

## Introduction

Selecting the right combination of blend tolerance, analytical tolerance and traceability is simple. Airgas offers six grades, covering most specification requirements:

- EPA Protocol Gases
- Traceability Standards
- Primary Standards
- Precision Blends
- Certified Standards
- Unanalyzed Mixtures

The Mixture Specifications Table on the next page outlines these grades and their respective tolerances. If your requirements are different from those listed, simply call the Airgas Specialty Gas Technical Hotline (1-877-ASG-4-GAS) or your Airgas representative to fully review your needs. In addition, with the exception of the Unanalyzed Mixtures, each calibration gas standard comes with a Certificate of Analysis at no extra charge. All mixtures are filled to 2000 psig at 70° F unless otherwise noted in the Technical Data sections.

### Types of Grades Available

#### EPA Protocol Gases

EPA Protocol Gases are manufactured and analytically certified in strict accordance with the most recent EPA traceability guideline document entitled "EPA Traceability Protocol for Assay and Certification of Gaseous Standards". The majority of EPA Protocol mixtures from Airgas are certified to a +/- 1% overall uncertainty guarantee, except where limited by the higher uncertainty of the NIST Standard Reference Materials (SRMs) or NIST Traceable Reference Materials (NTRMs). All analytical certifications are performed under completely interference-free conditions. Maximum allowable shelf life is guaranteed. Documentation fully conforms to the requirements of the EPA Protocol program, in compliance with the Clean Air Act.

#### Traceability Standards

Traceability Standards are calibration mixtures, which are analytically certified directly against either NIST SRMs or NTRMs, within a comprehensive quality system. The analytical testing process is based upon the EPA Protocol document, including triad analysis, comprehensive instrumentation characterization, and statistical data analysis. This results in a +/- 1% overall uncertainty (accuracy) with direct traceability to NIST Reference Materials.

#### Precision Blends

Precision Blends are developed to satisfy customer requirements for "zero blend tolerance" mixtures. These blends are manufactured by dynamically mixing the mixture components in real time while monitoring the composition using continuous analytical monitoring. Minor adjustments are made as needed during the blending process to assure the final mixture is statistically identical to the requested composition, as shown through careful analysis.

This process has several advantages:

- Gas mixtures are provided at the exact requested concentration
- Identical composition (homogeneity) of all cylinders within a batch
- Consistency of mixtures from one order to the next

Many Precision Blend mixtures are available upon request as Traceability Standards, i.e. with +/- 1% analytical traceability directly versus NIST Reference Materials.

#### Primary Standards

Primary Standards, often referred to as NIST Traceable By Weight Mixtures, should be used when your application demands the highest mixture accuracy and reliability. Airgas produces Primary Standards gravimetrically on sophisticated high-load, high-sensitivity scales, with statistically measured precision and accuracy. These weighing systems are stringently calibrated with NIST Class S weights, in accordance with ISO procedures. Gravimetric blending offers the closest tolerance available, often better than available through laboratory testing. A dual verification of mixture accuracy is also performed by routine quality control analysis on instrumentation calibrated with Airgas Registered Laboratory Standards.

#### Certified Standards

Certified Standards, sometimes referred to as working standards, are analyzed calibration mixtures used routinely in science and industry. For the majority of applications, the tolerance of a Certified Standard is acceptable. These standards are generally prepared either by partial pressure or gravimetrically. Certification of the standard is performed through quality control analysis on instrumentation calibrated with Airgas Registered Laboratory Standards.

#### Unanalyzed Mixtures

Although prepared by the same techniques as Primary and Certified Standards, Unanalyzed Mixtures are not verified or checked by analysis. These mixtures should be used in applications where the accuracy is less of an issue. Composition is guaranteed to fall within the stated blend tolerance.

#### Explanation of the Tolerances

Airgas has two tolerances associated with all six mixture grades. First is the Blend or Preparation tolerance. This is the minimum acceptable uncertainty associated with the actual production of the blend. These uncertainties are accumulated during the manufacturing process because of the inherent inaccuracies of equipment used in production, such as pressure gauges, and the inherent inaccuracies due to the physical properties of the gases. Second is the Analytical or Certification tolerance, which is the minimum acceptable uncertainty associated with the analysis of the blend. This uncertainty is accumulated throughout the analytical procedure and includes instrument and calibration uncertainties.