

SEMI C9.1-93 (Reapproved 1102) GUIDE FOR ANALYSIS OF UNCERTAINTIES IN GRAVIMETRICALLY PREPARED GAS MIXTURES

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1 Purpose

1.1 This document is intended to provide the minimum criterion for the analysis of uncertainty associated with preparation and use of gravimetric gas mixtures used for calibrating analytical instruments to determine whether various SEMI impurity specification are satisfied.

2 Scope

2.1 This guideline is intended for preparation of binary gas mixtures using individual cylinders.

2.2 It is the intent of this document to provide general guidelines for preparation of calibration gas mixtures in compliance with ISO 6142, with additional requirements to meet the needs of the semiconductor industry.

2.3 This guideline is applicable only to gaseous components which do not react between themselves or with the cylinder walls, and to condensable components which are totally vaporized under the test conditions. It is not intended for moisture calibration mixtures.

2.4 This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety health practices and determine the applicability or regulatory limitations prior to use.

3 Referenced Standards

3.1 ISO Standards¹

ISO 6142 — Gas Analysis; Preparation of calibration gas mixtures - weighing methods.

Addendum 1 to ISO 6142 - Annex — Precautions to be taken when weighing, handling and filling cylinders.

4 Weight Traceability

4.1 The weights used to prepare the gas mixtures or certify the balance should be Class S1-tested at least

annually with reference standards traceable to the National Institute of Standards and Technology or to another national standards organization.

5 Acceptable Mixture Criteria

5.1 *Cylinder* — Cylinder must comply with National or International Codes. The type of cylinder used for containment of the gas mixture may affect the stability of the mixture. Historical and experimental data should be requested from the supplier on the stability of similar mixtures. The cylinder material should be chosen based on its compatibility with the gas mixture.

5.2 *Valve* — The recommended valve should be packless type valve and the construction materials selected according to their compatibility with the gas mixture.

5.3 *Homogenous Mixture* — The cylinder and its contents should be at room temperature prior to use. The cylinder mixture components must be mixed to insure a homogenous mixture.

5.4 *Stability* — The gas mixture will have a demonstrated stability within the acceptable relative uncertainties given in Section 6 for a period of 1 year. The minimum useful pressure should be in accordance with the suppliers recommendations.

5.5 *Balance Gas Purity* — The balance gas should be determined to contain less than 1% of the relative concentration for the minor component.

5.6 *Minor Component Purity* — The product used for the minor component addition should be analyzed to verify its composition.

5.7 *Analysis* — Confirmation analysis of the calibration mixture should be performed to determine if any gross weighing errors occurred.

6 Acceptable Relative Uncertainties

6.1 Using the ISO procedures the acceptable maximum relative uncertainties for the component of interest are given below.

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Website: www.iso.ch

<i>Concentration Range</i>	<i>Relative Uncertainty</i>
Standard Concentrations > 1000 ppm	2%
Standard Concentrations ≤ 1000 ppm > 100	2%
Standard Concentrations ≤ 100 ppm > 10	5%
Standard Concentrations ≤ 10 ppm ≥ 1	10%

7 Report

7.1 The composition of the mixture should be reported including the relative uncertainty for a given mixture.

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