Primary Reference Materials

2016

VSL

Dutch
Metrology
Institute

Gas standards

VSL provides the following types of gas standards
- Primary reference materials
- Certified reference materials
- Calibrated gas mixtures

All gas standards are provided with traceable composition data and state-of-the-art uncertainties.

Primary reference materials (PRMs) are prepared gravimetrically based on your specification of the composition. The preparation is performed in accordance with ISO 6142-1:2015. After preparation, the mixture composition is verified against VSL's own primary standard gas mixtures to validate the assigned value and stated uncertainty. PRMs always come with a warranty regarding the mixture stability.

Certified reference materials (CRMs) are prepared gravimetrically based on your specification of the composition. The preparation is performed in accordance with ISO 6142-1:2015. The values of the composition are assigned based on a characterisation of the mixture using VSL's own primary standard gas mixtures or to the primary standard of humidity in case of water. CRMs are in particular provided for those ranges and components for which a reliable value on the basis of the preparation cannot be provided. CRMs always come with a warranty regarding the mixture stability.

Calibrated gas mixtures (CGMs) are third-party gas mixtures characterised using VSL's own primary standard gas mixtures.

Listed compositions

For binary mixtures, this catalogue provides a comprehensive overview of our gamma.

For multicomponent mixtures, such as automotive mixtures, natural gas, refinery gas, stack gas mixtures and volatile organic compounds, the compositions indicated are examples. Please provide us with your requested composition and we will get back to you soon with what we can offer.

Intended use

VSL's gas standards are indispensable for accurate and traceable calibration of your measurement equipment. These standards can also be used for method validation, quality control, and the assignment of values to other gas mixtures.

Accreditation

Unless otherwise indicated, all gas standards are provided under accreditation. VSL holds an accreditation on the basis of ISO Guide 34 (RvA P002) for its PRMs and CRMs services, and ISO/IEC 17025 (RvA K999) for CGMs. The accreditation is your assurance of the high quality standards that we maintain in gas mixture production and certification.

Stability warranty

For all components in gas mixtures provided as PRMs and CRMs, we know how they behave over time. The stability data generated over time is the basis for our warranty of the stability of the mixture composition. It is your assurance that you can use the gas standard without concern for the entire period of validity of the certificate.

Recommended use

VSL recommends using its gas standards in accordance with the standard ISO 16664. In doing so, you will benefit most from the quality of the gas standard and do your part in ensuring that the certificate provided remains valid until reaching its expiry date or the minimum utilisation pressure.

Proficiency testing

The provision of gas standards can be combined with your participation in our proficiency testing schemes. In our PT On Demand programme, the gas standard can be a PRM or CRM, and in most regular schemes it will be provided as a CRM.

Our proficiency tests are meeting the requirements of ISO/IEC 17043 and VSL maintains an accreditation (RvA R006) for the organisation of PT-schemes.

Equivalence with US gas standards

The U.S. National Institute of Standards and Technology (NIST) and VSL have signed a Memorandum of Understanding for regular intercomparisons of their Primary Standard Gas Mixtures.

As a result a Declaration of Equivalence was signed for the following types of gas mixtures: O_2 in N_2, CO_2 in N_2 and air, CO in N_2 and air, C_3H_8 in N_2 and air, NO in N_2, NO_2 in N_2 and air, SO_2 in N_2, ethanol in N_2, H_2S in N_2, volatile organic compounds and natural gas.

CIPM MRA

The PRMs are consistent with Calibration and Measurement Capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM).

Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see http://kcdb.bipm.fr/AppendixC).

Order information

Inquiries may be sent to:
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Upon request a detailed quotation will be sent promptly. Details about delivery and conditions are available on request.

Energy

Synthetic natural gas

Primary Reference Materials (PRM) containing Synthetic Natural Gases are available in a wide range of compositions. The range is listed below.
Due to respective partial pressures of the hydrocarbon components not every combination of components and molar fractions can be made at 11.5 Mpa.

The pressure of the mixture depends on the composition.

PRM Code	Synthetic Natural Gas range	Uncertainty (k=2)	Stability (Months)
NGA	60.0 - 99.9 × 10^{-2} mol/mol CH_4	≤ 0.15 % rel.	60
	0.25 - 11.0 × 10^{-2} mol/mol C_2H_6	≤ 0.5 - 0.2 % rel.	
	0.10 - 10.0 × 10^{-2} mol/mol C_3H_8	≤ 0.5 - 0.2 % rel.	
	0.03 - 0.70 × 10^{-2} mol/mol i-C_4H_{10}	≤ 0.5 - 0.2 % rel.	
	0.03 - 0.70 × 10^{-2} mol/mol n-C_4H_{10}	≤ 0.5 - 0.2 % rel.	
	0.02 - 0.80 × 10^{-2} mol/mol i-C_5H_{12}	≤ 0.5 - 0.2 % rel.	
	0.02 - 0.80 × 10^{-2} mol/mol n-C_5H_{12}	≤ 0.5 - 0.2 % rel.	
	0.02 - 0.80 × 10^{-2} mol/mol neo-C_5H_{12}	≤ 1.0 - 0.5 % rel.	
	0.01 - 0.40 × 10^{-2} mol/mol n-C_6H_{14}	≤ 0.5 - 0.2 % rel.	
	0.10 - 20.0 × 10^{-2} mol/mol CO_2	≤ 0.5 - 0.2 % rel.	
	0.10 - 20.0 × 10^{-2} mol/mol N_2	≤ 0.7 - 0.2 % rel.	
	0.05 - 0.40 × 10^{-2} mol/mol He	≤ 1.0 - 0.5 % rel.	

Synthetic natural gas (extended composition)

Primary Reference Materials (PRM) containing Synthetic Natural Gases are available in a wide range of compositions. This range is listed below.
Due to respective partial pressures of the hydrocarbon components not every combination of components and molar fractions can be made at 11.5 Mpa.

The pressure of the mixture depends on the composition.

PRM Code	Synthetic Natural Gas range	Uncertainty (k=2)	Stability (Months)
NGAE	60.0 - 99.9 × 10^{-2} mol/mol CH_4	≤ 0.15 % rel.	60
	0.25 - 11.0 × 10^{-2} mol/mol C_2H_6	≤ 0.5 - 0.2 % rel.	
	0.10 - 10.0 × 10^{-2} mol/mol C_3H_8	≤ 0.5 - 0.2 % rel.	
	0.03 - 0.70 × 10^{-2} mol/mol i-C_4H_{10}	≤ 0.5 - 0.2 % rel.	
	0.03 - 0.70 × 10^{-2} mol/mol n-C_4H_{10}	≤ 0.5 - 0.2 % rel.	
	0.02 - 0.80 × 10^{-2} mol/mol i-C_5H_{12}	≤ 0.5 - 0.2 % rel.	
	0.02 - 0.80 × 10^{-2} mol/mol n-C_5H_{12}	≤ 0.5 - 0.2 % rel.	
	0.02 - 0.80 × 10^{-2} mol/mol neo-C_5H_{12}	≤ 1.0 - 0.5 % rel.	
	0.01 - 0.40 × 10^{-2} mol/mol n-C_6H_{14}	≤ 0.5 - 0.2 % rel.	
	25 – 200 × 10^{-6} mol/mol n-C_7H_{16}	≤ 2.0 % rel.	
	15 – 100 × 10^{-6} mol/mol n-C_8H_{18}	≤ 2.0 % rel.	
	10 – 25 × 10^{-6} mol/mol n-C_9H_{20}	≤ 2.0 % rel.	
	5 – 20 × 10^{-6} mol/mol n-$C_{10}H_{22}$	≤ 2.0 % rel.	
	0.10 - 20.0 × 10^{-2} mol/mol CO_2	≤ 0.5 - 0.2 % rel.	
	0.10 - 20.0 × 10^{-2} mol/mol N_2	≤ 0.7 - 0.2 % rel.	
	0.05 - 0.40 × 10^{-2} mol/mol He	≤1.0 - 0.5 % rel.	

Sulfur components in methane

PRM Code	Coke-oven Gas range	Uncertainty (k=2)	Stability (Months)	Price (EUR)
SIM	10 – 50 × 10^{-6} mol/mol H_2S	≤ 3.0 % rel.	24	3543.25
	10 – 50 × 10^{-6} mol/mol COS	≤ 3.0 % rel.		
	10 – 50 × 10^{-6} mol/mol CH_3SH	≤ 3.0 % rel.		
	10 – 50 × 10^{-6} mol/mol C_2H_5SH	≤ 3.0 % rel.		
	10 – 50 × 10^{-6} mol/mol $(CH_3)_2S$	≤ 3.0 % rel.		

Coke-oven gas

Coke-oven gases are available in different compositions.
Other compositions, including other components, are available on request.

PRM Code	Coke-oven Gas range	Uncertainty (*k*=2)	Stability (Months)
AZ50	0.2 – 68 × 10^{-2} mol/mol H_2	≤ 0.5 % rel.	36
	4 – 32 × 10^{-2} mol/mol CH_4	≤ 0.5 % rel.	
	3 – 70 × 10^{-2} mol/mol CO	≤ 0.5 % rel.	
	1 – 22 × 10^{-2} mol/mol CO_2	≤ 0.5 % rel.	
	3 - 45 × 10^{-2} mol/mol N_2	≤ 0.5 % rel.	

Synthetic Refinery gas

Synthetic Refinery gases are available in different compositions. Other compositions, including other components, are available on request.
The pressure of the mixture depends on the composition.

PRM Code	Synthetic Refinery Gas range	Uncertainty (*k*=2)	Stability (Months)
AZ30	10.0 - 13.0 × 10^{-2} mol/mol CH_4	≤ 0.3 % rel.	36
	12.0 - 16.0 × 10^{-2} mol/mol C_2H_4	≤ 0.3 % rel.	
	1.0 – 3.0 × 10^{-2} mol/mol C_2H_6	≤ 0.3 % rel.	
	3.0 – 5.0 × 10^{-2} mol/mol C_3H_6	≤ 0.3 % rel.	
	0.4 – 0.7 × 10^{-2} mol/mol C_3H_8	≤ 0.3 % rel.	
	0.75 - 1.5 × 10^{-2} mol/mol 1.3-butadiene	≤ 0.5 % rel.	
	0.4 – 0.65 × 10^{-2} mol/mol 1-C_4H_8	≤ 0.5 % rel.	
	0.4 – 0.65 × 10^{-2} mol/mol i-C_4H_8	≤ 0.5 % rel.	
	7.0 – 9.0 × 10^{-2} mol/mol H_2	≤ 0.4 % rel.	
	3.5 – 4.5 × 10^{-2} mol/mol N_2	≤ 0.3 % rel.	
	50.0 – 60.0 × 10^{-2} mol/mol He	≤ 0.3 % rel.	

Biogas

Biogases are available in different compositions.
Other compositions, including other components, are available on request.
Pressure in cylinder will depend on composition.

PRM Code	Biogas range	Uncertainty (k=2)	Stability (Months)
BIOGAS	10 - 50 × 10^{-2} mol/mol CO_2	≤ 0.5 % rel.	36
	50 - 75 × 10^{-2} mol/mol CH_4	≤ 0.5 % rel.	
	1 - 25 × 10^{-2} mol/mol N_2	≤ 1.0 % rel.	
	0.1 - 2 × 10^{-2} mol/mol H_2	≤ 1.0 % rel.	
	0.1 - 2 × 10^{-2} mol/mol O_2	≤ 2.0 % rel.	

LPG mixtures

LPG mixtures are available in different compositions. Other compositions, including other components, are available on request. LPG mixtures will be supplied in a 1 L piston cylinder

PRM Code	LPG range	Uncertainty (k=2)	Stability (Months)
LPG 1	0.1 – 0.3 × 10^{-2} mol/mol Ethane	≤ 1.0 % rel.	12
	0.5 – 50 × 10^{-2} mol/mol Propylene	≤ 1.0 % rel.	
	0.1 – 1 × 10^{-2} mol/mol *n*–Butane	≤ 1.0 % rel.	
	0.1 – 3 × 10^{-2} mol/mol *i*–Butane	≤ 1.0 % rel.	
	0.1 – 1 × 10^{-2} mol/mol *i*–Pentane	≤ 1.0 % rel.	
	Balance Propane	≤ 1.0 % rel.	

Propane in nitrogen

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
AL09	1 – 10 × 10^{-6} mol/mol C_3H_8/N_2	≤ 0.5 % rel.	60	1660.00
AL10	11 – 100 × 10^{-6} mol/mol C_3H_8/N_2	≤ 0.4 % rel.	60	1660.00
AL11	101 – 1000 × 10^{-6} mol/mol C_3H_8/N_2	≤ 0.2 % rel.	60	1660.00
AL12	0.11 – 0.8 × 10^{-2} mol/mol C_3H_8/N_2	≤ 0.1 % rel.	60	1660.00
AL13	0.81 – 5 × 10^{-2} mol/mol C_3H_8/N_2	≤ 0.1 % rel.	60	1535.00

Propane in synthetic air

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
AL19	1 – 10 × 10^{-6} mol/mol C_3H_8/Air	≤ 0.5% rel.	60	1830.50
AL20	11 – 100 × 10^{-6} mol/mol C_3H_8/Air	≤ 0.4 % rel.	60	1830.50
AL21	101 – 1000 × 10^{-6} mol/mol C_3H_8/Air	≤ 0.2 % rel.	60	1830.50
AL22	0.11 – 0.8 × 10^{-2} mol/mol C_3H_8/Air	≤ 0.1 % rel.	60	1830.50

Methane in nitrogen

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
AB11	1 – 10 × 10^{-6} mol/mol CH_4/N_2	≤ 1.5 % rel.	48	1660.00
AB12	11 – 100 × 10^{-6} mol/mol CH_4/N_2	≤ 0.6 % rel.	60	1660.00
AB13	101 – 1000 × 10^{-6} mol/mol CH_4/N_2	≤ 0.4 % rel.	60	1660.00
AB14	0.11 – 1 × 10^{-2} mol/mol CH_4/N_2	≤ 0.2 % rel.	60	1660.00
AB15	1.1 – 10 × 10^{-2} mol/mol CH_4/N_2	≤ 0.2 % rel.	60	1660.00

Methane in synthetic air

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
AB21	1 – 10 × 10^{-6} mol/mol CH_4/Air	≤ 1.5% rel.	48	1830.50
AB22	11 – 100 × 10^{-6} mol/mol CH_4/Air	≤ 0.6 % rel.	60	1830.50
AB23	101 – 1000 × 10^{-6} mol/mol CH_4/Air	≤ 0.4 % rel.	60	1830.50

Moisture in methane

The pressure of the mixture depends on the composition.

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
DC21	20 –50 × 10^{-6} mol/mol H_2O/CH_4	≤ 5.0 % rel.	24	2154.75

The CRM is prepared by VSL and the molar amount fraction of H_2O is traceable to the primary humidity standard at VSL.

Environment

Carbon monoxide in nitrogen

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
AC10	1 – 10 × 10^{-6} mol/mol CO/N_2	≤ 1.0 % rel.	48	1660.00
AC11	11 - 100 × 10^{-6} mol/mol CO/N_2	≤ 0.3 % rel.	48	1660.00
AC12	101 – 1000 × 10^{-6} mol/mol CO/N_2	≤ 0.2 % rel.	60	1660.00
AC13	0.11 - 1 × 10^{-2} mol/mol CO/N_2	≤ 0.2 % rel.	60	1660.00
AC14	1.1 – 10 × 10^{-2} mol/mol CO/N_2	≤ 0.1 % rel.	60	1535.00

Carbon dioxide in nitrogen

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
AD11	10 - 100 × 10^{-6} mol/mol CO_2/N_2	≤ 0.4 % rel.	48	1660.00
AD12	101 – 1000 × 10^{-6} mol/mol CO_2/N_2	≤ 0.2 % rel.	60	1660.00
AD13	0.11 - 1 × 10^{-2} mol/mol CO_2/N_2	≤ 0.1 % rel.	60	1660.00
AD14	1.1 – 20 × 10^{-2} mol/mol CO_2/N_2	≤ 0.1 % rel.	60	1535.00

Carbon dioxide in synthetic air

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
AD22	100 - 1000 × 10^{-6} mol/mol CO_2/Air	≤ 0.2 % rel.	60	1830.50

Nitric oxide in nitrogen

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
BD08	0.1 – 0.4 × 10^{-6} mol/mol NO/N_2	≤ 3.0 % rel.	12	1830.50
BD09	0.41 – 1 × 10^{-6} mol/mol NO/N_2	≤ 3.0 % rel.	24	1830.50
BD10	1.1 – 10 × 10^{-6} mol/mol NO/N_2	≤ 1.0 % rel.	24	1830.50
BD11	11 – 100 × 10^{-6} mol/mol NO/N_2	≤ 0.5 % rel.	36	1660.00
BD12	101 – 1000 × 10^{-6} mol/mol NO/N_2	≤ 0.3 % rel.	48	1660.00
BD13	0.11 – 1 × 10^{-2} mol/mol NO/N_2	≤ 0.2 % rel.	60	1660.00

Nitrogen dioxide in nitrogen

Please note that mixtures of NO_2 in nitrogen also contain approximately 1000 × 10^{-6} mol/mol oxygen.

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
BF11	10 – 100 × 10^{-6} mol/mol NO_2/N_2	≤ 2.0 % rel.	12	1830.50
BF12	101 – 1000 × 10^{-6} mol/mol NO_2/N_2	≤ 1.0 % rel.	24	1830.50

Nitrogen dioxide in synthetic air

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
BF21	10 – 100 × 10^{-6} mol/mol NO_2/Air	≤ 2.0 % rel.	12	1830.50
BF22	101 – 1000 × 10^{-6} mol/mol NO_2/Air	≤ 1.0 % rel.	24	1830.50

Sulfur dioxide in nitrogen

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
BH09	1 × 10^{-6} mol/mol SO_2/N_2	≤ 2.0 % rel.	12	1830.50
BH09	2 –9.5 × 10^{-6} mol/mol SO_2/N_2	≤ 1.5 % rel.	12	1830.50
BH09	10 × 10^{-6} mol/mol SO_2/N_2	0.5 % rel.	18	1830.50
BH10	11 – 99 × 10^{-6} mol/mol SO_2/N_2	≤ 0.5 % rel.	24	1660.00
BH10	100 × 10^{-6} mol/mol SO_2/N_2	≤ 0.3 % rel.	36	1660.00
BH11	101 – 1000 × 10^{-6} mol/mol SO_2/N_2	≤ 0.3 % rel.	48	1660.00
BH12	0.11 – 1 × 10^{-2} mol/mol SO_2/N_2	≤ 0.2 % rel.	60	1660.00

Sulfur dioxide in synthetic air

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
BH20	10 × 10^{-6} mol/mol SO_2/Air	≤ 0.5 % rel.	18	1830.50
BH20	11 – 100 × 10^{-6} mol/mol SO_2/Air	≤ 0.5 % rel.	24	1830.50
BH21	101 – 1000 × 10^{-6} mol/mol SO_2/Air	≤ 0.3 % rel.	36	1830.50
BH22	0.11 – 1 × 10^{-2} mol/mol SO_2/Air	≤ 0.2 % rel.	48	1830.50

Entenox gas standard

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
BI30	50.0 × 10^{-2} mol/mol N_2O/O_2	≤ 1.0 % rel.	36	1660.00

Nitrous oxide in synthetic air

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
BI21	0.3 – 1 × 10^{-6} mol/mol N_2O/Air	≤ 3.0 % rel.	60	2213.00
BI22	1.1 – 10 × 10^{-6} mol/mol N_2O/Air	≤ 1.5 % rel.	60	2154.75
BI23	11 – 100 × 10^{-6} mol/mol N_2O/Air	≤ 1.0 % rel.	60	1830.50
BI24	101 – 800 × 10^{-6} mol/mol N_2O/Air	≤ 1.0 % rel.	60	1830.50

Nitrous oxide in nitrogen

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
BI11	0.3 – 1 × 10^{-6} mol/mol N_2O	≤ 3.0 % rel.	60	2036.00
BI12	1.1 – 10 × 10^{-6} mol/mol N_2O	≤ 1.5 % rel.	60	1985.00
BI13	11 – 100 × 10^{-6} mol/mol N_2O	≤ 1.0 % rel.	60	1660.00
BI14	101 – 800 × 10^{-6} mol/mol N_2O	≤ 1.0 % rel.	60	1660.00

Ammonia in nitrogen

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
DA11	10 – 80 × 10^{-6} mol/mol NH_3/N_2	≤ 5.0 % rel.	24	1830.50
DA11	81 – 300 × 10^{-6} mol/mol NH_3/N_2	≤ 2.0 % rel.	36	1830.50

Hydrogen sulfide in nitrogen

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
BN10	1 – 10 × 10^{-6} mol/mol H_2S/N_2	≤ 2.5 % rel.	24	1830.50
BN11	11 – 100 × 10^{-6} mol/mol H_2S/N_2	≤ 1.5 % rel.	24	1660.00
BN12	101 – 1000 × 10^{-6} mol/mol H_2S /N_2	≤ 1.0 % rel.	36	1660.00

BTEX in nitrogen

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)

BTEX	2 - 100 × 10^{-9} mol/mol Benzene, Toluene, Ethylbenzene, o-Xylene, m-Xylene, p-Xylene	≤ 5.0 % rel.	36	2906.00

VOCs in nitrogen

Primary reference materials containing up to 30 volatile organic compounds in nitrogen are available in a range of compositions. Within the listed ranges any composition can be supplied.

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
VOC	2 - 100 × 10^{-9} mol/mol with 30 volatile organic compounds (Ethane, Ethene, Ethyne, Propane, Propene, 1-Butene, iso-Butene, 1,3-Butadiene, n-Butane, iso-Butane, cis-2-Butene, trans-2-Butene, 2-methyl-1,3-Butadiene, n-Pentane, iso-Pentane, trans-2-Pentene, n-Hexane, 1-Pentene, 2-methyl-Pentane, Benzene, Toluene, Ethylbenzene, o-Xylene, m-Xylene, p-Xylene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, n-Heptane, n-Octane, iso-Octane)	≤ 5.0 % rel.	36	4231.50

Automotive

Automotive Gases-OIML

The listed PRMs are typical examples of automotive test gases which are prescribed in OIML recommendation R99 "Instruments for measuring vehicle exhaust emissions". Matrix gas is nitrogen.
Other compositions are available on request.

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
R991	0.5 – 9.0 × 10^{-2} mol/mol CO 4.0 – 18.0 × 10^{-2} mol/mol CO_2 0.1 – 21.0 × 10^{-2} mol/mol O_2 0.02 –0.32 × 10^{-2} mol/mol C_3H_8	≤ 0.2 % rel.	48	2997.75
R992	0.5 – 9.0 × 10^{-2} mol/mol CO 4.0 – 18.0 × 10^{-2} mol/mol CO_2 0.1 – 21.0 × 10^{-2} mol/mol O_2 0.005 –0.02 × 10^{-2} mol/mol C_3H_8	≤ 0.5 % rel.	48	2997.75

Stack gases in nitrogen

Stack gases are available in different compositions. Other compositions, including other components, are available on request.

PRM Code	Stack gas range	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
STG	50 – 100 × 10^{-6} mol/mol CO	≤ 0.5 % rel.	24	4017.00
	12 – 18 × 10^{-2} mol/mol CO_2	≤ 0.2 % rel.		
	5 –1000 × 10^{-6} mol/mol C_3H_8	≤ 1.0 % rel.		
	10 – 1000 × 10^{-6} mol/mol NO	≤ 1.0 % rel.		
	20 – 1000 × 10^{-6} mol/mol SO_2	≤ 1.0 % rel.		

Miscellaneous

Oxygen in nitrogen

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
BG08	1 – 10 × 10^{-6} mol/mol O_2/N_2	≤ 4.0 % rel.	36	2631.75
BG09	11 – 100 × 10^{-6} mol/mol O_2/N_2	≤ 2.0 % rel.	48	1830.50
BG10	101 – 1000 × 10^{-6} mol/mol O_2/N_2	≤ 0.4 % rel.	60	1660.00
BG11	0.11 – 2 × 10^{-2} mol/mol O_2/N_2	≤ 0.3 % rel.	60	1660.00
BG12	2.1 – 50 × 10^{-2} mol/mol O_2/N_2	≤ 0.1 % rel.	60	1535.00

Ethanol in nitrogen/synthetic air

Pressure in cylinder will depend on composition.

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
BX10	50 – 225 × 10^{-6} mol/mol C_2H_5OH/N_2	≤ 1.0 % rel.	36	1722.50
BX10	226 – 800 × 10^{-6} mol/mol C_2H_5OH/N_2	≤ 0.5 % rel.	36	1722.50
BX20	50 – 125 × 10^{-6} mol/mol C_2H_5OH /Air	≤ 1.0 % rel.	36	1905.75
BX20	126 –800 × 10^{-6} mol/mol C_2H_5OH /Air	≤ 0.5 % rel.	36	1905.75

Moisture in nitrogen

The pressure of the mixture depends on the composition.

PRM/CRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
DC11/PRM	100 – 200 × 10^{-6} mol/mol H_2O/N_2	≤ 5.0 % rel.	24	1830.50
DC11/CRM	10 – 99 × 10^{-6} mol/mol H_2O/N_2	≤ 5.0 % rel.	24	1830.50

The CRM is prepared by VSL and the molar amount fraction of H_2O is traceable to the primary humidity standard at VSL and therefore a fully traceable reference material under ISO Guide 34 and ISO/IEC 17025

Explosimetry standards

The listed PRMs are typical examples of standard gas mixtures used in the calibration of explosive concentration monitors. The compositions listed are all on 50 % L.E.L. level. Other compositions, including other components, are available on request.

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
EX-1	2.2×10^{-2} mol/mol CH_4 in synthetic air	≤ 0.5 % rel.	60	1830.50
EX-2	0.9×10^{-2} mol/mol C_3H_8 in synthetic air	≤ 0.3 % rel.	60	1830.50
EX-3	2.0×10^{-2} mol/mol H_2 in synthetic air	≤ 2.0 % rel.	36	1830.50

Leak detection standards

The listed PRMs are examples of standard gas mixtures used in leak detection. The compositions listed are on leakage measurement level. Some of these gases are used as tracers in dispersion modelling. Other compositions, at the level of the gases to be diluted, are available on request.

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
LD-1A	40×10^{-9} mol/mol SF_6 in synthetic air	≤ 6.0 % rel.	24	2154.75
LD-1B	400×10^{-9} mol/mol SF_6 in synthetic air	≤ 3.0 % rel.	24	2154.75
LD-1C	4×10^{-6} mol/mol SF_6 in synthetic air	≤ 1.0 % rel.	24	2154.75
LD-1D	40×10^{-6} mol/mol SF_6 in synthetic air	≤ 1.0 % rel.	24	2154.75
LD-2	10×10^{-6} mol/mol He in N_2	≤ 4.0 % rel.	36	2154.75

Noble gas standards

The listed PRMs are typical examples of standard noble gas mixtures. Other compositions, including other components, are available on request.

PRM Code	Description	Uncertainty (*k*=2)	Stability (Months)	Price (EUR)
NB-1	10.0×10^{-6} mol/mol Ar 10.0×10^{-6} mol/mol Xe 10.0×10^{-6} mol/mol Kr Matrix is Helium	≤ 3.0 % rel.	36	2871.00
NB-2	10.0×10^{-6} mol/mol O_2 10.0×10^{-6} mol/mol Ar Matrix is Nitrogen	≤ 3.0 % rel.	36	2685.00

Medical Diagnostic standards

The listed PRMs are typical examples of standard gas mixtures used in blood gas determination, respiratory and anaesthesia monitoring. Other compositions, including other components, are available on request.

PRM Code	Description	Uncertainty (k=2)	Stability (Months)	Price (EUR)
MG-1	*Blood gas standard* 10.0×10^{-2} mol/mol CO_2 90.0×10^{-2} mol/mol O_2	≤ 1.0 % rel.	36	1660.00
MG-2	*Blood gas standard* 5.0×10^{-2} mol/mol CO_2 95.0×10^{-2} mol/mol O_2	≤ 1.0 % rel.	36	1660.00
MG-3	*Blood gas standard* 5.0×10^{-2} mol/mol CO_2 20.0×10^{-2} mol/mol O_2 75.0×10^{-2} mol/mol N_2	≤ 1.0 % rel.	36	1830.50
MG-4	*Lung function standard* 0.3×10^{-2} mol/mol CO 20.0×10^{-2} mol/mol O_2 9.0×10^{-2} mol/mol He 70.7×10^{-2} mol/mol N_2	≤ 0.5 % rel.	24	3359.75

Interlaboratory Comparisons

Gas analysis

VSL's proficiency testing programs for gas analysis guarantee the quality of chemical analyses in the gas and petrochemical industry. For calibration and testing laboratories, participation in a program of this kind is a precondition for accreditation in accordance with ISO/IEC 17025. For other participants, such as refineries, participation is important for trading products and customer confidence.

Assurance

Accurate gas analyses are of vital importance in the gas and petrochemical industry. The slightest systematic error in the registered composition of natural gas or stack gas can have major financial consequences. For more than 10 years, VSL offers proficiency tests, enabling laboratories to compare their results and to verify their own standards through easy comparison with national standards.VSL has obtained ILAC G13 accreditation to conduct such interlaboratory comparisons.

- ### Natural gas program
  Since its launch in 1996, the natural gas program has attracted many participants. Twice a year, approximately 25 laboratories participate. Each participant is supplied with a gas cylinder to analyze its gas composition. VSL subsequently evaluates the results and rates the performance. Participants receive a report within two to three weeks. This PT can be used to fulfill requirements in international standards (e.g.: ASTM D1945, GPA2261, GPA2286, ISO6974, ISO17023) and all in house methods for (liquefied) natural gas composition measurement.

- ### Sulfur compounds in Natural Gas
  This international PT scheme allows you to evaluate the analytical performances of your laboratory in analyzing sulfur compounds found in natural gas. It can be used to evaluate methods prescribed in various international standards (e.g.: ASTM D5504, D6968, ISO 19739) and all in house developed methods for the determination of sulfur compounds in natural gas.

- ### Refinery Gas
  A specific PT scheme is available for refinery type gas compositions. Being different in composition and requiring dedicated GC techniques, participation in this Refinery Gas PT will be highly informative in evaluating your laboratory performance. It will again be helpful to fulfill requirements in international standards and all in house methods for refinery gas composition measurements.

- ### Stack gas
  This proficiency testing scheme aims to provide laboratories working in the field of stack gas analysis with a platform to compare their results. Participation is open to any laboratory providing services in this field.

- ### Binary gas mixtures
  VSL organizes typically 2 to 3 different binary gas mixtures Proficiency Tests each year. Components and composition vary from year to year. Participants for These PT's are typically specialty gas producers and (calibration) laboratories performing calibrations on analyzers in the laboratory or in the field

- ## *On demand PT* in Gas Analysis

  Any Primary Reference Material (PRM) can in principle be used as a proficiency test (PT) sample. In practice, it means that a range for the target composition can be specified, and a PRM will be prepared and undergo subsequent certification, just as usual. Instead of providing the certificate with the PRM, the PRM is sent first for the bilateral PT. Once the PRM has been analyzed by the customer and results have been received, a report on the PT is issued, and sent together with the PRM certificate.

  Please consult our technical staff first, to assess the eligibility of the gas mixture for proficiency testing.

VSL

Dutch
Metrology
Institute

CALIBRATION
RvA K 999

PROF. TESTING
RvA R 006

Reference Mat.
RvA P 002

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