

DECLARATION OF EQUIVALENCE

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

and

**VSL,
Van Swinden Laboratorium
Delft, The Netherlands**

NIST and VSL declare that on July 1, 2010 the suites of primary standard gas mixtures developed and maintained in both the Institutes, comprising a range of analyte concentrations 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, 2012 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, 2005.



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12/3/10
Date



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Annex 1: NIST and VSL Primary Standard Gas Mixture Suites which are declared to be equivalent

Component	Molar 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	2011
Carbon Dioxide in Air	$100 \cdot 10^{-6}$ to $500 \cdot 10^{-6}$	0.5 % relative	2011
Carbon Monoxide in nitrogen / air	$1 \cdot 10^{-6}$ to $10 \cdot 10^{-2}$	0.3 % relative	2012
Ethanol in nitrogen / air	$75 \cdot 10^{-6}$ to $500 \cdot 10^{-6}$	0,5 % relative	2010
Oxygen in nitrogen	$10 \cdot 10^{-6}$ to $25 \cdot 10^{-2}$	0.2 % relative	2012
Propane in nitrogen / air	$1 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.3 % relative	2010
Nitric Oxide in nitrogen	$0.5 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2011
Nitrogen Dioxide in nitrogen / air	$10 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0,5% relative	2013
Sulfur Dioxide in nitrogen	$1 \cdot 10^{-6}$ to $1 \cdot 10^{-2}$	0.5 % relative	2014
VOC's (ethane, ethane, propane, propene, iso-butane, iso-butene, 1-butene, n-butane, 2-methyl butane, iso-pentane, 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	2012
Natural gas CH ₄ , C ₂ H ₆ , C ₃ H ₈ , n-C ₄ H ₁₀ , i-C ₄ H ₁₀ , n-C ₅ H ₁₂ , i-C ₅ H ₁₂ , neo-C ₅ H ₁₂ , n-C ₆ H ₁₄ , CO ₂ , N ₂ , He	Typical	0.5 % relative (CH ₄ 0.3 % relative)	2014
Hydrogen Sulphide in nitrogen	$10 \cdot 10^{-6}$ to $1000 \cdot 10^{-6}$	0,5 % relative	2013