Schedule of Accreditation

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United Kingdom Accreditation Service

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UKAS CALIBRATION **0820** **Accredited to ISO/IEC 17025:2017**	**SGS United Kingdom Limited** **Issue No:** 016 **Issue date:** 13 July 2021
Metrology Laboratory **Unit 1, Rossmore Business Park** **Ellesmere Port** **South Wirral** **Cheshire** **CH65 3EN**	**Contact: Mr Paul Hannam** **Tel: +44 (0)151-350 6653** **E-Mail: paul.hannam@sgs.com** **Website: www.sgs.com**

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 Metrology Laboratory Unit 1, Rossmore Business Park Ellesmere Port South Wirral Cheshire CH65 3EN	**Local contact** Paul Hannam	Gas flow Hydrocarbon flow Volume tanks and provers	A
Address 2 Martin Close Blenheim Industrial Estate Bulwell Nottingham NG6 8UW	**Local contact** Sam Cooke	Dimensional Electrical Pressure Temperature Humidity	B
Address Aurora Court Barton Road Riverside Park Middlesbrough TS2 1RY	**Local contact** Andrew Smith	Electrical Frequency Pressure Temperature	C
Address Aberdeen Laboratory SGS House Well Heads Drive Dyce Aberdeen AB21 7GQ	**Local contact** Colin Brown	Volume tanks and provers Volume - pipe provers Flow meters	D

Site activities performed away from the locations listed above:

Location Details		Activity	Location code
The customers' site or premises must be suitable for the nature of the particular calibrations undertaken and will be the subject of contract review arrangements between the laboratory and the customer	Paul Hannam	Hydrocarbon flow Volume tanks and provers	A1
	Sam Cooke	Dimensional Electrical Pressure Temperature	B1
	Colin Brown	Volume tanks and provers Volume - pipe provers Flow meters	D1

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
FLOW				
Gas meters Volume passed	0.15 m^3 to 350 m^3 (At flow rates of 1.2 m^3/hour to 4579 m^3/hour)	0.60 %	Calibration against reference meters using air	A
	30 litres to 300 litres (At flow rates of 40 litres/hour to 65,000 litres/hour)	0.60 %	Calibration against bell provers using air	A
	30 litres to 300 litres (At flow rates of 40 litres/hour to 6,000 litres/hour)	0.60 %	Calibration against sonic nozzles using air.	A
Hydrocarbon oil flow meters Volume passed	500, 2500 & 5000 litres at flow rates from 50 l min^{-1} to 5000 l min^{-1}	0.052 % of measured quantity	Calibrations can be carried out using Kerosene at ambient temperature and pressures of up to 3 bar.	A
	3000 litres at flow rates from 50 l min^{-1} to 3000 l min^{-1}	0.052 % of measured quantity	Calibration carried out using diesel, gas oil, kerosene or motor oil and water at ambient temperature and pressures of up to 3 bar	A1
VOLUME				A
Calibration of Prover Tanks	100 litres to 5000 litres	0.020 % of measured quantity	Calibration carried out using water	A + A1
Calibration of Pipe Provers and Compact Provers using Waterdraw Method	60 litres to 40000 litres	0.025 % of measured quantity	Calibration carried out using water	A + A1
Calibration of Pipe Provers and Compact Provers using Master Meter Method	300 litres to 40000 litres	0.030 % of measured quantity	Calibration carried out using water	A + A1
Calibration of Pipe Provers and Compact Provers using Master Meter Method	300 litres to 40000 litres	0.045 % of measured quantity	Calibration carried out using hydrocarbons	A1
LENGTH				B
Plain plug gauges (parallel), cylindrical setting standards and rollers	1 to 50 50 to 100 100 to 150 150 to 200 200 to 300	0.50 0.80 1.0 1.2 1.6		B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
LENGTH (cont'd)			**Notes**	B
Thread measuring cylinders	BS 5590 0.1 to 5	 0.50	Note 1: plain cylindrical limit gauges are calibrated using a single axis measuring machine and reference standards	B
Plain ring gauges (parallel) and setting standards	2 to 10 diameter 10 to 25 25 to 50 50 to 100 100 to 150 150 to 250	1.0 0.80 1.0 1.5 2.0 3.0	Note 2: using gauge block Note 3: using a single axis measuring machine	B
Length gauges, flat and spherical ended	0 to 600	1.0 + (8.0 x length in m)		B
Plain gap gauges (parallel)	0.5 to 100 100 to 200 200 to 300	3.0 5.0 8.0	Note 4: thread gauges are calibrated using NPL methods described in Notes on Applied Science No. 1	B
Feeler Gauges and paint thickness foils	BS 957:2008 0.025 to 1	1.0		B
Screw plug gauges (parallel) including check and setting plugs See Note 3	1 to 100 diameter 100 to 150 150 to 200	2.5 on pitch diameter 5.0 on pitch diameter 8.0 on pitch diameter		B
Screw plug gauges (taper) including check plugs See Note 2	5 to 100 diameter	5.0 on pitch diameter		B
Screw ring gauges (parallel) See Notes 3 and 4	3 to 75 diameter 75 to 150 150 to 250	5.0 on pitch diameter 7.0 on pitch diameter 10 on pitch diameter		B
Screw ring gauges (taper) See Note 2	6 up to 150 diameter	7.0 on pitch diameter		B
Screw pitch Screw flank angle	0.2 to 8 0° to 52°	1.5 5.0 minutes of arc		B
Parallels	BS906:1972 5 to 50 x 100 x 400	 1.5 up to 5.0		B
Vee blocks	BS 3731:1987 20 to 150	2.5 to 5.0		B
Receiver, position and profile gauges, jigs, fixtures See note 5	Maximum dimensions 0 to 1000 x 750 x 500 (Limited to gauges where a specific procedure and uncertainty budget are available).	Minimum per co-ordinate: 3.0 + (10 x length in m)	Documented in-house methods using a cmm and first principles	B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
ANGLE				B
Squares Blade type	BS 939:2007 50 to 300 300 to 600	 3.0 On squareness 5.0 See Note 1		B
Angle plates and box angle plates	BS 5535:1978 50 to 600	Squareness: 3.0 + (1.0 per 100 mm) Parallelism: 1.0 + (1.0 per 100 mm) See Note 1		B
Sine bars and tables	BS 3064:1978 0 to 500 length	Linear dimensions: 1.0 + (10 x length in m) Overall performance: 3.0 seconds of arc		B
FORM				B
Surface plates Granite and Cast iron	BS 817:2008 and above 160 x 100 to 1600 x 1000	 1.5 + (0.80 diagonal in m) See Note 1		B
Steel balls	1 to 25 diameter	0.50 on diameter	Single axis measuring machine and reference standards	B
MEASURING INSTRUMENTS AND MACHINES				B
Micrometers External Internal Depth	 BS 870:2008 0 to 600 BS 959:2008 0 to 900 BS 6468:2008 0 to 300	 Heads: 2.0 Setting and extension rods 1.0 + (8.0 x length in m)		B
Micrometer heads	BS 1734:1951 0 to 50	1.0		B
Bench micrometer	NPL MOY/SCMI 22 0 to 100	Overall performance 1.0		B
Vernier caliper, height and depth gauges	BS 887:2008 0 to 1000 BS 1643:2008 0 to 1000 BS 6365:2008 0 to 600	Overall performance 10 + (30 x length in m)		B
Height gauges - (Simple) including vernier, dial and digital types.	As BS EN ISO 13225:2012 0 to 1000	Length measurement error (E): 2.0 + (5.0 x length in metres)		B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
MEASURING INSTRUMENTS AND MACHINES (Cont'd)				B
Dial gauges and dial test indicators	BS 907:2008 and BS 2795:1981 0 to 50	1.0		B
Comparators (external)	BS 1054:1975 250 to 10 000 magnifications	1.0 % of range Minimum 0.20		B
Graduated rules	BS 4372:1968 0 to 1000	5.0 + (10 x length in m)		B
Bevel protractors	BS 1685:2008 0° to 360°	6.0 minutes of arc		B
Electronic height gauges with microprocessor control	0 to 1000	2.0 + (5.0 x length in m)	Documented in-house methods	B
Notes for length, angle and form 1. The uncertainty quoted is for the departure from flatness, straightness, parallelism, or squareness, i.e. the distance separating the two parallel planes which just enclose the surface under consideration. 2. Single start, symmetrical thread forms only. 3. Single and multi-start symmetrical and asymmetrical thread forms. 4. Includes use of check plugs for screw rings from 1 mm to 14 mm diameter 5. Features and associated parts of these gauges can be measured to the uncertainties given for equivalent items listed in this schedule.				
ELECTRICAL				B
DC Voltage	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V 1kV to 50 kV	10 ppm + 0.80 µV 7.0 ppm + 1.0 µV 8.0 ppm + 3.5 µV 8.0 ppm +60 µV 8.0 ppm + 0.60 mV 0.20 % + 7.0 V	Electrical calibrations are performed as a comparison against a reference standard. These values can be generated for the calibration of measuring instruments, Outputs of instruments can be measured directly.	B
DC Resistance	0 Ω to 20 Ω 20 Ω to 200 Ω 200 Ω to 2 k Ω 2 k Ω to 20 k Ω 20 k Ω to 200 k Ω 200 k Ω to 2 M Ω 2 M Ω to 20 M Ω 20 M Ω to 200 M Ω 200 M Ω to 1 G Ω	18 ppm + 24 µ Ω 11 ppm + 0.10 m Ω 9.0 ppm + 0.80 m Ω 9.0 ppm + 8.0 m Ω 13 ppm + 80 m Ω 22 ppm + 1.7 Ω 38 ppm + 100 Ω 200 ppm + 11 k Ω 0.12 % + 0.10 M Ω		B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (Cont'd)				B
DC Current	0 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	35 ppm + 0.80 nA 30 ppm + 6.0 nA 35 ppm + 52 nA 46 ppm + 1.2 µA 70 ppm + 25 µA		B
	2 A to 30 A	400 ppm + 0.30 mA		
AC Voltage	20 Hz to 60 Hz 1 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	 0.025 % + 5.0 µV 0.024 % + 24 µV 0.021 % + 0.23 mV 0.021 % + 2.3 mV 0.024 % + 12 mV		B
	60 Hz to 3 kHz 1 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	 0.022 % + 5.0 µV 0.014 % + 24 µV 0.014 % + 0.23 mV 0.015 % + 2.3 mV 0.020 % + 12 mV		B
	3 kHz to 30 kHz 1 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V	 0.025 % + 10 µV 0.015 % + 50 µV 0.015 % + 0.50 mV 0.016 % + 5.0 mV		B
	3 kHz to 10 kHz 200 V to 1000 V	 0.040 % + 120 mV		
	30 kHz to 100 kHz 1 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V	0.060 % + 24 µV 0.075 % + 0.24 mV 0.030 % + 2.3 mV 0.050 % + 23 mV		B
	100 kHz to 500 kHz 200 mV to 2 V 2 V to 20 V	 0.20 % + 2.4 mV 0.30 % + 23 mV		B
	500 kHz to 1 MHz 200 mV to 2 V 2 V to 20 V	 0.25 % + 24 mV 0.25 % + 230 mV		B
	50 Hz 1 kV to 50 kV	 0.60 % + 60 V		B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (Cont'd)				B
AC Current	40 Hz to 1 kHz			B
	1 µA to 200 µA	0.040 % + 24 nA		
	200 µA to 2 mA	0.040 % + 0.24 µA		
	2 mA to 20 mA	0.040 % + 2.4 µA		
	20 mA to 200 mA	0.045 % + 24 µA		
	40 Hz to 100 Hz			
	200 mA to 2 A	0.030 % + 0.50 mA		
	100 Hz to 1 kHz			
	200 mA to 2 A	0.065 % + 1.0 mA		
	1 kHz to 5 kHz			B
	1 µA to 200 µA	0.10 % + 24 nA		
	200 µA to 2 mA	0.075 % + 0.24 µA		
	2 mA to 20 mA	0.075 % + 2.4 µA		
	20 mA to 200 mA	0.090 % + 24 µA		
	200 mA to 2 A	0.14 % + 1.0 mA		
	50 Hz to 60 Hz			B
	2 A to 30 A	0.040 % + 2.5 mA		
Electrical calibration of temperature indicators for the following sensors:				
Noble metal thermocouples	0 °C to 1600 °C	0.50 °C	Including cold junction compensation	B
	0 °C to 1600 °C	0.15 °C	Cold junction disabled	B
	0 °C to 1600 °C	0.90 °c	Including cold junction compensation	B1
Base metal thermocouples	-200 °C to +1300 °C	0.13 °C	Including cold junction compensation	B
	-200 °C to +1300 °C	0.060 °C	Cold junction disabled	B
	-200 °C to +1300 °C	0.70 °c	Including cold junction compensation	B1
Resistance sensors	-200 °C to +250 °C	5.0 m°C		B
	+250 °C to +650 °C	30 m°C		
	-200 °C to +850 °C	0.30 °C		B1
Cold junction compensation of thermocouple indictors and sources	At ambient temperature	0.10 °C		B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (Cont'd)				B
Capacitance Sourcing	1 nF 10 nF 20 nF 50 nF 100 nF 1 µF 10 µF	4.2 pF 30 pF 48 pF 72 pF 93 pF 2.0 nF 50 nF		B
Frequency Measurement	0 Hz to 3 GHz 3 GHz to 26 GHz	4.0 in 10^{12} + 3.0 mHz 3.0 in 10^{9}		B
Generation	0 Hz to 6 GHz	4.0 in 10^{12}		
Period	10 ns to 1700 s	1.5 in 10^{9}		B
Time interval	1 s to 8 x 10^{5} s	8.0 in 10^{9}		B
17th and 18th edition electrical test insturments			Using the calibrator to generate known quantities to simulate measurements made by the Electrical Test Instruments.	B
Insulation Testers:				B
Resistance	10 kΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ	0.30 % 0.85 % 1.5 %		B
Output Voltage DC	50 V to 1000 V	0.40 %		B
Output Current DC	0 mA to 1 mA	0.060 % + 6.0 µA		B
Continuity Resistance	50 mΩ to 1 Ω 1 Ω to 50 kΩ	0.30 % + 12 mΩ 0.40 %		B
Continuity Current DC	0 mA to 320 mA	0.70 mA		B
Voltage AC	100 V to 400 V at 50 Hz	0.40 %		B
Loop Testers:				B
Loop Resistance	0 Ω to 5 Ω 9 Ω to 1000 Ω	0.60 % + 24 mΩ 0.60 % + 45 mΩ		B
RCD Testers:				B
Current Measurement AC	0.1mA to 3000mA at 50 Hz	1.4 % + 0.070 mA		B
Trip time	0 ms to 390 ms 390 ms to 5 s	0.70 ms 8.2 ms		B
Appliance Testers:				B
Insulation Resistance	0.1 MΩ to 10 MΩ	0.30 %		B
Earth Bond Resistance	50 mΩ to 10 Ω 10 Ω to 1000 Ω	0.60 % + 8.0 mΩ 0.60 % + 35 mΩ		B
Earth Bond Current AC	0.1 mA to 500 mA at 50 Hz 500 mA to 30 A at 50 Hz	1.75 % + 7.0 mA 1.75 % + 75 mA		B
Leakage Current AC	1 mA to 8 mA at 50 Hz	1.75 % + 10 µA		B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (Cont'd)				B & B1
Flash Test (Accessory)				B
AC Voltage	0.1 kV to 3 kV at 50 Hz	2.0 % + 12 V		B
AC Leakage Current	0.1 mA to 3 mA at 50 Hz	6.0 % + 17 µA		B
Electrical verification of ultrasonic flaw detection equipment	AS BS EN 12668-1:2010			B
	Stability after warm up (height)	0.30 % of screen height		B
	Stability after warm up (width)	0.020 % of screen width		B
	Jitter – screen height	0.30 % of screen height		B
	Jitter – screen width	0.30 % of screen width		B
	Stability against supply variations (height)	0.30 % of screen height		B
	Stability against supply variations (width)	0.020 % of screen width		B
	Pulser Voltage	3.6 V		B
	Pulser Rise Time	1.7 ns		B
	Pulser Reverberation	1.0 % of pulsar voltage		B
	Pulse Duration	1.7 ns		B
	Frequency Response 0.1 MHz to 25 MHz	30 kHz at -3 dB point		B
	Equivalent input noise	2.4 x 10^{-9} V√Hz		B
	Calibrated Attenuator 0 MHz to 100 MHz	0.60 dB		B
	Vertical Linearity	0.70 % of screen height		B
	Linearity of Timebase	0.25 % relative to 20 % and 80 % of the horizontal scale		B
PRESSURE				B & B1
Gas Pressure Gauge			Methods consistent with EURAMET CG3	B & B1
Calibration of pressure indicating instruments and gauges	-95 kPa to -20 kPa	0.012 % + 66 Pa		
	-20 kPa to 20 kPa	0.015 % + 10 Pa		
	20 kPa to 200 kPa	0.012 % + 66 Pa		
	200 kPa to 2 MPa	0.012 % + 590 Pa		
Gas Pressure Absolute				B & B1
Calibration of pressure indicating instruments and gauges	3.5 kPa to 120 kPa	100 Pa		
	120 kPa to 200 kPa	140 Pa		
Hydraulic Pressure Gauge				B & B1
Calibration of pressure indicating instruments and gauges	0 Pa to 13.5 MPa	0.010 % + 6.0 kPa		
	13.5 MPa to 70 MPa	0.015 % + 20 kPa		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
TEMPERATURE			Calibration by Comparison with reference instruments.	B & B1
Resistance thermometers	-20 °C to +100 °C 100 °C to 250 °C 250 °C to 600 °C 50 °C to 300 °C 300 °C to 600 °C	0.055 °C 0.075 °C 0.15 °C 0.50 °C 1.3 °C	Liquid bath Block calibrator Block calibrator	B B1
Thermocouples	-20 °C to 250 °C 250 °C to 600 °C 600 ˚C to 1100 ˚C 1100 ˚C to 1300 ˚C 0 °C to 130 °C 130 °C to 350 °C 350 °C to 600 °C	0.50 °C 0.90 °C 1.9 ˚C 2.8 ˚C 0.60 °C 0.85 °C 1.5 °C	Liquid bath Block calibrator Spherical furnace Block calibrator	B B1
Temperature indicators with probes	-20 °C to +100 °C 100 °C to 250 °C 250 °C to 600 °C Ambient (typically 20 °C) 0 °C to 130 °C 130 °C to 350 °C 350 °C to 600 °C	0.060 °C 0.090 °C 0.15 °C 0.070 °C 0.50 °C 0.80 °C 1.4 °C	Liquid bath Block calibrator Ambient air Block calibrator	B B B1
Dry Block Calibrators	-20 °C to +600 °C	0.13 °C		B
Radiation thermometers (Pyrometers)	0 °C to +100 °C 100 °C to 200 °C 200 °C to 350 °C 350 °C to 500 °C	1.0 °C 1.5 °C 2.5 °C 3.5 °C	Radiation thermometers working in the wavelength range 8 µm to 14 µm	B
Calibration in air chamber	5 °C to 23 °C 23 °C to 60 °C	0.10 °C 0.15 °C	Comparison in air chamber	B
HUMIDITY			Calibration by comparison with a reference hygrometer and reference thermometers.	B
Relative humidity meters	At 5 °C to 12 °C 15 %rh to 90 %rh At 12 °C to 23 °C 10 %rh to 90 %rh At 23 °C to 60 °C 10 %rh to 90 %rh	 0.45 %rh to 1.9 %rh 0.50 %rh to 1.9 %rh 0.50 %rh to 1.6 %rh	Comparison in air chamber	B B B

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
DIMENSIONAL				B1
Surface plates Granite and Cast iron	BS 817:2008 and above 160 x 100 to 1600 x 1000	 1.5 + (0.80 diagonal in m) See Note 1		B1
Electronic height gauges with microprocessor control	0 to 1000	2.0 + (5.0 x length in m)		B1
PRESSURE				C
Gas pressure gauge			Methods consistent with EURAMET CG3	C
Calibration of pressure indicating instruments and gauges	- 100 kPa to - 3.5 kPa - 3.5 kPa to 3.5 kPa 3.5 kPa to 7 MPa	0.010 % 0.69 Pa 0.0080 %	Calibration of pressure devices with an electrical output can be undertaken	C
			Absolute pressure calibrations can be undertaken using the gauge and absolute ranges with an additional uncertainty of 10 Pa.	C
Gas pressure Absolute				C
Calibration of pressure indicating instruments and gauges	80 kPa to 120 kPa	10 Pa		
Hydraulic pressure gauge				C
Calibration of pressure indicating instruments and gauges	0.6 MPa to 120 MPa	0.013 %		
TEMPERATURE				C
Liquid-in-glass thermometers	- 50 °C to 250 °C	0.050 °C	Plus 1/10 scale division Calibrations performed in a range of dry and liquid baths	C
Temperature indicators with sensors	- 50 □C to 250 °C 250 °C to 350 °C 350 °C to 650 °C	0.050 °C 0.20 °C 0.30 °C		C

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
Values and uncertainties listed below are applicable for the calibration of both measurement instruments and for instruments with an output. the method used is by direct comparison unless otherwise stated in the remarks column.				
ELECTRICAL				C
DC Resistance	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ	17 ppm + 84 μΩ 14 ppm + 650 μΩ 12 ppm + 630 μΩ 12 ppm + 120 mΩ 12 ppm + 1.2 Ω 18 ppm + 18 Ω 59 ppm + 720 Ω 580 ppm + 58 kΩ 0.64 % + 6.0 MΩ		C
DC Voltage	0 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1 kV	11 ppm + 1.2 μV 9.0 ppm + 9.3 μV 9.0 ppm + 92 μV 12 ppm + 1.2 mV 12 ppm + 18 mV		C
AC Voltage	100 μV to 100 mV 1 kHz 100 mV to 1 V 40 Hz to 1 kHz 1 V to 10 V 40 Hz to 1 kHz 10 V to 100 V 40 Hz to 1 kHz 100 V to 700 V 50 Hz to 1 kHz	 0.010 % + 23 μV 0.010 % + 88 μV 0.010 % + 840 μV 0.020 % + 23 mV 0.050 % + 32 mV		C
Generation only (Increased frequency range)	10 mV to 300 mV 10 Hz to 3 kHz 300 mV to 3 V 10 Hz to 3 kHz 3 V to 30 V 10 Hz to 3 kHz 30 V to 100 V 10 Hz to 3 kHz 100 V to 300 V 40 Hz to 3 kHz 300 V to 750 V 40 Hz to 3 kHz	 0.050 % + 140 μV 0.050 % + 1.4 mV 0.050 % + 14 mV 0.050 % + 47 mV 0.10 % + 280 mV 0.10 % + 700 mV		C

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (Cont'd)				C
DC Current	0 µA to 1 µA 1 µA to 10 µA 10 µA to 100 µA 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A	56 ppm + 110 pA 25 ppm + 310 pA 24 ppm + 2.6 nA 24 ppm + 25 nA 24 ppm + 250 nA 41 ppm + 820 nA 130 ppm + 130 µA		C
Generation only (Extended range)	1 A to 3 A 3 A to 10 A	700 ppm + 2.1 mA 640 ppm + 6.4 mA		C
	3 A to 30 A 30 A to 100 A 100 A to 150 A 150 A to 500 A	0.10 % 0.091 % 0.10 % 0.091 %	Using multi turned coil, suitable only for calibration of clamp-on ammeters.	C
AC Current	1 µA to 100 µA 1 kHz	0.080 % + 36 nA		C
	100 µA to1 mA 1 kHz	0.080 % + 250 nA		
	1 mA to 10 mA 45 Hz to 1 kHz	0.11 % + 2.5 µA		
	10 mA to 100 mA 45 Hz to 1 kHz	0.11 % + 24 µA		
	100 mA to 1 A 45 Hz to 1 kHz	0.15 % + 250 □A		
Generation only (Extended range and frequency)	30 µA to 300 µA 10 Hz to 3 kHz	0.090 % + 350 nA		C
	300 µA to 3 mA 10 Hz to 3 kHz	0.090 % + 350 nA		
	3 mA to 30 mA 10 Hz to 3 kHz	0.090 % + 25 µA		
	30 mA to 300 m A 10 Hz to 3 kHz	0.10 % + 280 µA		
	300 mA to 3 A 10 Hz to 3 kHz	0.10 % + 560 □A		
	3 A to 10 A 10 Hz to 3 kHz	0.23 % + 23 mA		
	3 A to 150 A 10 Hz to 100 Hz	0.17 %	Simulation	
	100 A and 500 A 10 Hz to 100 Hz	0.33 %		

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (Cont'd)				C
AC Current (Cont'd)				C
Generation only (Extended range and frequency) (cont'd)	100 A to 150 A 10 Hz to 100 Hz	0.17 %		
	150 A to 500 A 10 Hz to 100 Hz	0.33 %		
Temperature indicators and recorders, calibration by electrical simulation			Including reference junction compensation	C
Type J	- 210 °C to -100 °C - 100 °C to + 1200 °C	0.32 °C 0.15 °C		C
Type K	- 270 °C to - 250 °C - 250 °C to - 100 °C - 100 °C to + 1370 °C	3.8 °C 1.0 °C 0.13 °C		C
Type N	- 270 °C to - 200 °C - 200 °C to - 100 °C - 100 °C to 1370 °C	3.9 °C 0.39 °C 0.18 °C		C
Type R	600 °C to 1760 °C	1.5 °C		C
Type S	700 °C to 1700 °C	1.6 °C		C
Type T	- 270 °C to - 200 °C - 200 °C to - 100 °C - 100 °C to 0 °C 0 °C to 400 °C	4.1 °C 0.52 °C 0.30 °C 0.21 °C		C
Resistance Thermometers				C
Pt 100	- 0200 ºC to 0 ºC 0 ºC to 850 ºC	4.0 mºC 17 m ºC		
FREQUENCY				C
Frequency reference	10 MHz	8.2 in 10^{12}		C
Generation	1 Hz to 120 MHz	16 in 10^{11}		C
Measurement	0.1 Hz to 10 Hz 10 Hz to 225 MHz	0.16 µHz 18 in 10^{12}		C
Pulse counting	1 Hz to 100 kHz	1 count		C
Periodic time	1 µs to 10 s	16 ps	Repetitive signals	C

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
VOLUME				D1
Calibration of small volume Provers by water draw method	40 l 60 l	0.031 % 0.035 %	Results are based on dynamic uncertainty, influenced by site conditions, pressure, temperature and calibration medium used.	D1
Calibration of Pipe Provers by master meter and compact prover method				D1
Water And Hydrocarbons	40 l to 20000 l At flow rates of 260 l/min to 2600 l/min	0.031 %		D1
Flow – volume				D1
Water or Hydrocarbons	5 l/min to 6600 l/min	0.031 %	Suitable for the calibration of flow meters with a pulsed output by compact prover method.	D1
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 uncertainty of measurement 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 CIPM-ILAC definition of the CMC is as follows:

A CMC is a calibration and measurement capability available to customers under normal conditions:
(a) as published in the BIPM key comparison database (KCDB) of the CIPM MRA; or
(b) as described in the laboratory's scope of accreditation granted by a signatory to the ILAC Arrangement.

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 CMC is calculated according to the procedures given in M3003 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 CMC in certificates issued under its accreditation.

The CMC may be described using various methods in the Schedule of Accreditation:

As a single value that is valid throughout the range.
As an explicit function of the measurand or of a parameter (see below).
As a range of values. The range is stated such that the customer can make a reasonable estimate of the likely uncertainty at any point within the range.
As a matrix or table where the CMCs depend on the values of the measurand and a further quantity.
In graphical form, providing there is sufficient resolution on each axis to obtain at least two significant figures for the CMC.

Expression of CMCs - symbols and units

In general, only units of the SI and those units recognised for use with the SI are used to express the values of quantities and of the associated CMCs. Nevertheless, other commonly used units may be used where considered appropriate for the intended audience. For example, the term "ppm" (part per million) is frequently used by manufacturers of test and measurement equipment to specify the performance of their products. Terms like this may be used in Schedules of Accreditation where they are in common use and understood by the users of such equipment, providing their use does not introduce any ambiguity in the capability that is being described.

When the CMC is expressed as an explicit function of the measurand or of a parameter, this often comprises a relative term (e.g., percentage) and an absolute term, i.e. one expressed in the same units as those of the measurand. This form of expression is used to describe the capability that can be achieved over a range of values. Some examples are shown below. It should be noted that these expressions are *not* mathematical formulae but are instead written in a commonly used shorthand for expressing uncertainties - therefore, for purposes of clarity, an indication of how they are to be interpreted is also provided below.

DC voltage, 100 mV to 1 V: 0.0025 % + 5.0 µV

Over the range 100 mV to 1 V, the CMC is 0.0025 %·V + 5.0 µV, where V is the measured voltage.

Hydraulic pressure, 0.5 MPa to 140 MPa: 0.0036 % + 0.12 ppm/MPa + 4.0 Pa

Over the range 0.5 MPa to 140 MPa, the CMC is $0.0036\ \%\cdot p + (0.12\cdot 10^{-6}\cdot p\cdot 10^{-6}) + 4.0$ Pa, where p is the measured pressure in Pa.

It should be noted that the percentage symbol (%) simply represents the number 0.01. In cases where the CMC is stated only as a percentage, this is to be interpreted as meaning percentage of the measured value or indication.

Thus, for example, a CMC of 1.5 % means $1.5 \cdot 0.01 \cdot i$, where i is the instrument indication.