



**The Gold Standard in Calibration Mixtures**



## Calibration standards

are used in a wide variety of industries. The need for accurate and precise standards has become increasingly important because of the consequences involved with improper equipment calibration. For example:

- **On-line analyzers** have real-time control of large-scale, industrial processes. Accurate calibration of these analyzers is critical to the optimization of process controls thereby optimizing company profits.
- **Continuous Emission Monitoring Systems (CEMs)** monitor the emissions of large electric power generation plants, cogeneration plants, boiler operations and other industrial processes. Accurate calibration of these systems is critical for compliance with federal, state and local environmental regulations.
- **Gas chromatographs and other analytical instruments** are used to analyze many types of samples. Some of these analytical results are used as evidence in courts of law. Proper calibration of analytical instruments is critical to support evidence introduced in legal proceedings.
- **Control of engine emissions** from jet aircraft engines to automobiles to gasoline-powered lawnmowers is coming under increasingly tighter regulation. The calibration of instrumentation used to measure and evaluate these emissions must be done with exact calibration standards; any mistakes could result in emission non-compliance because of these tighter regulations.
- **Corporate and Institutional R & D applications** require the use of calibration standards to benchmark analytical processes as well as establish baselines for research and product development. Accurate calibration standards eliminate bias while ensuring application integrity.

# The Four Cornerstones of

The design and manufacture of all Matheson calibration standards are anchored on the four critical cornerstones of high-quality mixtures: blend tolerance, accuracy, traceability and stability.

## Blend Tolerance

**Blend tolerance** reflects the range within which a mixture is produced and is a critical factor when constructing any blend. Many factors will influence blend tolerance; the most common include:

- **Blending method** (*such as gravimetric or partial pressure*)
- **Reactivity of mixture components with impurities, cylinder surfaces and blending equipment**
- **Concentration of mixture components**

Matheson's use of the best blending technology in the industry, proprietary cylinder treatment methods and detailed knowledge of gas reactivity ensures accurate and precise mixtures time after time.

## Accuracy

**Accuracy**, also known as analytical uncertainty, is influenced by many factors. Calibration standard manufacturers and users must both have a thorough understanding of these factors and their influence on mixture accuracy. Some of the more important factors include:

- **The reference standard materials used in the mixture analysis**
- **Precision of the analytical instrument used in the mixture analysis**
- **Stability factors of the mixture components**
- **Raw material purity of the mixture components**
- **Accuracy of the gravimetric system used in mixture preparation**

Matheson has the unique capability of understanding, controlling and calculating random bias as a result of over 70 years of experience in mixture preparation and certification. This includes a statistical propagation of all known errors that can exist in the analytical process. The end results are calibration standards that are accurate, precise and repeatable.

# Matheson Calibration Standards

## Traceability

**Traceability** is defined as an unbroken chain of comparisons to the National Measurement System using statistically valid methods. There are two types of traceability:

- **Direct** - Direct traceability is the analysis of a customer mixture against a NIST SRM or NTRM (*See Notes at bottom of the Mixture Grade Table*).
- **Indirect** - Indirect traceability is the analysis of a customer mixture against a lab standard certified against a NIST SRM, NTRM or weight traceability.

The accuracy of the reference standard will have direct impact on the accuracy of the calibration standard. The more direct the lineage of the calibration standard to the National Measurement System, the more accurate the calibration standard will be. This has increased significance when proper instrument calibration is required because of environmental regulations, use of analyses in legal proceedings and other critical situations.

## Stability

**Mixture Stability** is defined as the ability to maintain a constant concentration value over a defined time within statistical significance. Factors that affect mixture stability include:

- **Cylinder and valve material of construction**
- **Cylinder preparation (*internal*)**
- **Raw material purity**
- **Component reactivity**
- **Cylinder pressure (*fill pressure and decaying cylinder pressure*)**
- **Mixture delivery systems**

Mixture stability has significant impact on the accuracy and long-term usability of the calibration standard. Matheson manufactures a wide spectrum of low concentration mixtures and guarantees their stability over a defined period of time.

## Matheson Mixture Grade Table

Mixture Grade	Blend Technique	Blend Tolerance	Certified Accuracy	Certification	NIST Traceable by	Shelf Life Statement
<b>Matheson Reference Standard</b>	Gravimetric	5%-50% ±1% 500ppm-5% ±2% 1ppm-<500ppm ±5%	1%	Dual	SRM, NTRM, NMI, Weight	Yes
<b>Primary Plus Standard</b>	Gravimetric	5%-50% ±1% 500ppm-5% ±2% 1ppm-<500ppm ±5%	1%	Dual	NIST Direct and NIST Indirect	Yes
<b>Primary Standard</b>	Gravimetric	5%-50% ±1% 500ppm-5% ±2% 1ppm-<500ppm ±5%	0.02% absolute or 1%	Single or Dual depending on feasibility	Weights or traceable lab standards	Yes
<b>Certified Plus Standard</b>	Gravimetric or Partial Pressure	5%-50% ±2% 500ppm-5% ±5% 1ppm-<500ppm ±10%	2%	Single	Weights or traceable lab standards or titrimetrics	Yes
<b>Certified Standard</b>	Gravimetric or Partial Pressure	10%-50% ±5% 50ppm-10% ±10% 1ppm-<50ppm ±20%	2% 50ppm-50% 5% 1ppm-<50ppm	Single	Weights or traceable lab standards or titrimetrics	Yes
<b>Gravimetric Standard</b>	Gravimetric	2%	2%	Single	Weights	Yes
<b>Unanalyzed Standard</b>	Gravimetric or Partial Pressure	10%	None	None	Not Determined	No
<b>Custom Standard</b>	Gravimetric or Partial Pressure	Varies with mix components and concentrations	Varies	Single	Varies	Yes

The quality of our calibration standards is constantly improving. Check the Matheson Website @ [www.mathesontrigas.com](http://www.mathesontrigas.com) for up-to-date specifications. Also check the website or catalog for Matheson's complete line of EPA Protocol Gases and Environmental Calibration Standards.

**Notes:**

NIST - National Institute of Standards & Technology  
 SRM - Standard Reference Material  
 NTRM - NIST Traceable Reference Material  
 NMI - Netherlands Measurement Institute



### Matheson Enhanced Service Program (ESP)

**Matheson's Enhanced Service Program** is a unique tool used to link our customers' application needs to Matheson products. Program benefits include:

1. **Reduced transaction costs**
2. **Minimized procurement errors**
3. **Documentation and control of customer product and services**
4. **Accurate assessment of product demand**
5. **Knowledgeable and proactive technical sales representation**

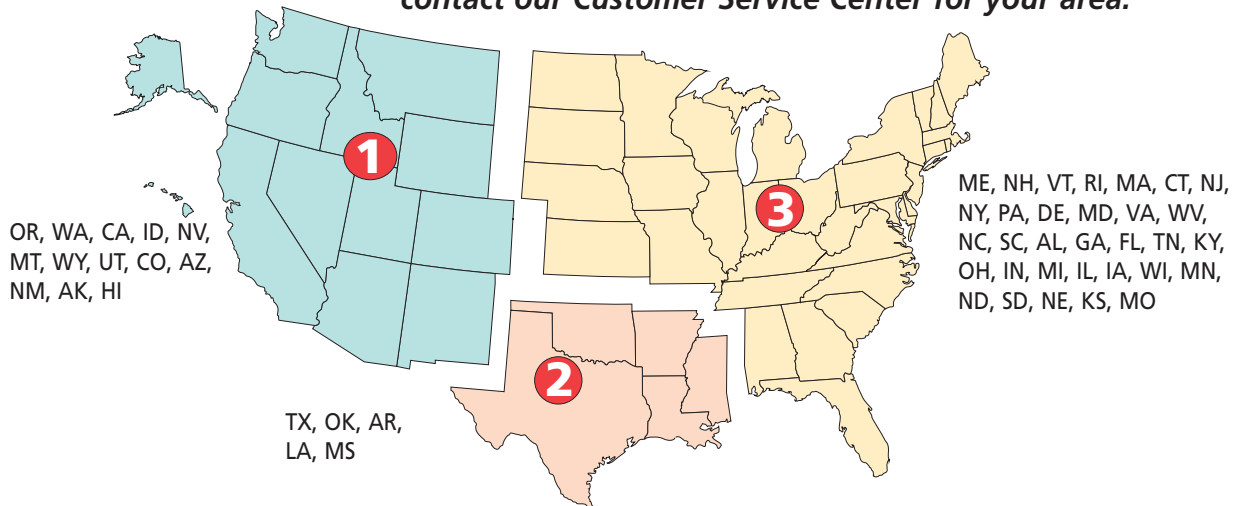
The **Matheson Enhanced Service Program** is a vehicle designed to improve productivity and lower overall costs. Please contact your local branch office for more information.



# MATHESON TRI-GAS

## CUSTOMER SERVICE CENTERS

To place an order, or to obtain more information, please contact our Customer Service Center for your area:



### SPECIALTY GASES

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### MATERIAL SAFETY DATA SHEETS (MSDS)

Data Sheets for gases can be downloaded from the Matheson Tri-Gas, Inc. Web site at [www.mathesontrigas.com/msds](http://www.mathesontrigas.com/msds)



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