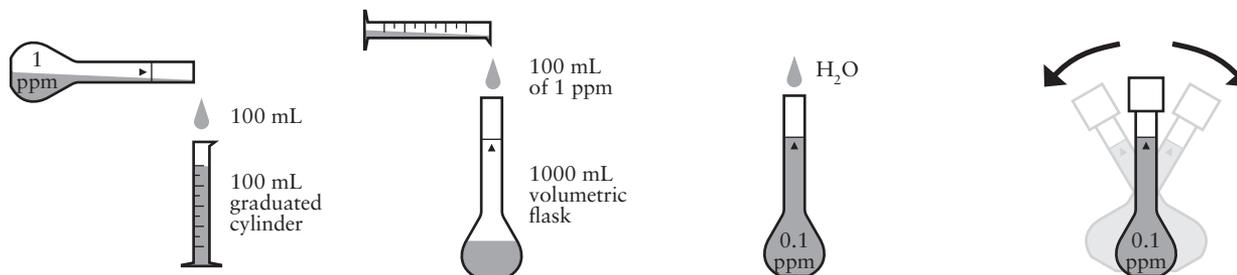
- Using a volumetric pipette, prepare a 10 ppm ammonia standard by pipetting 10 mL of the 1000 ppm ammonia as Nitrogen (N) standard (Orion 951007) into a 1000 mL volumetric flask. Add 990 mL DI water, diluting to the mark indicated on the flask. Mix the solution well.



- Prepare a 1 ppm ammonia standard by measuring 100 mL of the 10 ppm ammonia as nitrogen (N) standard from Step 1 using a graduated cylinder. Add the 100 mL measured into a 1000 mL volumetric flask. Add 900 mL DI water, diluting to the mark indicated on the flask. Mix the solution well.



- Prepare a 0.1 ppm ammonia standard by measuring 100 mL of the 1 ppm ammonia standard from Step 2 using a graduated cylinder. Add the 100 mL measured into a 1000 mL volumetric flask. Add 900 mL DI water, diluting to the mark indicated on the flask. Mix the solution well.



### Storage

If the ammonia standards are refrigerated, they will remain stable for 30 days. (Allow them to come to room temperature before using them to calibrate the ammonia probe). If the ammonia standards are kept at room temperature (not refrigerated), they will remain stable for one week.

## Measuring Tips

When performing ammonia measurements, select one ammonia ISA solution and use it with all calibration standards and samples. For most samples, use the Orion 951211 ammonia ISA. For clean water samples at very low levels of ammonia, the Orion 951210 low-level ammonia ISA or the Orion 951011 alkaline reagent is recommended.



### If using the Orion 9512BNWP Standard Ammonia Gas Sensing ISE Electrode

When using the Orion standard Ammonia ISE probe, use a graduated cylinder to measure 100 mL each of the 10 ppm, 1 ppm and 0.1 ppm standards into separate 150 mL beakers and label the beakers.

Just prior to performing the calibration, add 2 mL of the Orion ammonia Ionic Strength Adjuster (ISA) with pH-indicating blue dye (Orion 951211) to each beaker. It must be added just prior to calibration to avoid ammonia loss from the standard. Calibrate starting with the lowest concentration standard and proceeding to the highest concentration standard.

The slope value should be between -54 and -60 mV when the standards are between 20 and 25°C.



### If using the Orion 9512HPBNWP High-Performance Ammonia Gas Sensing ISE Electrode

When using the Orion High-Performance (HP) Ammonia ISE probe, use a graduated cylinder to measure 100 mL each of the 10 ppm, 1 ppm and 0.1 ppm standards into separate 150 mL beakers and label the beakers.

Just prior to performing the calibration, add ISA. Add 1 mL of the Orion alkaline reagent (Orion 951011) or 2 mL of the Orion ammonia Ionic Strength Adjuster (ISA) with pH-indicating blue dye (Orion 951210 or Orion 951211) to each beaker.

The slope value should be between -54 and -60 mV when the standards are between 20 and 25°C.

Visit [www.thermoscientific.com/water](http://www.thermoscientific.com/water) for additional information on Thermo Scientific Orion products, including laboratory and field meters, sensors and solutions for pH, ion concentration (ISE), conductivity and dissolved oxygen analysis plus spectrophotometry, colorimetry and turbidity products.

To purchase a Thermo Scientific Ammonia Ion Selective Electrode and other related products, please contact your local equipment distributor and reference the part numbers listed below.

Product	Description	Part Number
Meters	Thermo Scientific™ Orion™ VERSA STAR™ Dual Input pH/ISE Benchtop Meter	VSTAR40B
	Orion VERSA STAR pH/ISE Benchtop Meter	VSTAR40A
	Thermo Scientific™ Orion™ Star™ A214 pH/ISE Benchtop Meter	STARA2140
Sensors	Orion High Performance Ammonia Ion Selective Electrode, BNC Connection	9512HPBNWP
	Orion Standard Ammonia Ion Selective Electrode, BNC Connection	9512BNWP
Solutions	Orion 0.1 M Ammonia as Nitrogen (N) Standard, 475 mL	951006
	Orion 1000 ppm Ammonia as Nitrogen (N) Standard, 475 mL	951007
	Orion 100 ppm Ammonia as Nitrogen (N) Standard, 475 mL	951207
	Orion Ammonia ISA with pH-Indicating Blue Dye, 475 mL	951211
	Orion Ammonia Low Level ISA with pH-Indicating Blue Dye, 475 mL	951210
	Orion Ammonia Electrode Storage Solution, 475 mL	951213

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