

# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

 <p><b>UKAS</b> CALIBRATION <b>0408</b></p> <p>Accredited to <b>ISO/IEC 17025:2005</b></p>	<p><b>BOC</b></p> <p><b>Issue No: 029    Issue date: 15 September 2011</b></p>	
	<p><b>The Priestley Centre</b> 10 Priestley Road <b>The Surrey Research Park</b> Guildford Surrey GU2 7XY</p>	<p><b>Contact: Dr K D Cleaver</b> <b>Tel: +44 (0)1483 244308</b> <b>Fax: +44 (0)1483 450741</b> <b>E-Mail: kevin.cleaver@boc.com</b> <b>Website: www.BOCspecialGases.co.uk</b></p>
<p><b>Calibration performed by the Organisations at the locations specified below</b></p>		

### Locations covered by the organisation and their relevant activities

#### Laboratory locations:

Location details	Activity	Location code
<p><b>Address</b> The Priestley Centre 10 Priestley Road The Surrey Research Park Guildford Surrey GU2 7XY</p> <p><b>Local contact</b> Dr K D Cleaver Tel: +44 (0)1483 244308 Fax: +44 (0)1483 450741 Email: kevin.cleaver@boc.com</p>		Guildford
<p><b>Address</b> 28 Deer Park Road London SW19 3UF</p> <p><b>Local contact</b> Mr Paul Willson Tel: +44 (0)20 8542 6677 Fax: +44 (0)20 8543 9678 Email: paul.willson@boc.com</p>	MOT Mixture Binary Gas Mixtures Ethanol/Air Mixture	Morden
<p><b>Address</b> Hobson Way Stallingborough Immingham NE Lincolnshire DN41 8DZ</p> <p><b>Local contact</b> Mr Walter Branowsky Tel: +44 (0)1469 577977 Fax: +44 (0)1469 576493 Email: walter.branowsky@boc.com</p>	Natural Gas and Gravimetric Mixtures	Immingham



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DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty ( $k = 2$ )	Remarks	Location Code
GAS MIXTURES				
QUATERNARY GAS MIXTURES	Volume fraction			Morden
Carbon monoxide	3.5 %	1.0 % relative		
Carbon dioxide	14 %	1.0 % relative		
Propane	2000 ppm	1.0 % relative		
Nitrogen	balance			
BINARY GAS MIXTURES	Amount fraction			Morden
Propane/air	1.7 ppm to 4 ppm 4 ppm to 10 ppm 10 ppm to 30 ppm 30 ppm to 100 ppm 100 ppm to 1000 ppm	6.6 % to 3.1 % relative 3.1 % to 1.8 % relative 1.8 % to 1.0 % relative 1.0 % to 0.90 % relative 1.5 % to 0.90 % relative	Certification of binary gas mixtures against nationally traceable gas reference standards	
Carbon monoxide/nitrogen	2 ppm to 10 ppm 10 ppm to 20 ppm 20 ppm to 55 ppm 55 ppm to 100 ppm 100 ppm to 1000 ppm 1000 ppm to 2400 ppm 2400 ppm to 1 % 1 % to 2.4 % 2.4 % to 10 %	2.6 % to 1.2 % relative 2.7 % to 1.6 % relative 1.6 % to 1.0 % relative 1.0 % relative 1.5 % to 0.90 % relative 1.6 % to 1.0 % relative 1.0 % to 0.90 % relative 1.6 % to 1.0 % relative 1.0 % to 0.90 % relative		
Carbon monoxide/air	2 ppm to 10 ppm 10 ppm to 20 ppm 20 ppm to 55 ppm 55 ppm to 100 ppm 100 ppm to 1000 ppm 1000 ppm to 2400 ppm 2400 ppm to 1 % 1 % to 2.4 % 2.4 % to 6.25 %	2.6 % to 1.2 % relative 2.7 % to 1.6 % relative 1.6 % to 1.0 % relative 1.0 % relative 1.5 % to 0.90 % relative 1.6 % to 1.0 % relative 1.0 % to 0.90 % relative 1.6 % to 1.0 % relative 1.0 % to 0.90 % relative		
Carbon dioxide/nitrogen	0.1 % to 0.26 % 0.26 % to 1 % 1 % to 5 % 5 % to 15 %	1.7 % to 1.0 % relative 1.0 % to 0.90 % relative 1.2 % to 0.90 % relative 1.2 % to 0.90 % relative		
Nitric oxide/nitrogen	2 ppm to 20 ppm 20 ppm to 100 ppm 100 ppm to 240 ppm 240 ppm to 1000 ppm 1000 ppm to 2400 ppm 2400 ppm to 1 %	1.4 % to 1.3 % relative 1.2 % to 0.90 % relative 1.6 % to 1.0 % relative 1.0 % to 0.90 % relative 1.6 % to 1.0 % relative 1.0 % to 0.90 % relative		
Oxygen/nitrogen	0.5 % to 1.65 % 1.65 % to 5 % 5 % to 25 %	2.2 % to 1.0 % relative 1.0 % to 0.90 % relative 1.6 % to 1.2 % relative		



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BINARY GAS MIXTURES (cont'd)				
Sulphur dioxide/nitrogen	10 ppm to 30 ppm 30 ppm to 60 ppm 60 ppm to 100 ppm 100 ppm to 300 ppm 300 ppm to 550 ppm 550 ppm to 1000 ppm 1000 ppm to 3000 ppm	1.7 % to 1.3 % relative 1.7 % to 1.2 % relative 1.2 % to 1.1 % relative 1.0 % to 0.90 % relative 1.3 % to 1.0 % relative 1.0 % relative 0.80 % to 0.50 % relative		Morden
ETHANOL IN AIR CALIBRATION STANDARD FOR EVIDENTIAL BREATH TESTING				
Ethanol/air	35 µg Ethanol per 100 ml air equivalent to 191.4 ppm	0.40 µg per 100 ml air 2.0 ppm (1.1 % relative)		
	22 µg Ethanol per 100 ml air equivalent to 120.3 ppm	0.30 µg per 100 ml air 1.6 ppm (1.3 % relative)		
	9 µg Ethanol per 100 ml air equivalent to 49.2 ppm	0.20 µg per 100 ml air 1.0 ppm (1.9 % relative)		
NATURAL GAS MIXTURES	Amount fraction (% mol/mol)	Amount fraction (% mol/mol)	Certification of Natural Gas mixtures against nationally traceable gas reference standards using gas chromatography in accordance with ISO 6143:2001	Immingham
Methane	55 to 100	0.10 % relative		
Ethane	0.008 to 0.1 0.1 to 1 1 to 11	2.0 % relative 1.0 % relative 0.35 % relative		
Propane	0.01 to 0.5 0.5 to 2 2 to 8	0.0035 0.30 % relative + 0.0020 0.40 % relative		
i-Butane	0.004 to 0.16 0.16 to 1.2	0.00080 0.50 % relative		
n-Butane	0.004 to 0.24 0.24 to 1.3	0.0012 0.50 % relative		
i-Pentane	0.003 to 0.1 0.1 to 0.4	0.40 % relative + 0.00050 0.90 % relative		
n-Pentane	0.003 to 0.1 0.1 to 0.4	0.40 % relative + 0.00050 0.90 % relative		



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NATURAL GAS MIXTURES (continued)	Amount fraction (% mol/mol)	Amount fraction (% mol/mol)		Immingham
neo-Pentane	0.002 to 0.02 0.02 to 0.4	0.00030 1.5 % relative		
Hexane	0.0009 to 0.1 0.1 to 0.35	0.0016 1.6 % relative		
C <sub>6</sub> +	0.0009 to 0.1 0.1 to 0.35	0.0016 1.6 % relative	C <sub>6</sub> + is the sum of hydrocarbon amount fractions containing six carbon atoms or greater	
Nitrogen	0.02 to 1.25 1.25 to 20.4	0.0050 0.40 % relative		
Carbon dioxide	0.09 to 0.8 0.8 to 12	0.0024 0.30 % relative		
Calculated values for:	Calculations valid for gas mixtures with amount fractions (% mol/mol):		Calculation of physical properties in accordance with ISO 6976:1995	
Calorific Value (superior)	Nitrogen < 30 %	0.10 % relative		
Calorific Value (inferior)	Carbon dioxide < 15 %	0.10 % relative		
Relative density	Ethane < 15 %	0.10 % relative		
Density	Other components < 5 %	0.10 % relative		
Wobbe Index	Methane no restriction	0.10 % relative		
Mean Molecular Mass		0.10 % relative		
Compression Factor		0.10 % relative		
GAS MIXTURES	Amount fraction (% mol/mol)		Multi-component gaseous mixtures prepared by gravimetry in accordance with ISO 6142 with analytical validation against traceable standards.	Immingham
C <sub>1</sub> - C <sub>3</sub>	0.0008 to 100	Amount fractions from 1 % to 100 %:		
C <sub>4</sub>	0.001 to 50	± 0.50 % relative		
C <sub>5</sub>	0.001 to 9			
C <sub>6</sub>	0.001 to 1.5	Amount fractions from		
C <sub>7</sub>	0.001 to 0.5	0.1 % to 1 %:		
C <sub>8</sub>	0.001 to 0.2	± 1.0 % relative	Where more than 5 components fall within the above scope for Natural Gas, certification shall be using nationally traceable gas reference standards.	
C <sub>9</sub>	0.001 to 0.2			
C <sub>10</sub>	0.001 to 0.05			
Benzene	0.001 to 1	Amount fractions from		
Toluene	0.001 to 0.4	0.0008 % to 0.1 %:		
Xylenes, m, p and o	0.001 to 0.1	± 2.0 % relative		
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				