Laboratory Accreditation Programmes

Schedule to

CERTIFICATE OF ACCREDITATION

Laboratory	Total Calibration Ltd
Address	PO Box 76769, Manukau City, Auckland, 2241 293 Patumahoe Rd, RD 3, Pukekohe, Auckland, 2678
Telephone	021 143-7907
URL	www.totalcal.co.nz
Authorised Representative	Mr Mike Horner Owner and General Manager
Client No.	9726
Programme	Metrology & Calibration Laboratory
Accreditation Number	1346
Initial Accreditation Date	23 December 2019
Conformance Standard	ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories
Testing Services Summary	4.55 Pipes, Hoses, Valves and Fittings 5.21 Masses 5.22 Precision Laboratory Balances 5.23 Industrial Balances 5.31 Volumetric Equipment 5.35 Hygrometry 5.42 Differential Pressure Measuring Devices 5.44 Pressure and Vacuum Measurement 5.61 Temperature Measuring Equipment 5.63 Temperature controlled enclosures 5.68 Optical Properties of Materials: Spectral 5.70 Optical Instruments 5.91 Frequency Measurement and Time Measurement
Signatories	Mr Mike Horner — 4.55, 5.21, 5.22, 5.23, 5.31, 5.35, 5.42, 5.44, 5.61, 5.63, 5.68, 5.70, 5.91

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Calibration and Measurement Capabilities (CMC) Uncertainties are expressed as an expanded uncertainty with a level of confidence of approximately 95 % (k = 2) Note1.

Measurement results are traceable to the International System of Units (SI) via an unbroken chain of comparisons to the New Zealand National Standards or to the National Standards of other Signatories to the CIPM MRA.

Calibrations are performed on-site at the customer's premises or in the laboratory unless otherwise stated that it is a laboratory only service.

4.55 Pipes, Hoses, Valves and Fittings

Pressure relief valve testing to an in-house method up to 25 bar.

5.21 Masses

(a) Examination of laboratory standards of mass
(b) Examination of industrial standards of mass

In accordance with an in-house procedure based on the Measurement Standards Laboratory of New Zealand (MSL) Technical Guide 7 and OIML R 111-1

Maximum nominal value	CMC Uncertainty
1 mg to 10 g	15 µg
10 g to 200 g	6 µg/g
200 g to 200 kg	25 µg/g

5.22 Precision Laboratory Balances

Examination of the performance of precision laboratory balances having a nominal measurement uncertainty not exceeding 1 part in 100,000 of maximum capacity to an in-house method based on MSL Technical Guide 25 and OIML R111-1

Maximum nominal value	CMC Uncertainty
1 mg to 10 g	15 µg
10 g to 200 g	6 µg/g
200 g 200 kg	25 µg/g

5.23 Industrial Balances

Examination of the performance of industrial balances having a nominal measurement uncertainty exceeding 1 part in 100,000 of maximum capacity to an in-house method based on MSL Technical Guide 25 and OIML R111-1

CMCs as for class 5.22

5.31 Volumetric Equipment

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(a) Examination of laboratory volumetric glassware including examination for compliance with the Class A or Class B requirements of the relevant national or international standards

Volume	CMC Uncertainty
i) Calibration of piston-operated volume apparatus in accordance with an in-house method based on ISO 8655.2 Piston pipettes and MSL Technical Guide 30.	
0.1 µL to 10 µL	0.04 µL
10 µL to 1 mL	0.12 µL
1 mL to 10 mL	0.21 µL
ii) Other one and multiple mark glassware	
0.5 mL to 5 L	0.2 %

5.35 Hygrometry

(a) Humidity measuring devices

By comparison with a chilled mirror hygrometer to an in-house method. Carried out at the laboratory only.

Relative Humidity		CMC Uncertainty
At 10 °C	43 % to 60 %	0.7 %
	60 % to 75 %	0.9 %
	75 % to 90 %	1.1 %
At 20 °C	25 % to 45 %	0.5 %
	45 % to 60 %	0.7 %
	60 % to 75 %	0.8 %
	75 % to 90 %	1.0 %
At 30 °C	12 to 30 %	0.4 %
	30 to 45 %	0.5 %
	45 to 60 %	0.7 %
	60 to 75 %	0.8 %
Dew point		
-3 °C to 25 °C		0.34 °C

(b) Environmental chambers

Spatial measurements using RH loggers to an in-house method. Carried out on-site or in the laboratory

12 % to 90 % (temperature range 10°C to 30°C)	CMC uncertainties as for Relative Humidity CMCs above

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5.42 Differential Pressure Measuring Devices

(c) Transducers and transmitters
(d) Other types

Calibration of mechanical and digital differential pressure gauges in accordance with an in-house method by comparison with reference gauges which pressurises the high pressure port only leaving the low pressure port open to atmosphere. Note that actual vacuum achievable will depend on ambient conditions at the time of measurement.

Pressure	CMC Uncertainty
-100 kPa to 0 kPa	1 kPa
0 Pa to 200 Pa	1.3 Pa
0.2 kPa to 2400 kPa	0.5 % of applied pressure (in Pa)

5.44 Pressure and Vacuum Measurement

(a) Pressure gauges
(b) Vacuum gauges
(c) Pressure transducers
(d) Pressure recorders

In accordance with an in-house method by comparison with reference gauges. Note that actual vacuum achievable will depend on ambient conditions at the time of measurement.

Gauge pressure	CMC Uncertainty
-100 kPa to 0 kPa	1 kPa
0 Pa to 200 Pa	1.3 Pa
0.2 kPa to 2400 kPa	0.5 % of applied pressure (in Pa)
Absolute pressure	
0 kPa to 2500 kPa	2.5 kPa

5.61 Temperature Measuring Equipment

(including temperature calibration of electronic and glass thermometers)

(d) Germanium thermometers
(e) Thermistors and other semi-conductor thermometers
(f) Liquid-in-glass thermometers
(j) Radiation thermometers (including infrared thermometers)
(m) Bimetallic systems
(o) Indicators, recorders and controllers
(p) Other direct reading temperature measuring equipment

Contact thermometry by comparison with reference thermometers to in-house methods

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Temperature	Medium	CMC Uncertainty
-196 °C to -110 °C	In air	0.15 °C
-110 °C to -25 °C	Dry block	0.11 °C
-25 °C to 0 °C	Dry block	0.08 °C
Ice point		0.01 °C
0 °C to 30 °C	Liquid	0.05 °C
30 °C to 75 °C	Liquid	0.04 °C
75 °C to 140 °C	Dry block	0.05 °C
140 °C to 400 °C	Dry block	0.15 °C
400 °C to 650 °C	Dry block	3.3 °C
650 °C to 1050 °C	Air furnace	3.9 °C

Non-contact thermometry by comparison with reference thermometers in black body bath inserts to in-house methods

Temperature	CMC Uncertainty
-25 °C to 75 °C	0.2 °C

5.63 Temperature Controlled Enclosures

(a) Ovens and furnaces (including autoclaves)
(b) Baths
(e) Conditioning rooms and cabinets

Spatial measurements using temperature loggers or thermocouples to an in-house method. CMCs represent the uncertainties in the reference thermometer(s) used to calibrate survey probes.

Temperature	CMC Uncertainty
Using dataloggers	
-35 °C to -20 °C	0.09 °C
-20 °C to 0 °C	0.07 °C
0 °C to 100 °C	0.05 °C
Using thermocouples	
-196 °C to -80 °C	0.32 °C
-80 °C to 10 °C	0.25 °C
10 °C to 110 °C	0.3 °C
110 °C to 190 °C	0.4 °C
190 °C to 250 °C	0.5 °C

250 °C to 330 °C	0.7 °C
330 °C to 420 °C	1.0 °C
420 °C to 650 °C	2.0 °C
650 °C to 810 °C	3.0 °C
810 °C to 950 °C	4.0 °C
950 °C to 1050 °C	4.9 °C

5.68 Optical Properties of Materials: Spectral

(a) Regular transmittance and absorbance

Calibration of UV and visible light Spectrophotometers to an in-house method

i)	Wavelength calibration range (nominal values)	Wavelength CMC Uncertainty
	190 nm to 1100 nm	0.23 nm
ii)	Photometric calibration range	Absorbance CMC Uncertainty
	250 nm to 900 nm	0.004
iii)	Hetero-chromatic stray light	Absorbance CMC Uncertainty
	Measured at 240 nm by filter	0.11
	Measured at 340 nm by filter	0.11
iv)	Iso-chromatic stray light	Absorbance CMC Uncertainty
	Measured at 240 nm by filter	0.11

5.70 Optical Instruments

(f) Saccharimeters and equivalent instruments (including refractometers)

Refractive index by comparison with reference materials

	CMC Uncertainty
0 °Brix to 84 °Brix	0.45 °Brix

(h) Turbidity meters

Calibration of turbidity meters using proprietary pre-prepared formazin solutions in accordance with USEPA 180.1 and an in-house modification of APHA 2130B

Nephelometric Turbidity Unit (NTU)	CMC Uncertainty
20 NTU	4.8 %
200 NTU	4.8 %
1000 NTU	4.8 %
4000 NTU	4.8 %

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5.91 Frequency Measurement and Time Measurement

(d) Time interval meters (stopwatches and timers) to an in-house method

	CMC Uncertainty
Time interval	0.54 s

(f) Stroboscopes

Measurement of rotational velocity of centrifuges and other rotating machines by means of an optical tachometer to an in-house method

	CMC Uncertainty
15 rpm to 999.9 rpm	0.8 rpm
1000 rpm to 5000 rpm	1.8 rpm
5000 rpm to 10000 rpm	3.1 rpm
10000 rpm to 20000 rpm	5.5 rpm
20000 rpm to 96000 rpm	24.5 rpm

Where rpm = revolutions per minute

Note 1:
Unless stated otherwise the CMC is based on the performance of the best commercially available device and measurement uncertainties achieved for specific calibrations may be greater than the CMC. A laboratory may not report measurement uncertainties lower than its CMC Uncertainty. However, if the device under calibration has a greater accuracy than the device used to calculate the CMC the laboratory may be able to use the calibration data to lower its CMC Uncertainty. Please contact the laboratory to discuss your specific requirements.

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