

CALIBRATION GASES by Scott Specialty Gases

We would like to share with you that Air Liquide - Scott Specialty Gases has earned its reputation by combining technology-driven products with value added services. Specialty gases are all Scott produce. Scott has to be better than other companies that may offer similar products, but only as a small part of a larger line of commodity gases. Our emphasis on these analytical products has provided a better understanding, more proprietary technology and experience of the chemistry involved when mixing gas and liquid calibration materials. This is also why Scott has earned a reputation of being able to engineer gases that no one else can.

Product Engineering

Crucial to Scott's success is advanced understanding of the production process, analytical applications and the situation in which the calibration mixture is used for. Engineering calibration products to its application requires not only understanding of the production process, application and situation, but also proper understanding of key components in mixture, critical impurities or external elements that may affect the quality of the calibration product or analytical measurement.

Products engineering is not only required to define the products specifications to the required performance of the analytical system, it also is required to define the production requirements for Scott to manufacture the products. The engineered production requirement to manufacture the mixture allows Scott to define the amount of labor, cost of raw material, cost of reference materials and analytical methods to calculate the cost price of the calibration product.

From our experience we feel that we can immediately improve the supply of calibration materials for our customers:

- Improvement of the measurement accuracy: Our accredited production laboratory guarantees you an independently recognized traceability and accuracy, which will eventually, offers you the possibility to obtain a higher qualification of the end-product or process.
- A comprehensive product portfolio and technical support: We have been active for many years in your line of business and are familiar with the applications and instrumentation. This allows us to provide you with complete portfolio of products and an extensive technical support in specific product wishes.
- Global alignment of analytical measurements: Our partnership will provide us the possibility to align and standardize specific calibration requirements (Uncertainty, Traceability and Reliability claims) within your organization, which will reduce the disputes on measurement results among different departments.
- Dedicated global Proficiency Testing program: Dedicated service for our customers that provides an indispensable opportunity for the local laboratories to assess the accuracy of their own measurements through comparison with other laboratories.

ACCURACY

There are three important elements that play an important role in defining your calibration needs or mixture classification for your application:

- **UNCERTAINTY**; The minimum acceptable error associated with the analysis and production of the blend. This error is accumulated throughout the analytical procedure and includes analyzers, calibration errors and production process.
- **TRACEABILITY**: Unbroken, identifiable and demonstrable pathway between measurement process and fundamental link to SI-unit, which can be obtained through a) the gravimetric process or b) the analytical process.
- **RELIABILITY** (level of confidence): Level of confidence that is obtained through validation of factors that influence the results of the measurement.

These elements need to be defined for each application before defining the accuracy of your calibration material for each application.

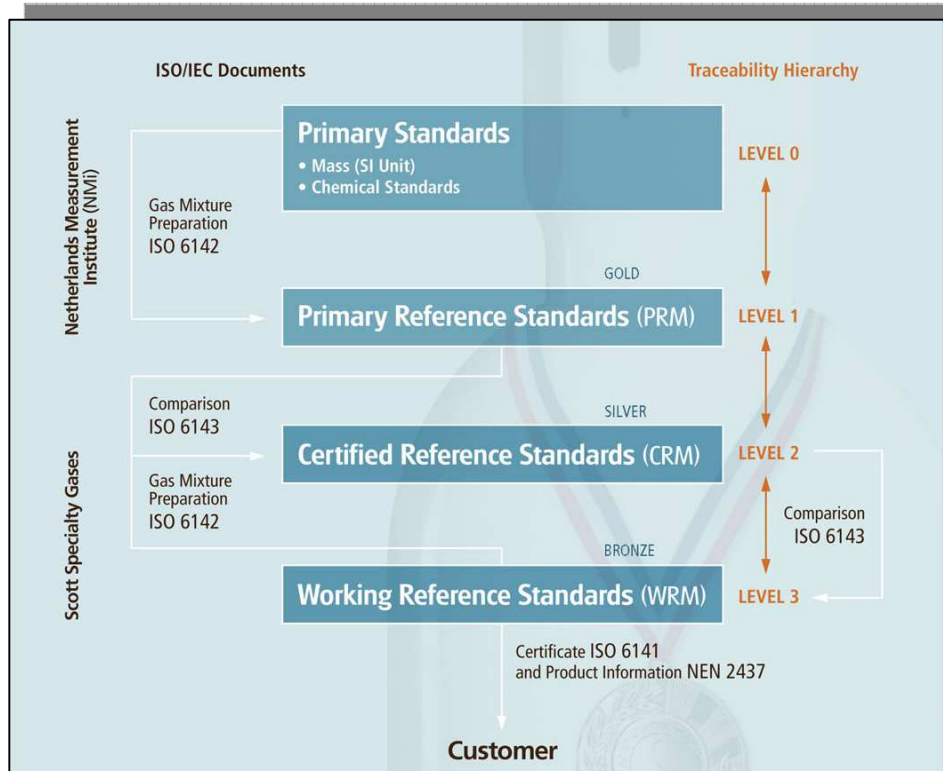
The performance of an analytical system is traceable if the procedure of the performance is validated and traceable calibration gases are used.

Calibration gas is traceable if its composition has been validated (with specified uncertainty limits) through comparison with traceable reference materials.

FUNDAMENTAL PRINCIPLES OF TRACEABILITY

Calibration Gas Mixtures are traceable if they are analyzed using a validated method, a traceable reference gas standard and the calibration work is performed under an accredited quality management system. There are three levels of gaseous reference materials within the metrology hierarchy:

- Primary Reference Gas Mixture (PRM): Hierarchy Level 1 realizes a particular composition at the highest quality level, particularly in accuracy and stability, and is available from national metrology organizations such as VSL (former Netherlands Metrology Institute -NMI) in the Netherlands, National Physical Laboratory (NPL) in the U.K. and National Institute of Standards (NIST) in the U.S.A.
- Certified Reference Gas Mixture (CRM): Hierarchy Level 2 realizes a particular composition that is certified and validated by direct analytical comparison with level-1 primary reference gas mixture with a closely related concentration. This secondary reference gas is available from national metrology organizations and Scott Specialty Gases under ISO/IEC 17025 Calibration Laboratory Accreditation scope.
- Working Reference Gas Mixture (WRM): Hierarchy Level 3 realizes a particular composition that is certified and validated by direct analytical comparison with level-2 certified reference materials with a closely related concentration. These gas mixtures are used for routine procedures. Scott Specialty Gases produces a portfolio of ten different gas mixture classes containing different levels of tractability and accuracy.



SCOTT REFERENCE GAS MIXTURES

Working Reference Gas Mixture (WRM): Are manufactured and certified under ISO-9001 Certification. The products are manufactured using different methods and available with various uncertainty and traceability claims

Scott has the option to supply different classifications for your requested mixtures:

1. SINGLE CERTIFIED STANDARDS are gaseous or liquid reference materials that provide the certified concentration from one independent method - either the blending process or the laboratory analysis were applicable.
2. DUAL CERTIFIED STANDARDS are gaseous or liquid reference materials that receive two rigorous, independent methods of certification. They are gravimetrically prepared and analyzed against traceable but independent reference standards, which are typically obtained from VSL. The values of both methods must interlock.

ANALYTICAL TRACEABILITY - Traceability is provided analytically to VSL, NPL or NIST reference materials or to Scott validated and qualified reference materials in compliance with ISO-6143.

GRAVIMETRIC blending process - The gravimetric manufacturing method provides traceability by weight to VSL in compliance with ISO-6142 (only for non-reactive components).

INTERLOCK - Interlocking assures that two independent certification values, one during the blending process and the other during laboratory analytical procedures, agree within a predefined limit of each other. By providing the blending and analytical values, the mixture effectively has two certifications (dual-certified).

Certified Reference Gas Mixtures (CRM): CRM is produced by Scott Specialty Gases under ISO/IEC 17025 Calibration Laboratory Accreditation scope. CRM's are used to calibrate the measurement system in order to obtain an independent reference value with proven tractability and an indisputable link to the SI-unit. The CRM also provides a true expanded uncertainty, as per the GUM uncertainty budget rules.

Accreditation is a process in which certification of competency, authority, or credibility is presented. In gas manufacturing, accreditation is the formal attestation that the manufacturing plant provides gas mixtures in according to standards of manufacturing, traceability, accuracy, analysis and stability.

Calibration Laboratory Accreditation is obtained through an independent assessment by technical experts of an Accreditation Body, to determine whether a laboratory has the competence to perform specific types of testing, measurement and calibration correctly and to appropriate standards.

CYLINDERS FOR CALIBRATION GASES

Scott has a high preference to work with cylinders treated and equipped by the manufacturing side in Breda the Netherlands for quality reasons! The historical knowledge of the cylinder is critical in assignment of the proper cylinder to the engineered gas application, which is highly crucial to guarantee stability and accuracy of the products.

Cylinders:

The offered cylinders have been carefully assigned. The construction material of the assigned cylinders and valves has been selected based on the application. Selection of construction material is very important. Incorrect selection will highly influence stability and accuracy claims on the calibration products.

Cylinder Valve Outlets and Connections:

Scott Specialty Gases has the flexibility to supply gases in cylinders with valves having BS, DIN, CGA, NEN and AFNOR standard outlets. In some cases, alternate connections may be used, and upon request be supplied instead of the standard connection. Scott highly recommends standardizing the valve connection used for safety and quality reasons.