

DECLARATION OF EQUIVALENCE

**Material Measurement Laboratory
National Institute of Standards and Technology - NIST
Gaithersburg, MD 20899, United States of America**

and

**VSL
National Metrology Institute
Delft, The Netherlands**

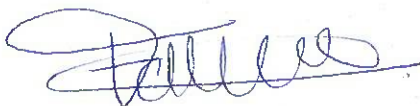
NIST and VSL declare that on July 1, 2026 the suites of Primary Standard Gas Mixtures (PSMs), including dynamically prepared Standard Gas Mixtures, developed and maintained in both the Institutes, comprising a range of analyte amount fractions in the stated diluent gas as listed in Annex 1, can be considered as equivalent within the stated uncertainties. This declaration shall expire on July 1, 2028 at which time a new declaration shall take effect.

This declaration is based on the results of both BIPM (CCQM) Key Comparisons and intercomparisons carried out between the two Institutes. A continuous program of intercomparisons has been agreed to in order to maintain this declaration and is outlined in a mutual Memorandum of Cooperation, effective July 1, 2023.

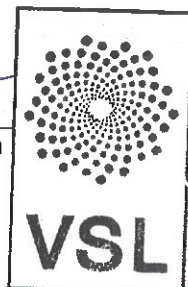
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Marcela N. Najarro,
Acting Chief, Chemical Sciences Division
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Date



Fabienne (F.J.M.) van Booma
General Director
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26 June 2026

Date

**National
Metrology
Institute**

Annex 1: NIST and VSL suites of Primary Standard Gas Mixtures which are declared to be equivalent

Component	Mole Fractions (mol/mol)	Maximum allowable difference	Date of Next Assessment
Carbon dioxide in nitrogen	$10 \cdot 10^{-6}$ to $20 \cdot 10^{-2}$	0.3 % relative	2028
Carbon dioxide in air	$100 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	0.2 % relative	2028
Carbon monoxide in nitrogen	$1 \cdot 10^{-6}$ to $10 \cdot 10^{-2}$	0.3 % relative	2028
Carbon monoxide in air	$10 \cdot 10^{-6}$ to $10 \cdot 10^{-2}$	0.3 % relative	2028
Ethanol in nitrogen / air	$75 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	0.5 % relative	2028
Oxygen in nitrogen	$10 \cdot 10^{-6}$ to $100 \cdot 10^{-6}$ $100 \cdot 10^{-6}$ to $25 \cdot 10^{-2}$	1 % relative 0.2 % relative	2028
Propane in nitrogen / air	$1 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.3 % relative	2028
Nitric oxide in nitrogen	$0.5 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2028
Nitrogen dioxide in nitrogen / air	$10 \cdot 10^{-6}$ - $1000 \cdot 10^{-6}$	2 - 0.5 % relative	2028
Sulfur dioxide in nitrogen	$1 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2028
Sulfur dioxide in air	$10 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2028
VOC's (ethane, ethene, propane, propene, iso-butane, iso-butene, 1-butene, n-butane, 2-methyl butane, n-pentane, 1-pentene, 1,3-butadiene, trans-2-pentene, 2-methyl pentane, 2,2,4-trimethyl	$1 \cdot 10^{-9}$ to $1 \cdot 10^{-6}$	5 % to 2 % relative	2028

Component	Mole Fractions (mol/mol)	Maximum allowable difference	Date of Next Assessment
pentane, n-hexane, n-heptane, benzene, toluene, n-octane, o-xylene) in nitrogen			
Hydrogen sulfide in nitrogen	$1 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	1 % relative	2028
Ammonia in nitrogen	$10 \cdot 10^{-6}$ to $300 \cdot 10^{-6}$	3 % relative	2028
Stack gas (NO, CO, CO ₂ , C ₃ H ₈ , SO ₂) in nitrogen	Typical	1 % relative (CO, CO ₂ and C ₃ H ₈ 0.3 % relative)	2028
HCl in nitrogen	$10 \cdot 10^{-6}$ to $300 \cdot 10^{-6}$	5 % relative	2028
CH ₄ in nitrogen / air	$1.7 \cdot 10^{-6}$ to $10 \cdot 10^{-2}$	0.1 % relative	2028
N ₂ O in nitrogen/ air	$0.3 \cdot 10^{-6}$ to $5000 \cdot 10^{-6}$	1 % relative	2028

Exploratory comparisons

Component	Mole Fractions (mol/mol)	Maximum allowable difference	Date of Next Assessment
CO in air	$1 \cdot 10^{-6}$ to $10 \cdot 10^{-6}$		Planned for 2028
Formaldehyde in nitrogen	$1 \cdot 10^{-6}$ to $10 \cdot 10^{-6}$		Awaiting a key comparison
Mercury in air	30 µg/m ³ to 200 µg/m ³		Comparison in 2026

