


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>UKAS REFERENCE MATERIALS</p> <p>5710</p> <p>Accredited to ISO 17034:2016</p>	<p>EffecTech Limited</p> <p>Issue No: 004 Issue date: 13 June 2022</p>	
	<p>Dove House Dove Fields Uttoxeter Staffordshire ST14 8HU</p>	<p>Contact: Dr Gavin Squire Tel: +44 (0)1889 569229 E-Mail: gavin.squire@effectech.co.uk Website: www.effectech.co.uk</p>
<p>Reference material production at the above address</p>		

DETAIL OF ACCREDITATION

Matrix / Artefact	Property Value(s) / Identity / Characterisation Range	Characterisation Procedure / Technique	Type* (CRM / RM)	
SYNTHETIC NATURAL GAS MIXTURES	amount fraction	(% mol/mol)	<p>In-house method TM001/UT</p> <p>Calibration of certified reference materials (CRM) by ISO 6143:2001 using gas chromatography.</p>	CRM
	nitrogen	(0.1 to 22)		
	carbon dioxide	(0.05 to 15)		
	methane	(34 to 100)		
	ethane	(0.1 to 35)		
	propane	(0.05 to 15)		
	iso-butane	(0.01 to 2)		
	n-butane	(0.01 to 2)		
	neo-pentane	(0.002 to 0.35)		
	iso-pentane	(0.005 to 0.35)		
	n-pentane	(0.005 to 0.35)		
	n-hexane	(0.001 to 0.35)		
	2-methylpentane	(0.001 to 0.35)		
	3-methylpentane	(0.001 to 0.35)		
	2,2-dimethylbutane	(0.001 to 0.35)		
	benzene	(0.001 to 0.2)		
	cyclohexane	(0.001 to 0.2)		
	n-heptane	(0.001 to 0.2)		
	toluene	(0.001 to 0.1)		
	methylcyclohexane	(0.001 to 0.1)		
	n-octane	(0.0005 to 0.05)		
	n-nonane	(0.0005 to 0.02)		
	n-decane	(0.0005 to 0.005)		
helium	(0.005 to 0.2)			
hydrogen	(0.005 to 20)			
oxygen	(0.05 to 3)			



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SYNTHETIC NATURAL GAS MIXTURES (cont'd)	amount fraction (% mol/mol)	In-house method TM026/UT	CRM
	oxygen (0.001 to 22.5)	Calibration of certified reference materials (CRM) by ISO 12963:2017 using galvanic fuel cell sensors	
	superior calorific value molar basis (kJ.mol ⁻¹) mass basis (MJ.kg ⁻¹) volume basis (MJ.m ⁻³) inferior calorific value molar basis (kJ.mol ⁻¹) mass basis (MJ.kg ⁻¹) volume basis (MJ.m ⁻³) relative density density (kg.m ⁻³) superior Wobbe index (MJ.m ⁻³) inferior Wobbe index (MJ.m ⁻³) molar mass (kg.kmol ⁻¹) compression factor	Values calculated by ISO 6976:1995 (including amendment No 1, May 1998) on a <i>real</i> or <i>ideal</i> gas basis assuming mixture is dry (free from water) Combustion properties can be expressed in units of the Joule (J) or in kilowatt hours (kWh)	CRM
gross calorific value molar basis (kJ.mol ⁻¹) mass basis (MJ.kg ⁻¹) volume basis (MJ.m ⁻³) net calorific value molar basis (kJ.mol ⁻¹) mass basis (MJ.kg ⁻¹) volume basis (MJ.m ⁻³) relative density density (kg.m ⁻³) gross Wobbe index (MJ.m ⁻³) net Wobbe index (MJ.m ⁻³) molar mass (kg.kmol ⁻¹) compression factor	Values calculated by ISO 6976:2016 on a <i>real</i> or <i>ideal</i> gas basis assuming mixture is dry (free from water) Combustion properties can be expressed in units of the Joule (J) or in kilowatt hours (kWh)	CRM	



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SYNTHETIC NATURAL GAS MIXTURES (cont'd)	gross heating value net heating value relative density compressibility factor	Values calculated by methods given in GPA 2172-09 (2009) using data tables from GPA 2145-09	CRM
	gross heating value net heating value relative density density compressibility factor	Values calculated by methods given in ASTM D3588-98 (2011) using data tables from GPA 2145-09	CRM
SULPHUR GAS MIXTURES	amount fraction (µmol/mol)	In-house method TM002/UT	CRM
	hydrogen sulphide (0.2 to 10)	Calibration of certified reference materials (CRM) using gas chromatography with sulphur chemiluminescence detection (GC-SCD)	CRM
	carbonyl sulphide (0.2 to 10)		
	methanethiol (methyl mercaptan) (0.2 to 10)		
	ethanethiol (ethyl mercaptan) (0.2 to 10)		
	dimethyl sulphide (0.2 to 10)		
	1-propanethiol (n-propyl mercaptan) (0.2 to 10)		
	2-propanethiol (iso-propyl mercaptan) (0.2 to 10)		
	ethyl methyl sulphide (methyl ethyl sulphide) (0.2 to 10)		
	1-butanethiol (n-butyl mercaptan) (0.2 to 10)		
	2-methyl-2-propanethiol (tert-butyl mercaptan) (0.2 to 10)		
	2-methyl-1-propanethiol (iso-butyl mercaptan) (0.2 to 10)		
	1-methyl-1-propanethiol (sec-butyl mercaptan) (0.2 to 10)		
	diethyl sulphide (0.2 to 10)		
n-hexyl mercaptan (0.2 to 10)			
tetrahydrothiophene (THT) (0.2 to 10)			



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BLAST FURNACE GAS MIXTURES (BFG)	amount fraction (% mol/mol)	In-house method TM004/UT Calibration of certified reference materials (CRM) by ISO 6143:2001 using gas chromatography with thermal conductivity detection (GC-TCD)	CRM
	nitrogen (27 to 54)		
	carbon dioxide (20 to 31)		
	hydrogen (1 to 16)		
BASIC OXYGEN STEELMAKING GAS (BOS)	amount fraction (% mol/mol)	In-house method TM004/UT Calibration of certified reference materials (CRM) by ISO 6143:2001 using gas chromatography with thermal conductivity detection (GC-TCD)	CRM
	carbon monoxide (20 to 31)		
	nitrogen (11 to 30)		
	carbon dioxide (12 to 20)		
	carbon monoxide (45 to 75)		
BINARY EMISSION GAS MIXTURES	hydrogen (1 to 16)	In-house method TM014 Calibration of certified reference materials (CRM) by ISO 12963:2017 using dynamically generated reference gases in accordance with ISO 6145 Part 7: Thermal Mass Flow Controllers	CRM
	oxygen (0.3 to 1.3)		
	amount fraction (% mol/mol)		
	carbon dioxide (0.1 to 15) in nitrogen or synthetic air		
	oxygen (0.5 to 25) in nitrogen		
	methane (0.1 to 5) in nitrogen		
	methane (0.1 to 2.5) in synthetic air		
	amount fraction (µmol/mol)		
	carbon monoxide (10 to 1000) in nitrogen or synthetic air		
	nitric oxide (10 to 600) in nitrogen		
nitrogen dioxide (5 to 500) in synthetic air			
sulphur dioxide (10 to 1000) in nitrogen or synthetic air			
			CRM



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BINARY EMISSION GAS MIXTURES (cont'd)	amount fraction (% mol/mol) oxygen in nitrogen (0.001 to 22.5)	In-house method TM026/UT Calibration of certified reference materials (CRM) by ISO 12963:2017 using galvanic fuel cell sensors	CRM
END			

*** Type**

CRM= Certified Reference Material(s)

RM = Reference Material(s)

Refer to ISO 17034 for full definitions