Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

0687

Accredited to ISO/IEC 17025:2017

Chell Instruments Limited

Issue No: 047 **Issue date:** 18 August 2021

Folgate House
Folgate Road
North Walsham
Norfolk
NR28 0AJ

Contact: Mr P C A Marks
Tel: +44 (0)1692 500555
Fax: +44 (0)1692 500088
E-Mail: pcm@chell.co.uk
Website: www.chell.co.uk

Calibration performed by the Organisation at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details	Activity	Location code
Address Folgate House Folgate Road North Walsham Norfolk NR28 0AJ **Local contact** Mr P C A Marks	Calibration: Pressure Vacuum Flow (Gas) Temperature Electrical	Lab

Site activities performed away from the locations listed above:

Location details	Activity	Location code
The customer's 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	Calibration: Flow (Gas) Pressure Electrical	Site

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Flow			Calibration of instruments with electrical or frequency output may be undertaken	
Calibration of flow meters Flow rate - gas	0.0010 l/min to 0.010 l/min 0.010 l/min to 0.10 l/min 0.10 l/min to 1 l/min 1 l/min to 10 l/min 10 l/min to 60 l/min 60 l/min to 600 l/min	0.25 % + 0.0025 ml/min 0.25 % + 0.0060 ml/min 0.25 % + 0.060 ml/min 0.25 % + 0.60 ml/min 0.36 % + 2.0 ml/min 0.50 %	Calibration on nitrogen, air, helium or argon	Lab
	100 l/min to 1250 l/min	0.67 % + 2.5 l/min	Dry air up to 7 bar	
	600 l/min to 3600 l/min 3600 l/min to 12500 l/min	0.75 % + 3.8 l/min 0.75 % + 7.1 l/min	Calibration performed using ambient filtered air at or slightly above atmospheric pressure	
Calibration of flow meters Flow rate - gas	0.0010 l/min to 0.010 l/min 0.010 l/min to 0.10 l/min 0.10 l/min to 10 l/min 1.0 l/min to 10 l/min 10 l/min to 30 l/min 30 l/min to 60 l/min 60 l/min to 600 l/min	0.47 % + 0.0030 ml/min 0.47 % + 0.020 ml/min 0.47 % + 0.20 ml/min 0.47 % + 2.0 ml/min 0.47 % + 6.0 ml/min 0.65 % 0.85 %	Calibration on nitrogen, air, helium or argon	Site
	600 l/min to 3600 l/min	1.2 % + 3.8 l/min	Ambient air only	
Vacuum				
Calibration of indicating instruments and gauges	1.0 x 10^{-4} Pa to 6 x 10^{-2} Pa 1.33 x 10^{-2} Pa to 1.33 Pa 1.33 Pa to 13.3 Pa 13.3 Pa to 133 Pa 133 Pa to 1.33 kPa 1.33 kPa to 13.3 kPa 13.3 kPa to 133 kPa	4.7 % + 1.9 x 10^{-5} Pa 0.63 % + 2.7 x 10^{-3} Pa 0.24 % + 1.6 x 10^{-2} Pa 0.28 % + 7.8 x 10^{-2} Pa 0.30 % + 1.7 x 10^{-1} Pa 0.12 % + 2.3 Pa 0.063 % + 6.1 Pa	Calibration performed by direct comparison against reference meters. Calibration of thermionic and gas friction gauges can be undertaken	Lab
Pressure				
<u>Gas Pressure (absolute)</u> Calibration of pressure indication instruments and gauges	1.0 x 10^{-4} Pa to 6 x 10^{-2} Pa 6 x 10^{-2} Pa to 1.33 Pa 1.33 Pa to 13.3 Pa 13.3 Pa to 133 Pa 133 Pa to 1.33 kPa 1.33 kPa to 13.3 kPa 13.3 kPa to 133 kPa	4.7 % + 1.9 x 10^{-5} Pa 0.63 % + 2.7 x 10^{-3} Pa 0.24 % + 1.6 x 10^{-2} Pa 0.28 % + 7.8x 10^{-2} Pa 0.30 % + 1.7 x 10^{-1} Pa 0.12 % + 2.3 Pa 0.063 % + 6.1 Pa	Calibration performed by direct comparison against reference meters.	Lab
Calibration of pressure indication instruments and gauges	1.7 kPa to 379 kPa	0.0026 % + 1.7 Pa	Calibration performed using mercury manometer standard	Lab
Calibration of pressure indication instruments and gauges	8 kPa to 350 kPa 350 kPa to 7 MPa	0.0017 % + 0.20 Pa 0.0025 % + 1.7 Pa	Calibration performed using pneumatic pressure balance	Lab

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Pressure (cont'd)				
Gas Pressure (absolute) (cont'd)				
Calibration of pressure indication instruments and gauges	2.7 kPa to 200 kPa	0.022 % + 35 Pa	Calibration performed using digital pressure transfer standards... Ambient conditions 20°C ± 10°C	Site
Gas Pressure (Gauge)				
Calibration of pressure indication instruments and gauges	0 Pa to 133 Pa 133 Pa to 1.33 kPa	0.085 % + 0.069 Pa 0.094 % + 0.21 Pa	Calibration performed using capacitance diaphragm gauge transfer standards	Lab
Calibration of pressure indication instruments and gauges, and pressure equivalent calibration of dead weight testers	1 kPa to 15 kPa 15 kPa to 60 kPa 60 kPa to 250 kPa 250 kPa to 3500 kPa	0.0075 % + 0.26 Pa 0.0030 % + 1.2 Pa 0.0030 % + 1.6 Pa 0.0038 % + 15 Pa	Calibration performed using digital pressure transfer standards	Lab
Calibration of pressure indication instruments and gauges, and pressure equivalent calibration of dead weight testers	-100 kPa to 278 kPa	0.0025 % + 1.8 Pa	Calibration performed using mercury manometer standard	Lab
Pressure equivalent calibration of dead weight testers	8 kPa to 350 kPa 350 kPa to 7 MPa	0.0017 % + 0.15 Pa 0.0025 % + 1.5 Pa	Calibration performed using pneumatic pressure balance	Lab
Calibration of pressure indication instruments and gauges	1.4 MPa to 14 MPa 14 MPa to 35 MPa 35 MPa to 69 MPa	0.014 % + 1.0 kPa 0.014 % + 2.0 kPa 0.014 % + 4.0 kPa	Calibration performed using digital pressure transfer standards, oil-free N_2 or dry air only	Site
	-90 kPa to 200 kPa 200 kPa to 2 MPa 100 kPa to 7 MPa -4.5 kPa to 4.5 kPa -15 kPa to 15 kPa	0.022 % + 27 Pa 0.015 % + 207 Pa 0.016 % + 610 Pa 0.039 % + 1.7 Pa 0.028 % + 2.0 Pa	Calibration performed using digital pressure transfer standards… Ambient conditions 20°C ± 10°C	
	1.4 MPa to 14 MPa	0.017 % + 16 kPa	…oil-free N_2 or dry air only	Site
	14 MPa to 35 MPa 35 MPa to 69 MPa	0.017 % + 41 kPa 0.017 % + 81 kPa		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Temperature			Calibration by comparison with reference probes in thermal bath	
Platinum resistance thermometers, thermistor systems and resistance sensors with indicators	-20 °C to 19 °C 19 °C to 40 °C 40 °C to 100 °C	0.039 °C 0.024 °C 0.039 °C		Lab
Platinum resistance thermometers	-20 °C to 19 °C 19 °C to 40 °C 40 °C to 100 °C	0.052 °C 0.040 °C 0.052 °C		Lab
Thermocouples with indicators	-20 °C to 100 °C	0.12 °C		Lab
Thermocouples:				
Base Metal	-20 °C to 100 °C	0.28 °C		Lab Lab
Electrical			Calibration performed by direct comparison against reference meters.	
DC Voltage (measure)	0 mV to 120 mV 120 mV to 1.2 V 1.2 V to 12 V 12 to 100 V	0.0018 % + 2.7 µV 0.0016 % + 5.0 µV 0.0016 % + 41 µV 0.0019 % + 0.33 mV		Lab
DC Voltage (generate)	0 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 to 100 V	0.0035 % + 2.9 µV 0.0035 % + 12 µV 0.0035 % + 120 µV 0.0035 % + 1.2 mV		Lab
DC Current (measure)	0 mA to 10 mA 10 mA to 100 mA	0.014 % + 83 nA 0.014 % + 0.22 µA		Lab
DC Current (generate)	0 mA to 100 mA	0.0099 % + 1.2 µA		Lab
DC Resistance (measure & generate)	0 Ω to 120 Ω 120 Ω to 1.2 kΩ 1.2 kΩ to 12 kΩ 12 kΩ to 120 kΩ	0.0084 % + 1.3 mΩ 0.0045 % + 3.5 mΩ 0.0045 % + 35 mΩ 0.0045 % + 0.35 Ω		
Frequency & Period (measure)	1 Hz to 10 MHz	5.8 in 10^7		Lab
Time Interval (measure)	240 s to 60,000 s	0.0050 % + 0.14 s	Manual trigger for calibration of flow totalisers and rate of climb indicators	Lab

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Temperature Simulation			Calibration by electrical simulation.	
Temperature indicators and simulators:				
Base metal thermocouples	-100 °C to 1300 °C -100 °C to 1300 °C	0.10 °C 0.25 °C	Excluding CJC Including CJC	Lab
Type S & R thermocouples	0 °C to 1750 °C 0 °C to 1750 °C	0.50 °C 0.55 °C	Excluding CJC Including CJC	
RTD (Pt100)	-50 °C to 400 °C 400 °C to 850 °C	0.034 °C 0.062 °C		Lab
Electrical - site			Calibration performed by direct comparison against reference meters.	
DC Voltage (measure & generate)	-10 mV to 100 mV 100 mV to 2 V 2 V to 12 VDC	0.016 % + 12 µV 0.0082 % + 12 µV 0.012 % + 500 µV		Site
DC Current (measure & generate)	0 mA to 24 mA	0.020 % + 1.4 µA		Site
DC Resistance (measure & generate)	0 Ω to 400 Ω 400 Ω to 4 kΩ	0.010 % + 0.014 Ω 0.069 % + 0.21 Ω		Site
Temperature Simulation - site			Calibration by electrical simulation.	
Temperature indicators and simulators:				
Base metal thermocouples	0 °C to 1300 °C 0 °C to 1300 °C	0.42 °C 0.62 °C	Excluding CJC Including CJC	Site
RTD (Pt100)	0 °C to 400 °C 400 °C to 850 °C	0.085 °C 0.092 °C		Site
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: $Q[a, b] = [a^2 + b^2]^{1/2}$