Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

0408

Accredited to ISO/IEC 17025:2017

BOC Ltd

Issue No: 048 **Issue date:** 03 August 2023

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Calibration performed by the Organisations at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address Forge 43 Church Street West Woking Surrey GU21 6HT	**Local contact** Dr K D Cleaver Tel: +44 (0) 7825 844998 Email: kevin.cleaver@boc.com	Head Office	A Woking
Address 28 Deer Park Road London SW19 3UF	**Local contact** Mr Freddie Evans Tel: +44 (0) 7785 454036 Email: Freddie.Evans@boc.com	MOT Mixture Binary Gas Mixtures Ethanol/Air Mixture	B Morden
Address Hobson Way Stallingborough Immingham NE Lincolnshire DN41 8DZ	**Local contact** Mr Walter Branowsky Tel: +44 (0)1469 577977 Fax: +44 (0)1469 576493 Email: walter.branowsky@boc.com	Natural Gas Mixtures Multi-component Gravimetric Gas Mixtures	C Immingham

Calibration and Measurement Capability (CMC

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
GAS MIXTURES				
MOT MIXTURE			Certification of MOT gas mixtures against traceable gas reference standards	B
	Volume Fractions (% vol/vol)	1.0 % relative		
Carbon monoxide	3.5	1.0 % relative		
Carbon dioxide	14			
	(µvol/vol, equivalent to ppm (v))			
Propane	2000	1.0 % relative		
Nitrogen	balance			
BINARY GAS MIXTURES			Certification of binary gas mixtures against traceable gas reference standards	B
	Amount fraction (µmol/mol, equivalent to ppm)			
Propane/air	1.7 to 10	6.6 % to 1.9 % relative		
	10 to 100	1.9 % to 1.0 % relative		
	100 to 1000	1.5 % to 0.9 % relative		
	Amount fraction (µmol/mol, equivalent to ppm)			
Carbon monoxide/nitrogen	2 to 10	2.6 % to 1.2 % relative		
	10 to 100	2.7 % to 1.0 % relative		
	100 to 1000	1.5 % to 0.9 % relative		
	Amount fraction (% mol/mol)			
Carbon monoxide/nitrogen	0.1 to 1	1.6 % to 0.9 % relative		
	1 to 10	1.6 % to 0.9 % relative		
	Amount fraction (µmol/mol, equivalent to ppm)			
Carbon monoxide/air	2 to 10	2.6 % to 1.2 % relative		
	10 to 100	2.7 % to 1.0 % relative		
	100 to 1000	1.5 % to 0.9 % relative		
	Amount fraction (% mol/mol)			
Carbon monoxide/air	0.1 to 1	1.6 % to 0.9 % relative		
	1 to 6.25	1.6 % to 0.9 % relative		
	Amount fraction (% mol/mol)			
Carbon dioxide/nitrogen	0.1 to 1	1.7 % to 1.0 % relative		
	1 to 5	1.2 % to 0.9 % relative		
	5 to 15	1.2 % to 0.9 % relative		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
BINARY GAS MIXTURES (cont'd)			Certification of binary gas mixtures against traceable gas reference standards	B
	Amount fraction (µmol/mol, equivalent to ppm)			
Nitric oxide/nitrogen	2 to 10	1.4 % to 1.3 % relative		
	10 to 20	1.3 % relative		
	20 to 100	1.2 % to 0.9 % relative		
	100 to 1000	1.6 % to 0.9 % relative		
	Amount fraction (% mol/mol)			
Nitric oxide/nitrogen	0.1 to 1	1.6 % to 0.9 % relative		
	Amount fraction (% mol/mol)			
Oxygen/nitrogen	0.5 to 5	2.2 % to 0.9 % relative		
	5 to 25	1.6 % to 1.2 % relative		
	Amount fraction (µmol/mol, equivalent to ppm)			
Sulphur dioxide/nitrogen	10 to 30	1.8 % to 1.4 % relative		
	30 to 100	1.7 % to 1.1 % relative		
	100 to 300	1.7 % to 0.8 % relative		
	300 to 1000	1.6 % to 0.7 % relative		
	1000 to 3000	0.9 % to 0.6 % relative		
ETHANOL IN AIR CALIBRATION STANDARD FOR EVIDENTIAL BREATH TESTING			Certification of ethanol/air mixtures against traceable gas reference standards	B
Ethanol/air	35 µg Ethanol per 100 ml air (equivalent to 191.4 µmol/mol which corrresponds to ppm)	0.4 µg per 100 ml air (1.1 % relative)		
Ethanol/air	22 µg Ethanol per 100 ml air (equivalent to 120.3 µmol/mol which corresponds to ppm)	0.3 µg per 100 ml air (1.3 % relative)		
Ethanol/air	9 µg Ethanol per 100 ml air (equivalent to 49.2 µmol/mol which corresponds to ppm)	0.2 µg per 100 ml ai (1.9 % relative)		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
NATURAL GAS MIXTURES	Amount fraction (% mol/mol)	Amount fraction (% mol/mol)	Certification of Natural Gas mixtures against traceable gas reference standards using gas chromatography in accordance with BS EN ISO 6143:2006	C
Methane	55 to 100	0.05		
Ethane	0.008 to 1.5 1.5 to 11	0.28 % relative + 0.0003 0.3 % relative		
Propane	0.01 to 0.5 0.5 to 8	0.25 % relative + 0.0005 0.35 % relative		
i-Butane	0.004 to 0.25 0.25 to 1.2	0.46 % relative + 0.0001 0.5 % relative		
n-Butane	0.004 to 0.25 0.25 to 1.3	0.46 % relative + 0.0001 0.5 % relative		
i-Pentane	0.003 to 0.2 0.2 to 0.4	0.45 % relative + 0.0001 0.5 % relative		
n-Pentane	0.003 to 0.2 0.2 to 0.4	0.45 % relative + 0.0001 0.5 % relative		
neo-Pentane	0.002 to 0.4	0.8 % relative + 0.0001		
Hexane	0.0009 to 0.1 0.1 to 0.35	0.5 % relative + 0.0001 0.6 % relative		
Nitrogen	0.02 to 20.4	0.2 % relative + 0.002		
Carbon dioxide	0.09 to 12	0.2 % relative + 0.002		
Calculated values for: Gross calorific value Net calorific value Density Relative density Gross Wobbe index Net Wobbe index Mean Molecular Mass Compression Factor			Calculation of physical properties in accordance with BS EN ISO 6976: 2005 and/or BS EN ISO 6976: 2016	C

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
GAS MIXTURES	Amount fraction (% mol/mol)		Multi-component gaseous mixtures prepared by gravimetry in accordance with BS EN ISO 6142:2006 with analytical validation.	C
C_1 - C_3	0.0008 to 100	Amount fractions from (1 to 100) % mol/mol: 0.5 % relative		
C_4	0.001 to 50			
C_5	0.001 to 9			
C_6	0.001 to 1.5			
C_7	0.001 to 0.5	Amount fractions from (0.1 to 1) % mol/mol: 1 % relative	Where more than 5 components fall within the above scope for Natural Gas, certification shall be using traceable gas reference standards.	
C_8	0.001 to 0.2			
C_9	0.001 to 0.2			
C_{10}	0.001 to 0.05			
Benzene	0.001 to 1	Amount fractions from (0.0008 to 0.1) % mol/mol: 2 % relative		
Toluene	0.001 to 0.4			
Xylenes, m, p and o	0.001 to 0.1			
Argon	0.1 to 100			
Carbon dioxide	0.03 to 100			
Carbon monoxide	0.001 to 100			
Helium	0.1 to 100			
Hydrogen	0.08 to 100			
Nitrogen	0.1 to 100			
Oxygen	0.05 to 100			
END				

Appendix - Calibration and Measurement Capabilities

Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant non-repeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of $k = 2$. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand.
Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \times 0.01 \times q$, where q is the quantity value.

The notation Q[a, b] stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$