

DECLARATION OF EQUIVALENCE

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

and

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

NIST and VSL declare that on July 1, 2020 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, 2022 at which time a new declaration shall take effect.

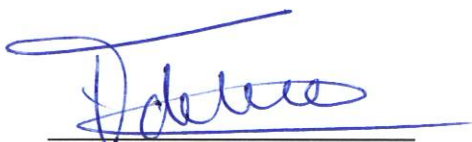
This declaration is based on the results of both BIPM (CCQM) Key Comparisons and intercomparisons carried out between the two Institutes. A continuous program of intercomparisons has been agreed to in order to maintain this declaration and is outlined in a mutual Memorandum of Cooperation, effective July 1, 2018.



06/11/2020

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Date



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12th June 2020

Date

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	2021
Carbon dioxide in air	$100 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	0.2 % relative	2021
Carbon monoxide in nitrogen	$1 \cdot 10^{-6}$ to $10 \cdot 10^{-2}$	0.3 % relative	2021
Carbon monoxide in air	$10 \cdot 10^{-6}$ to $10 \cdot 10^{-2}$	0.3 % relative	2021
Ethanol in nitrogen / air	$75 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	0.5 % relative	2021
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	2023
Propane in nitrogen / air	$1 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.3 % relative	2022
Nitric oxide in nitrogen	$0.5 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2022
Nitrogen dioxide in nitrogen / air	$10 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5% relative	2020
Sulfur dioxide in nitrogen	$1 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2023
Sulfur dioxide in air	$10 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2023
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 pentane, n-hexane, n-heptane, benzene, toluene, n-octane, o-xylene) in nitrogen	$1 \cdot 10^{-9}$ to $1 \cdot 10^{-6}$	2 % relative	2021

Hydrogen sulphide in nitrogen	$1 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	1 % relative	2022
Ammonia in nitrogen	$10 \cdot 10^{-6}$ to $300 \cdot 10^{-6}$	3 % relative	2022
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)	2022
HCl in nitrogen	$10 \cdot 10^{-6}$ to $300 \cdot 10^{-6}$	5 % relative	2020
CH ₄ in nitrogen / air	$1.7 \cdot 10^{-6}$ to $10 \cdot 10^{-2}$	0.1 % relative	2023
N ₂ O in nitrogen/ air	$0.3 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	1 % relative	2022