



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

VACS Ltd.
15 Regan Road, Unit 6
Brampton, ON L7A 1E3 Canada
(and satellite locations as shown on the scope)

Fulfills the requirements of

ISO/IEC 17025:2017

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

In the field of

CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

A handwritten signature in black ink, appearing to be 'J. Stine', is positioned above a horizontal line.

Jason Stine, Vice President

Expiry Date: 29 July 2025

Certificate Number: AC-1402



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory
quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AND

ANSI/NCSL Z540-1-1994 (R2002)

VACS Ltd.

15 Regan Road, Unit 6
Brampton, ON L7A 1E3
Derek Magee 905-840-7651
Derekmagee.vacs@calibrations.ca

CALIBRATION

Valid to: **July 29, 2025**

Certificate Number: **AC-1402**

Satellite locations in:

Edmonton, AB Canada

Burnaby, BC Canada

Accredited Services performed at Main Site Laboratory

VACS Ltd.

15 Regan Road, Unit 6
 Brampton, ON L7A 1E3
 Derek Magee 905-840-7651
 derekmagee@calibrations.ca

Electrical – DC/Low Frequency

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Measure ¹	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	1.6 µV 10 µV 0.3 mV 1.6 mV 30 mV	Agilent 3458A 8.5 Digit Multimeter
DC Voltage – Source ¹	Up to 20 mV (20 to 200) mV (0.2 to 2) V (2 to 20) V (20 to 200) V (200 to 1 000) V	6.1 µV 0.13 mV 40 µV 0.43 mV 4.3 mV 40 mV	Fluke 5100B Multifunction Calibrator, Agilent 3458A 8.5 Digit Multimeter
DC Current – Measure ¹	Up to 100 µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	4.3 nA 40 nA 0.39 µA 6.3 µA 0.19 mA	Agilent 3458A 8.5 Digit Multimeter
DC Current – Source ¹	Up to 200 µA (0.2 to 2) mA (2 to 20) mA (20 to 200) mA (0.2 to 1) A	30 nA 0.18 µA 2.2 µA 50 µA 0.2 mA	Fluke 5100B Multifunction Calibrator, Agilent 3458A 8.5 Digit Multimeter
Resistance – Measure ¹	(1 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ	16 µΩ/Ω + 87 µΩ 19 µΩ/Ω + 0.25 mΩ 10 µΩ/Ω + 2.1 mΩ 11 µΩ/Ω + 12 mΩ 11 µΩ/Ω + 0.12 Ω 22 µΩ/Ω + 1.2 Ω 92 µΩ/Ω + 23 Ω	Agilent 3458A 8.5 Digit Multimeter



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment		
Resistance – Source ¹ (Simulation-Fixed Points)	1 Ω	0.29 mΩ	Fluke 5100B Multifunction Calibrator (6-months)		
	10 Ω	1.2 mΩ			
	100 Ω	6.3 mΩ			
	1 kΩ	60 mΩ			
	10 kΩ	0.63 Ω			
	100 kΩ	6.1 Ω			
	1 MΩ	0.12 kΩ			
Resistance – Source ¹ (Fixed Artifacts)	1 Ω	0.64 mΩ	GR 1440 Resistors		
	10 Ω	1.2 mΩ	Vishay S102K Resistors		
	100 Ω	6.5 mΩ			
	1 kΩ	62 mΩ			
Electrical Calibration of Thermocouple Indicating Devices – Source/Measure ¹	Type E (-20 to 1 000) °C	0.3 °C	Fluke Process Calibrator		
	Type J (-210 to 1 200) °C	0.3 °C			
	Type K (-200 to 1 372) °C	0.4 °C			
	Type N (-200 to 1 300) °C	0.6 °C			
	Type T (-200 to 1 300) °C	0.4 °C			
	Type R, S (0 to 1 767) °C	1.1 °C			
	Electrical Simulation of RTD Indicating Devices – Source ¹	100 Ω, Pt 385 (-200 to 0) °C		0.1 °C	Fluke Process Calibrator
(0 to 400) °C		0.2 °C			
(400 to 800) °C		0.4 °C			
1 000 Ω, Pt 385 (-200 to 0) °C		0.1 °C			
(0 to 400) °C		0.2 °C			
(400 to 800) °C		0.4 °C			
100 Ω, Pt 3926 (-200 to 0) °C		0.1 °C			
(0 to 630) °C		0.2 °C			
100 Ω, Pt 3916 (-200 to 0) °C		0.1 °C			
(0 to 630) °C		0.2 °C			
Resistance Thermometers ¹ (Artifacts)		(10 to 400) Ω	6 mΩ	Resistance Standards	

Length – Dimensional Metrology

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2}	Up to 24 in	$(289 + 7.3L) \mu\text{in}$	Gauge Blocks, Micrometer Setting Standards
Outside Micrometer ^{1,2}	Up to 6 in	$(32 + 14L) \mu\text{in}$	Grade 2 Gauge Blocks
Gauge Blocks ¹	Up to 4 in (200 mm)	40 μin (1 μm)	Grade 2 Gauge Blocks, Heidenhain MT60, MT2581 Length Gauge, Comparator Stand
Length Gauges, Indicators ¹ 1 μin resolution	(0 to 0.062 5) in (0 to 0.125) in (0 to 0.2) in (0 to 0.25) in (0 to 0.3) in (0 to 0.5) in (0 to 1) in	3 μin 4 μin 6 μin 8 μin 9 μin 15 μin 29 μin	Grade 2 Gage Blocks, Comparator Stand
Length Gauges, Indicators ¹ (Mounted in stands or custom fixtures) 500 μin resolution 1 000 μin resolution	(0 to 1) in (0 to 1) in	335 μin 600 μin	Grade 2 Gauge Blocks, Comparator Stand
Measuring Microscope ¹	Up to 5 mm	0.96 μm	Stage Micrometer
Displacement Transducer ¹	Up to 5 in (5 to 40) in	600 μin 0.1 % of reading	Height Gauge
Optical Comparators ^{1,2} X-Y Length	Up to 50 mm	5 μm	Glass Scale Angle Blocks
Angle	Up to 90°	0.5'	
Material Testing Machine ^{1,2} Displacement	(0.01 to 0.4) in (0.4 to 40) in	600 μin $(600 + 200L) \mu\text{in}$	ASTM E2309; Height Gauge, MT25B Heidenhain Length Gauge;
Speed	(0.01 to 20) in/min	0.5 % of reading	ASTM E2658; Timer



ANSI National Accreditation Board

Length – Dimensional Metrology

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Extensometer, Type 1 Strain ^{1,2}	Gauge length of 0.5 in: (0.06 to 1) in/in (0.002 to 0.06) in/in Gauge length of 1 in : (0.025 to 1) in/in (0.001 to 0.025) in/in Gauge length of 2 in : (0.000 5 to 0.5) in/in	(64 + 715L) μin/in 88 μin/in (27 + 300L) μin/in 40 μin/in (17 + 126L) μin/in	Extensometer Calibrator; ASTM E83
Extensometer, Type 1 Gauge Length ¹	(0.5 to 2) in	400 μin	Extensometer Calibrator; ASTM E83
Torque Drive Arms ¹ (2-point Dimensional Measurement)	(4 to 60) in	0.1 % of arm length	Height Gauge, 60 in Steel Rule, Length Standards
Protractors, Inclinometers ²	Up to 90°	0.5'	Angle Blocks, Surface Plate
Stage Micrometers	Up to 25 mm	2 μm	Heidenhain Length Gauge
Length Scale, Ruler ²	(25 to 300) mm	(0.4 + 0.064L) μm	Heidenhain Length Gauge

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Aircraft Wheel Scales ¹	(1 to 100 000) lbf	0.05 % of reading	Dead Weight Machine, Loading Weights, Secondary Standards
Force Testing Machines, Force Measuring Systems ¹ Tension	1 gf to 471 kgf (1 to 500 000) lbf	0.25 % of reading	Loading Weights, Reference Standard Load Cells; ASTM E4
Compression	1 gf to 471 kgf (1 to 2 000 000) lbf	0.25 % of reading	
Load Cells ¹	1 gf to 471 kgf	0.005 % of reading	Loading Weights; ASTM E74



ANSI National Accreditation Board

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Gages, Crane Scales, Dynamometers, Load Cells ¹ (Tension and Compression)	(10 to 1 040) lbf (1 000 to 500 000) lbf	0.01 % of reading 0.05 % of reading	Dead Weight Machine, Calibration Load Frames with Secondary Standards; ASTM E74
Liquid Flow	(4 to 40) lph	0.75 % of reading	Digital Balance, Stop Watch, Thermometer, Distilled Water
Analytical Balances ^{1,3}	Up to 10 g (10 to 200) g 200 g to 35 kg 200 g to 220 kg	60 µg 0.12 mg 0.000 25 % of reading 0.000 2 % of reading	ASTM E617 Class 1, OIML Class F1, NIST Class F Weights and NIST Handbook 44 utilized for calibration of the weighting system.
Conventional Mass ¹ (non-integral weights) (SI)	(1 to 100) kg	0.003 % of reading	Electronic Balances, ASTM E617 Class 0 and Class 1 Weights
Conventional Mass ¹ (Avoirdupois)	(0.01 to 0.05) lb (0.05 to 5) lb (5 to 220) lb	23 mg/lb 4.5 mg/lb 14 mg/lb	Electronic Balances, NIST Class F1 Weights



ANSI National Accreditation Board

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conventional Mass ¹ (SI)	1 mg	8.8 µg	Electronic Balances, ASTM E617 Class 0 and Class 1 Weights
	2 mg	8.8 µg	
	3 mg	8.8 µg	
	5 mg	8.8 µg	
	10 mg	8.8 µg	
	20 mg	8.8 µg	
	30 mg	8.8 µg	
	50 mg	8.8 µg	
	100 mg	8.8 µg	
	200 mg	8.8 µg	
	300 mg	8.8 µg	
	500 mg	8.8 µg	
	1 g	10 µg	
	2 g	11 µg	
	3 g	23 µg	
	5 g	23 µg	
	10 g	44 µg	
	20 g	39 µg	
	30 g	50 µg	
	50 g	50 µg	
100 g	68 µg		
200 g	0.28 mg		
300 g	1.3 mg		
500 g	1.3 mg		
1 kg	1.5 mg		
Conventional Mass ¹ (SI)	2 kg	12 mg	Electronic Balances; ASTM E617 Class 0 and Class 1 Weights
	3 kg	12 mg	
	5 kg	0.12 g	
	10 kg	0.12 g	
	20 kg	0.35 g	
Deadweight Testers Effective Area	(0.01 to 0.5) in ²	0.033 % of reading	Ametek DWT (PK-854, HK-1000, R-50)
Dead Weights	(0.01 to 10) lb	0.005 % of reading	Electronic Balance, ASTM E617 Class 1 Weights
Pressure Calibrators ¹	(4 to 854) in H ₂ O	0.033 % of reading	Ametek DWT (PK-854, HK-1000, R-50)
	(30 to 1 000) psig	0.014 % of reading	
	(1 000 to 10 000) psig	0.033 % of reading	

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure Indicators, Pressure Gauges ¹	Up to 1 in H ₂ O Up to 5 psig Up to 30 psig Up to 500 psig (100 to 1 000) psig (1 000 to 10 000) psig	0.005 in H ₂ O 0.002 5 psi 0.015 psi 0.05 psi 0.015 % of reading 0.015 % of reading	Ametek DWT (PK-854, HK-1000, R-50)
Vacuum Devices ¹	Up to 28 inHg	0.042 inHg	MKS 270B Signal Conditioner with MKS 390HA/270 Vacuum Gauge
Absolute Pressure ¹	0 torr	0.000 1 % of reading	MKS PVS-6/Ion Gauge
Absolute Pressure ¹	(1 to 10) torr (100 to 1 000) torr	0.08 % of reading 0.08 % of reading	MKS 390HA/270 Vacuum Gauge
Torque Testers, Analyzers, Transducers ¹	(8 to 36) lbf·in (40 to 300) lbf·in (22 to 651) lbf·ft	0.19 % of reading 0.19 % of reading 0.19 % of reading	ASTM E2428; Torque Arms, Loading Weights
Torque Wrenches ¹	(8 to 36) lbf·in (40 to 300) lbf·in (22 to 651) lbf·ft	0.75 % of reading 0.75 % of reading 0.75 % of reading	ASTM E2624; Torque Testers
Direct Verification of Hardness Testing Machines ¹ Verification of Test Force	(1 to 3 000) kgf	0.25 % of reading	ASTM E10, ASTM E18, ASTM E92, ASTM E384 Working Force Standards
Verification of the Indentation Measuring System	(0.01 to 5) mm	1 μm	Stage Micrometer
Deflection Measuring System	(0.025 to 0.05) mm	0.1 μm	Gauge Blocks

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers ¹	(< 70) HRA	0.28 HRA	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(≥ 70 and < 80) HRA	0.17 HRA	
	(≥ 80) HRA	0.16 HRA	
	(< 60) HRBW	1.4 HRBW	
	(≥ 60 to < 88) HRBW	0.87 HRBW	
	(≥ 88) HRBW	0.42 HRBW	
	(< 35) HRC	0.4 HRC	
	(≥ 35 to < 60) HRC	0.36 HRC	
	(≥ 60) HRC	0.32 HRC	
	(< 51) HRD	0.27 HRD	
	(≥ 51 to < 71) HRD	0.26 HRD	
	(≥ 71) HRD	0.18 HRD	
	(< 84) HREW	0.54 HREW	
	(≥ 84 to < 93) HREW	0.54 HREW	
	(≥ 93) HREW	0.54 HREW	
	(< 80) HRFW	0.54 HRFW	
	(≥ 80 to < 94) HRFW	0.4 HRFW	
	(≥ 94) HRFW	0.4 HRFW	
	(< 55) HRGW	0.76 HRGW	
	(≥ 55 to < 80) HRGW	0.36 HRGW	
(≥ 80) HRGW	0.36 HRGW		
(< 96) HRHW	0.54 HRHW		
(≥ 96) HRHW	0.41 HRHW		
(< 65) HRKW	0.64 HRKW		
(≥ 65 to < 85) HRKW	0.4 HRKW		
(≥ 85) HRKW	0.4 HRKW		
(90 to 114) HRLW	0.36 HRLW		
(115 to 130) HRL W	0.36 HRLW		
(70 to 99) HRMW	0.56 HRMW		
(100 to 130) HRMW	0.56 HRMW		



ANSI National Accreditation Board

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	(40 to 84) HRPW	0.91 HRPW	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(85 to 130) HRPW	0.65 HRPW	
	(100 to 119) HRRW	0.41 HRRW	
	(120 to 130) HRRW	0.24 HRRW	
	(110 to 111) HRSW	0.95 HRSW	
	(112 to 130) HRSW	0.2 HRSW	
	(80 to 103) HRVW	0.95 HRVW	
	(104 to 130) HRVW	0.2 HRVW	
	(< 78) HR15N	0.39 HR15N	
	(≥ 78 to < 90) HR15N	0.19 HR15N	
	(≥ 90) HR15N	0.19 HR15N	
	(< 55) HR30N	0.55 HR30N	
	(≥ 55 to < 77) HR30N	0.28 HR30N	
	(≥ 77) HR30N	0.28 HR30N	
	(< 37) HR45N	0.43 HR45N	
	(≥ 37 to < 66) HR45N	0.22 HR45N	
(≥ 66) HR45N	0.19 HR45N		
(< 81) HR15TW	0.37 HR15TW		
(≥ 81 to < 87) HR15TW	0.21 HR15TW		
(≥ 87) HR15TW	0.21 HR15TW		
(< 57) HR30TW	0.9 HR30TW		
(≥ 57 to < 70) HR30TW	0.66 HR30TW		
(≥ 70) HR30TW	0.39 HR30TW		
(< 33) HR45TW	0.73 HR45TW		
(≥ 33 to < 53) HR45TW	0.41 HR45TW		
(≥ 53) HR45TW	0.41 HR45TW		

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	(80 to 88) HR15WW (89 to 100) HR15WW	0.67 HR15WW 0.67 HR15WW	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(40 to 64) HR30WW (65 to 100) HR30WW	0.9 HR30WW 0.76 HR30WW	
	(10 to 47) HR45WW (48 to 100) HR45WW	0.3 HR45WW 0.13 HR45WW	
	(80 to 87) HR15XW (88 to 100) HR15XW	0.62 HR15XW 0.33 HR15XW	
	(60 to 78) HR30XW (79 to 100) HR30XW	0.99 HR30XW 0.15 HR30XW	
	(40 to 68) HR45XW (69 to 100) HR45XW	0.81 HR45XW 0.35 HR45XW	
	(85 to 93) HR15YW (94 to 100) HR15YW	1.3 HR15YW 0.63 HR15YW	
	(60 to 87) HR30YW (88 to 100) HR30YW	0.82 HR30YW 0.37 HR30YW	
	(60 to 81) HR45YW (82 to 100) HR45YW	0.94 HR45YW 0.3 HR45YW	
	Rockwell Superficial Hardness Testers ¹	1/62.5 (200 to 400) HBW (400 to 600) HBW	
2.5/187.5 (200 to 400) HBW (400 to 600) HBW		6.2 HBW 15 HBW	
10/500 (20 to 100) HBW (100 to 150) HBW		1 HBW 1.5 HBW	

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment		
Brinell Hardness Testers ¹	5/1 000 (200 to 400) HBW (400 to 600) HBW	4 HBW 8 HBW	Indirect verification per ASTM E10 using Brinell Test Blocks and Brinell Scope		
	10/1 000 (200 to 400) HBW (400 to 600) HBW	3.3 HBW 7 HBW			
	10/1 500 (200 to 400) HBW (400 to 600) HBW	2.7 HBW 6.5 HBW			
	10/2 000 (200 to 400) HBW (400 to 600) HBW	2.2 HBW 5.2 HBW			
	10/2 500 (200 to 400) HBW (400 to 600) HBW	2 HBW 4.4 HBW			
	10/3 000 (200 to 400) HBW (400 to 600) HBW	1.9 HBW 4.9 HBW			
	Vickers Hardness Testers ¹ ≥ 1 kgf	HV 1 200 HV 400 HV 700 HV		4.1 HV 8 HV 18 HV	Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
		HV 2 200 HV 400 HV 700 HV		3 HV 8 HV 14 HV	
		HV 5 200 HV 400 HV 700 HV		3 HV 6 HV 11 HV	

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vickers Hardness Testers ¹ ≥ 1 kgf	HV 10		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HV	3 HV	
	400 HV	6 HV	
	700 HV	11 HV	
	HV 20		
	200 HV	3 HV	
	400 HV	6 HV	
	700 HV	11 HV	
	HV 30		
	200 HV	3 HV	
	400 HV	4 HV	
	700 HV	7 HV	
	HV 50		
	200 HV	3 HV	
	400 HV	4 HV	
	700 HV	7 HV	
	HV 0.01		
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.025		
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
HV 0.05			
200 HV	10 HV		
400 HV	20 HV		
700 HV	35 HV		
HV 0.1			
200 HV	8 HV		
400 HV	20 HV		
700 HV	35 HV		
HV 0.2			
200 HV	8 HV		
400 HV	18 HV		
700 HV	35 HV		

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vickers Hardness Testers ¹ < 1 kgf	HV 0.3		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HV	5 HV	
	400 HV	14 HV	
	700 HV	24 HV	
	HV 0.5		
	200 HV	5 HV	
	400 HV	12 HV	
	700 HV	24 HV	
	HV 1		
	200 HV	4 HV	
	400 HV	8 HV	
	700 HV	17 HV	
Knoop Micro-Indentation Hardness Testers ¹	HK 0.01		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HK	7 HK	
	400 HK	16 HK	
	700 HK	33 HK	
	HK 0.025		
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	22 HK	
	HK 0.05		
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	20 HK	
	HK 0.1		
	200 HK	7 HK	
	400 HK	12 HK	
	700 HK	19 HK	
	HK 0.2 and 0.3		
	200 HK	5 HK	
	400 HK	8 HK	
	700 HK	17 HK	
	HK 0.5 and 1		
	200 HK	5 HK	
	400 HK	7 HK	
	700 HK	15 HK	
Leebs Hardness Tester ¹	(600 to 670) LD	9 LD	Indirect verification per ASTM A956 using Hardness Test Blocks

Mass and Mass Related

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Durometer ¹ (Types A, B, C, D, DO, E, M, O, OO) Force	Up to 44.5 N	0.06 N	Partial Direct Verification per ASTM D2240 using Balance
Indenter Deflection	Up to 3.57 mm	2.3 μm	Gauge Blocks, Transducer

Thermodynamic

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Source ¹	0 °C	0.01 °C	Ice Bath, Secondary Standard PRT, Instrulab 4312A Thermometer
Temperature – Source ¹	(-78 to 200) °C	0.1 °C	Baths, Secondary Standard PRT, Instrulab 4312A Thermometer
Temperature – Source ¹	(150 to 660) °C	1.2 °C	Dry Block, Standard PRT, Instrulab 4312A Thermometer
Temperature – Measure ¹	(-78 to 660) °C	0.05 °C	Secondary Standard PRT, Instrulab 4312A Thermometer
Temperature – Measure ¹	(660 to 1 200) °C	5.5 °C	Type N Thermocouple Probe, Fluke 744 Process Calibrator
Dry-well Calibrators ¹	(-78 to 660) °C	0.5 °C	Secondary Standard PRT, Instrulab 4312A Thermometer
PRT/RTD Probes ¹	(-78 to 660) °C	0.1 °C	Ice Bath, Liquid baths, Dry Block Calibrator, Secondary Standard PRT, Instrulab 4312A Thermometer

Thermodynamic

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple Probes ¹	(-78 to 660) °C	0.5 °C	Ice Bath, Liquid baths, Dry Block Calibrator, Secondary Standard PRT, Instrulab 4312A Thermometer
Liquid-in-Glass Thermometers ¹	(-78 to 200) °C	0.1 °C	Ice Bath, Liquid baths, Dry Block Calibrator, Secondary Standard PRT, Instrulab 4312A Thermometer
Radiation (Infrared) Thermometers ¹	0 °C 100 °C 200 °C 300 °C 400 °C 500 °C	0.34 °C 0.7 °C 1.1 °C 1.3 °C 1.7 °C 2 °C	Radiometric Method using Blackbody Calibrator (Flat Plate) $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
Radiation (Infrared) Thermometer Calibrators ¹	0 °C 100 °C 200 °C 300 °C 400 °C 500 °C 600 °C	0.34 °C 0.6 °C 1 °C 1.1 °C 1.6 °C 1.7 °C 1.8 °C	Radiometric Method using Heitronics KT19.82 Reference Radiation Thermometer
Humidity – Source ¹	11 %RH 33 %RH 57 %RH 75 %RH 90 %RH	0.75 %RH 0.75 %RH 0.75 %RH 0.75 %RH 0.75 %RH	Custom Humidity Chamber, Salts, Vaisala Humidity Transmitter

Time and Frequency

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Timers ¹	1 min to 24 h	0.25 s	NRC Time Signal
Frequency – Measure ¹	(1 to 40) Hz 40 Hz to 10 MHz	0.81 mHz/Hz + 0.83 mHz 0.16 mHz/Hz + 6.5 mHz/Hz	Agilent 3458A 8.5 Digit Multimeter

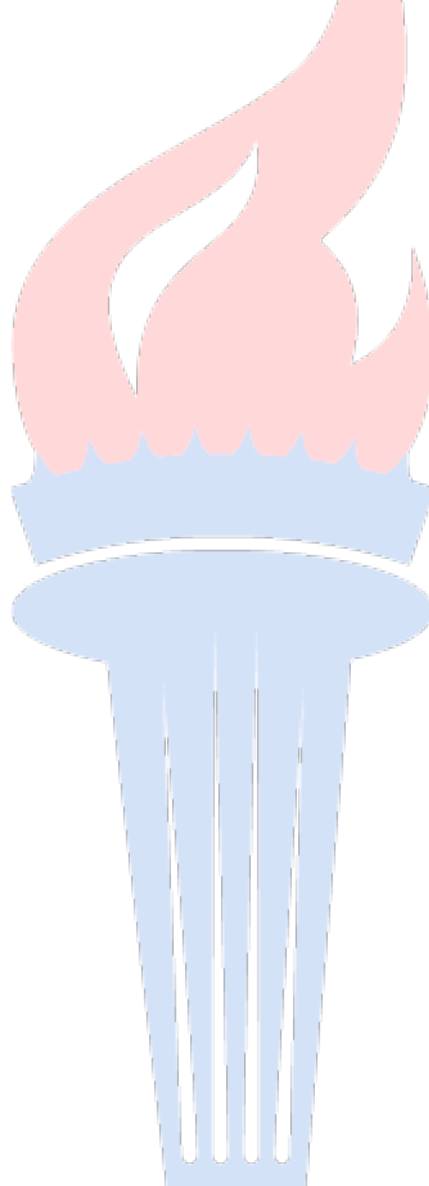
Time and Frequency

Brampton, ON

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source ¹	1 Hz to 10 MHz	0.12 mHz/Hz + 0.62 mHz	RIGOL DG 1022 Generator

[Return to Site Listings \(top\)](#)

[Go to Notes \(bottom\)](#)



Accredited Services performed at Satellite Laboratory

VACS Ltd.

4145-74 Avenue
Edmonton, AB T6B 2Z7
Justin Jacobs 780-699-7712
justinjacobs.vacs@calibrations.ca

Electrical – DC/Low Frequency

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Measure ¹	(-110 to 110) mV (-1 to 1) V (-11 to 11) V (-110 to 110) V (-300 to 300) V	2.9 mV/V + 17 μ V 2.9 mV/V + 55 μ V 2.9 mV/V + 0.55 mV 0.58 mV/V + 5.5 mV 0.57 mV/V + 15 mV	Fluke 743B Process Calibrator
DC Voltage – Source ¹	(-110 to 110) mV (-1 to 1) V (-15 to 15) V	0.16 mV/V + 5.5 μ V 0.12 mV/V + 55 μ V 0.12 mV/V + 0.75 mV	Fluke 743B Process Calibrator
DC Current – Measure ¹	(0 to 22) mA (0 to 30) mA (0 to 110) mA	0.26 mA/A + 6.6 μ A 0.17 mA/A + 4.5 μ A 0.17 mA/A + 17 μ A	Fluke 743B Process Calibrator
DC Current – Source ¹	(0 to 22) mA	0.17 mA/A + 3.3 μ A	Fluke 743B Process Calibrator
DC Current – Simulate ¹ (Loop)	(4 to 20) mA	0.26 mA/A + 6.6 μ A	Fluke 743B Process Calibrator
Resistance – Measure ¹	Up to 11 Ω Up to 110 Ω Up to 1.1 k Ω Up to 11 k Ω	0.62 m Ω / Ω + 50 m Ω 0.58 m Ω / Ω + 50 m Ω 0.59 Ω / Ω + 0.5 Ω 1.2 Ω /k Ω + 10 Ω	Fluke 743B Process Calibrator
Resistance – Source ¹	Up to 11 Ω Up to 110 Ω Up to 1.1 k Ω Up to 11 k Ω	0.17 m Ω / Ω + 20 m Ω 0.15 m Ω / Ω + 40 m Ω 0.25 Ω / Ω + 0.5 Ω 0.35 Ω /k Ω + 5 Ω	Fluke 743B Process Calibrator
Electrical Calibration of Thermocouple Indicating Devices – Source/Measure ¹	Type E (-20 to 1 000) $^{\circ}$ C Type J (-210 to 1 200) $^{\circ}$ C Type K (-200 to 1 372) $^{\circ}$ C Type N (-200 to 1 300) $^{\circ}$ C	0.3 $^{\circ}$ C 0.3 $^{\circ}$ C 0.4 $^{\circ}$ C 0.6 $^{\circ}$ C	Fluke 743B Process Calibrator



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Calibration of Thermocouple Indicating Devices – Source/Measure ¹	Type T (-200 to 1 300) °C	0.4 °C	Fluke 743B Process Calibrator
	Type R (0 to 1 767) °C	1.1 °C	
	Type S (0 to 1 767) °C	1.1 °C	
Electrical Simulation of RTD Indicating Devices – Source ¹	Pt 385, 100 Ω (-200 to 0) °C	0.1 °C	Fluke 743B Process Calibrator
	(0 to 400) °C	0.2 °C	
	(400 to 800) °C	0.4 °C	
	Pt 385, 1 000 Ω (-200 to 0) °C	0.1 °C	
	(0 to 400) °C	0.2 °C	
	(400 to 800) °C	0.4 °C	
	Pt 3926, 100 Ω (-200 to 0) °C	0.1 °C	
	(0 to 630) °C	0.2 °C	
	Pt 3916, 100 Ω (-200 to 0) °C	0.1 °C	
	(0 to 630) °C	0.2 °C	

Length – Dimensional Metrology

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2}	Up to 24 in	$(289 + 7.3L) \mu\text{in}$	Gauge Blocks, Micrometer Setting Standards
Outside Micrometer ^{1,2}	Up to 6 in	$(32 + 14L) \mu\text{in}$	Grade 2 Gauge Blocks
Gauge Blocks ¹	Up to 4 in (200 mm)	40 μin (1 μm)	Grade 2 Gauge Blocks, Heidenhain CT60 Length Gauge
Length Gauges, Indicators ¹	50 μin resolution	(0 to 1) in 35 μin (0 to 2) in 50 μin	Gage Blocks, Comparator Stand
	100 μin resolution	(0 to 1) in 60 μin (0 to 2) in 70 μin	

Length – Dimensional Metrology

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length Gauges, Indicators ¹ (Mounted in stands or custom fixtures) 500 µin resolution 1 000 µin resolution	(0 to 1) in (0 to 1) in	335 µin 600 µin	Gauge Blocks
Measuring Microscope ¹	Up to 5 mm	0.96 µm	Stage Micrometer
Displacement Transducer ¹	Up to 5 in (5 to 40) in	600 µin 0.1 % of reading	Height Gauge
Optical Comparators ^{1,2} X-Y Length Angle	Up to 50 mm Up to 90°	5 µm 0.5'	Glass Scale Angle Blocks
Material Testing Machine ^{1,2} Displacement Speed	(0.01 to 0.4) in (0.4 to 40) in (0.01 to 20) in/min	600 µin (600 + 200L) µin 0.5 % of reading	ASTM E2309; Height Gauge, Heidenhain MT25B Length Gauge; ASTM E2658; Timer
Extensometer, Type 1 Strain ^{1,2}	Gauge length of 0.5 in : (0.06 to 1) in/in (0.002 to 0.06) in/in Gauge length of 1 in : (0.025 to 1) in/in (0.001 to 0.025) in/in Gauge length of 2 in : (0.000 5 to 0.5) in/in	(64 + 715L) µin/in 88 µin/in (27 + 300L) µin/in 40 µin/in (17 + 126L) µin/in	Extensometer Calibrator; ASTM E83
Extensometer, Type 1 Gauge Length ¹	(0.5 to 2) in	400 µin	Extensometer Calibrator; ASTM E83
Torque Drive Arms ¹ (2-point Dimensional Measurement)	(4 to 60) in	0.1 % of arm length	Height Gauge, 60 in Steel Rule, Length Standards
Protractors, Inclinometers ²	Up to 90°	0.5'	Angle Blocks, Surface Plate

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Testing Machines, Force Measuring Systems ¹ Tension	1 gf to 471 kgf (1 to 500 000) lbf	0.25 % of reading	Loading Weights, Reference Standard Load Cells; ASTM E4
Compression	1 gf to 471 kgf (1 to 2 000 000) lbf	0.25 % of reading	
Force Gages, Crane Scales, Dynamometers, Load Cells, Tension Links ^{1,4} (Tension and Compression)	(1 to 100 000) lbf	0.25 % of reading	Calibration Load Frame, Reference Standard Load Cells; ASTM E4
Analytical Balances ^{1,3}	Up to 10 g (10 to 200) g 200 g to 35 kg 200 g to 220 kg	60 µg 0.12 mg 0.000 25 % of reading 0.000 2 % of reading	ASTM E617 Class 1, OIML Class F1, NIST Class F Weights and NIST Handbook 44 utilized for calibration of the weighting system.
Conventional Mass ¹ (non-integral weights) (SI)	1 g 2 g 3 g 5 g 10 g 20 g 30 g 100 g 200 g 300 g 1 kg 2 kg 3 kg 5 kg 10 kg 20 kg 25 kg 30 kg	10 µg 10 µg 20 µg 20 µg 20 µg 40 µg 50 µg 80 µg 0.12 mg 1.2 mg 1.4 mg 12 mg 13 mg 0.12 g 0.12 g 0.12 g 0.12 g 0.12 g	Electronic Balances; ASTM E617 Class 0 and Class 1 Weights



ANSI National Accreditation Board

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conventional Mass ¹ (Avoirdupois)	0.062 5 oz	10 µg	Electronic Balances; ASTM E617 Class 1 and OIML Class F1 Weights
	0.125 oz	20 µg	
	0.25 oz	30 µg	
	0.5 oz	30 µg	
	0.005 lb	10 µg	
	0.01 lb	20 µg	
	0.02 lb	30 µg	
	0.05 lb	40 µg	
	0.1 lb	0.1 mg	
	0.2 lb	0.13 mg	
	0.5 lb	1.2 mg	
	1 lb	1.2 mg	
	2 lb	1.5 mg	
	5 lb	12 mg	
10 lb	12 mg		
25 lb	0.12 g		
50 lb	0.12 g		
Pressure Calibrators ^{1,4}	(0.3 to 300) psig	0.015 % of reading	Ametek DWT (R300, HK-1000, R-50)
	(30 to 1 000) psig	0.015 % of reading	
	(1 000 to 10 000) psig	0.015 % of reading	
Pressure Indicators, Pressure Gauges ^{1,4}	(30 to 1 000) psig	0.015 % of reading	Ametek DWT (R300, HK-1000, R-50)
	(1 000 to 10 000) psig	0.25 % of reading	
Vacuum Devices ^{1,4}	(-14 to 0) psiv	0.05 psi	Fluke Pressure Calibrator, Fluke Vacuum Module
Torque Wrenches ¹	(8 to 300) lbf·in	0.75 % of reading	ASTM E2624; Torque Testers
	(22 to 651) lbf·ft	0.75 % of reading	
Direct Verification of Hardness Testing Machines ¹ Verification of Test Force	(1 to 3 000) kgf	0.25 % of reading	ASTM E10, ASTM E18, ASTM E92, ASTM E384 Working Force Standards
Verification of the Indentation Measuring System	(0.01 to 5) mm	1 µm	Stage Micrometer
Deflection Measuring System	(0.025 to 0.05) mm	0.1 µm	Gauge Blocks

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers ¹	(< 70) HRA	0.28 HRA	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(≥ 70 and < 80) HRA	0.17 HRA	
	(≥ 80) HRA	0.16 HRA	
	(< 60) HRBW	1.4 HRBW	
	(≥ 60 to < 88) HRBW	0.87 HRBW	
	(≥ 88) HRBW	0.42 HRBW	
	(< 35) HRC	0.4 HRC	
	(≥ 35 to < 60) HRC	0.36 HRC	
	(≥ 60) HRC	0.32 HRC	
	(< 51) HRD	0.27 HRD	
	(≥ 51 to < 71) HRD	0.26 HRD	
	(≥ 71) HRD	0.18 HRD	
	(< 84) HREW	0.54 HREW	
	(≥ 84 to < 93) HREW	0.54 HREW	
	(≥ 93) HREW	0.54 HREW	
	(< 80) HRFW	0.54 HRFW	
	(≥ 80 to < 94) HRFW	0.4 HRFW	
	(≥ 94) HRFW	0.4 HRFW	
	(< 55) HRGW	0.76 HRGW	
	(≥ 55 to < 80) HRGW	0.36 HRGW	
(≥ 80) HRGW	0.36 HRGW		
(< 96) HRHW	0.54 HRHW		
(≥ 96) HRHW	0.41 HRHW		
(< 65) HRKW	0.64 HRKW		
(≥ 65 to < 85) HRKW	0.4 HRKW		
(≥ 85) HRKW	0.4 HRKW		
(90 to 114) HRLW	0.36 HRLW		
(115 to 130) HRL W	0.36 HRLW		
(70 to 99) HRMW	0.56 HRMW		
(100 to 130) HRMW	0.56 HRMW		

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	(40 to 84) HRPW	0.91 HRPW	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(85 to 130) HRPW	0.65 HRPW	
	(100 to 119) HRRW	0.41 HRRW	
	(120 to 130) HRRW	0.24 HRRW	
	(110 to 111) HRSW	0.95 HRSW	
	(112 to 130) HRSW	0.2 HRSW	
	(80 to 103) HRVW	0.95 HRVW	
	(104 to 130) HRVW	0.2 HRVW	
	(< 78) HR15N	0.39 HR15N	
	(≥ 78 to < 90) HR15N	0.19 HR15N	
	(≥ 90) HR15N	0.19 HR15N	
	(< 55) HR30N	0.55 HR30N	
	(≥ 55 to < 77) HR30N	0.28 HR30N	
	(≥ 77) HR30N	0.28 HR30N	
	(< 37) HR45N	0.43 HR45N	
	(≥ 37 to < 66) HR45N	0.22 HR45N	
	(≥ 66) HR45N	0.19 HR45N	
	(< 81) HR15TW	0.37 HR15TW	
(≥ 81 to < 87) HR15TW	0.21 HR15TW		
(≥ 87) HR15TW	0.21 HR15TW		
(< 57) HR30TW	0.9 HR30TW		
(≥ 57 to < 70) HR30TW	0.66 HR30TW		
(≥ 70) HR30TW	0.39 HR30TW		
(< 33) HR45TW	0.73 HR45TW		
(≥ 33 to < 53) HR45TW	0.41 HR45TW		
(≥ 53) HR45TW	0.41 HR45TW		
(80 to 88) HR15WW	0.67 HR15WW		
(89 to 100) HR15WW	0.67 HR15WW		

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	(40 to 64) HR30WW (65 to 100) HR30WW	0.9 HR30WW 0.76 HR30WW	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(10 to 47) HR45WW (48 to 100) HR45WW	0.3 HR45WW 0.13 HR45WW	
	(80 to 87) HR15XW (88 to 100) HR15XW	0.62 HR15XW 0.33 HR15XW	
	(60 to 78) HR30XW (79 to 100) HR30XW	0.99 HR30XW 0.15 HR30XW	
	(40 to 68) HR45XW (69 to 100) HR45XW	0.81 HR45XW 0.35 HR45XW	
	(85 to 93) HR15YW (94 to 100) HR15YW	1.3 HR15YW 0.63 HR15YW	
	(60 to 87) HR30YW (88 to 100) HR30YW	0.82 HR30YW 0.37 HR30YW	
	(60 to 81) HR45YW (82 to 100) HR45YW	0.94 HR45YW 0.3 HR45YW	
Brinell Hardness Testers ¹	/62.5 (200 to 400) HBW (400 to 600) HBW	9.5 HBW 25 HBW	Indirect verification per ASTM E10 using Brinell Test Blocks and Brinell Scope
	2.5/187.5 (200 to 400) HBW (400 to 600) HBW	6.2 HBW 15 HBW	
	10/500 (20 to 100) HBW (100 to 150) HBW	1 HBW 1.5 HBW	
	5/1 000 (200 to 400) HBW (400 to 600) HBW	4 HBW 8 HBW	
	10/1 000 (200 to 400) HBW (400 to 600) HBW	3.3 HBW 7 HBW	

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment		
Brinell Hardness Testers ¹	10/1 500 (200 to 400) HBW (400 to 600) HBW	2.7 HBW 6.5 HBW	Indirect verification per ASTM E10 using Brinell Test Blocks and Brinell Scope		
	10/2 000 (200 to 400) HBW (400 to 600) HBW	2.2 HBW 5.2 HBW			
	10/2 500 (200 to 400) HBW (400 to 600) HBW	2 HBW 4.4 HBW			
	10/3 000 (200 to 400) HBW (400 to 600) HBW	1.9 HBW 4.9 HBW			
	Vickers Hardness Testers ¹ ≥ 1 kgf	HV 1 200 HV 400 HV 700 HV		4.1 HV 8 HV 18 HV	Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
		HV 2 200 HV 400 HV 700 HV		3 HV 8 HV 14 HV	
		HV 5 200 HV 400 HV 700 HV		3 HV 6 HV 11 HV	
		HV 10 200 HV 400 HV 700 HV		3 HV 6 HV 11 HV	
		HV 20 200 HV 400 HV 700 HV		3 HV 6 HV 11 HV	
HV 30 200 HV 400 HV 700 HV		3 HV 4 HV 7 HV			
HV 50 200 HV 400 HV 700 HV		3 HV 4 HV 7 HV			

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vickers Hardness Testers ¹ < 1 kgf	HV 0.01		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.025		
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.05		
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.1		
	200 HV	8 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.2		
	200 HV	8 HV	
	400 HV	18 HV	
	700 HV	35 HV	
	HV 0.3		
200 HV	5 HV		
400 HV	14 HV		
700 HV	24 HV		
HV 0.5			
200 HV	5 HV		
400 HV	12 HV		
700 HV	24 HV		
HV 1			
200 HV	4 HV		
400 HV	8 HV		
700 HV	17 HV		
Knoop Micro-Indentation Hardness Testers ¹	HK 0.01		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HK	7 HK	
	400 HK	16 HK	
	700 HK	33 HK	

Mass and Mass Related

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Knoop Micro-Indentation Hardness Testers ¹	HK 0.025		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	22 HK	
	HK 0.05		
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	20 HK	
	HK 0.1		
	200 HK	7 HK	
	400 HK	12 HK	
	700 HK	19 HK	
	HK 0.2 and 0.3		
	200 HK	5 HK	
400 HK	8 HK		
700 HK	17 HK		
HK 0.5 and 1			
200 HK	5 HK		
400 HK	7 HK		
700 HK	15 HK		
Leeb's Hardness Tester ¹	(600 to 670) LD	9 LD	Indirect verification per ASTM A956 using Hardness Test Blocks
Durometer ¹ (Types A, B, C, D, DO, E, M, O, OO) Force Indenter Deflection	Up to 44.5 N Up to 3.57 mm	0.06 N 2.3 µm	Partial Direct Verification per ASTM D2240 using Balance Gauge Blocks, Transducer

Thermodynamic

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Source ¹	0 °C	0.01 °C	Ice Bath, Secondary Standard PRT, Instrulab 4312A Thermometer

Thermodynamic

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Source ¹	(> 0.01 to 90) °C	0.1 °C	Baths, Secondary Standard PRT, Instrulab 4312A Thermometer
Temperature – Source ¹	(> 90 to 660) °C	1.2 °C	Dry Block, Fluke Process Calibrator, Thermocouple Probe
Temperature – Measure ¹	(-78 to 200) °C	0.05 °C	Secondary Standard PRT, Instrulab 4312A Thermometer
Temperature – Measure ¹	(200 to 660) °C	1.2 °C	Type N Thermocouple Probe, Fluke 744 Process Calibrator
PRT/RTD Probes ¹	(> 0.01 to 90) °C	0.1 °C	Ice Bath, Liquid baths, Dry Block Calibrator, Secondary Standard PRT, Instrulab 4312A Thermometer
Thermocouples ¹	(> 90 to 660) °C	0.5 °C	
Liquid-in-Glass Thermometers ¹	(> 0.01 to 90) °C	0.1 °C	
Infrared Thermometers ¹	0 °C	0.34 °C	Radiometric Method using Blackbody Calibrator (Flat Plate) $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
	100 °C	0.7 °C	
	200 °C	1.1 °C	
	300 °C	1.3 °C	
	400 °C	1.7 °C	
500 °C	2 °C		
Humidity – Measure ¹	(11 to 90) %RH	1 %RH	Vaisala Humidity Transmitter

Time and Frequency

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Timers ¹	1 min to 24 h	0.25 s	NRC Time Signal



ANSI National Accreditation Board

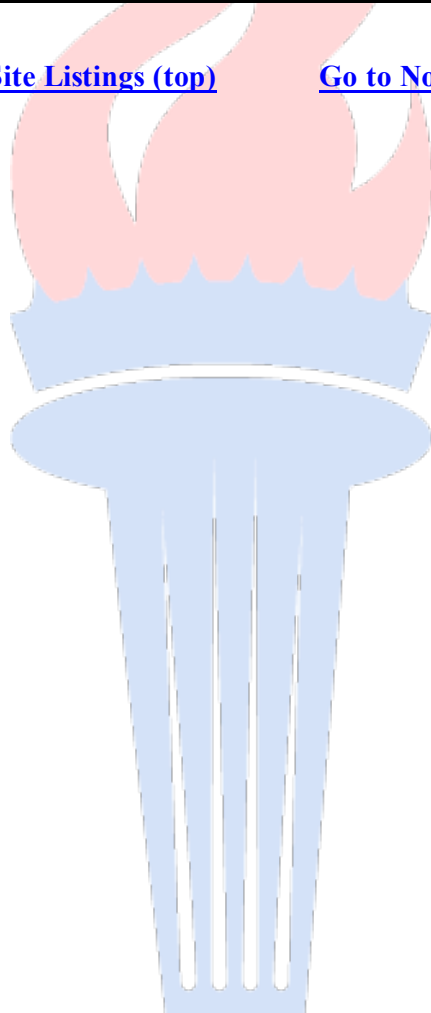
Time and Frequency

Edmonton, AB

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	(1 to 109.99) Hz (110 to 1 099.9) Hz (1.1 to 10.999) kHz (11 to 50) kHz	0.11 mHz/Hz + 50 mHz 0.1 mHz/Hz + 0.5 Hz 0.75 Hz/kHz + 50 Hz 0.22 Hz/kHz + 50 Hz	Fluke 743 Process Calibrator
Frequency – Source ¹	Up to 10.99 Hz (11 to 109.99) Hz (110 to 1 099.9) Hz (1 100 to 21 999) Hz (22 to 50) kHz	1.1 mHz/Hz + 10 mHz 0.54 mHz/Hz + 0.1 Hz 0.1 mHz/Hz + 0.1 Hz 45 µHz/Hz + 2 Hz 0.1 Hz/kHz + 5 Hz	Fluke 743 Process Calibrator

[Return to Site Listings \(top\)](#)

[Go to Notes \(bottom\)](#)



Accredited Services performed at Satellite Laboratory

VACS Ltd.

6994 Greenwood Street, Unit 104
Burnaby, BC V5A 1X8
Derek Magee 905-840-7651
derekmagee@calibrations.ca

Electrical – DC/Low Frequency

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Measure ¹	(-110 to 110) mV (-1 to 1) V (-11 to 11) V (-110 to 110) V (-300 to 300) V	2.9 mV/V + 17 μV 2.9 mV/V + 55 μV 2.9 mV/V + 0.55 mV 0.58 mV/V + 5.5 mV 0.57 mV/V + 15 mV	Fluke 743B Process Calibrator
DC Voltage – Source ¹	(-110 to 110) mV (-1 to 1) V (-15 to 15) V	0.16 mV/V + 5.5 μV 0.12 mV/V + 55 μV 0.12 mV/V + 0.75 mV	Fluke 743B Process Calibrator
DC Current – Measure ¹	(0 to 22) mA (0 to 30) mA (0 to 110) mA	0.26 mA/A + 6.6 μA 0.17 mA/A + 4.5 μA 0.17 mA/A + 17 μA	Fluke 743B Process Calibrator
DC Current – Source ¹	(0 to 22) mA	0.17 mA/A + 3.3 μA	Fluke 743B Process Calibrator
DC Current – Simulate ¹ (Loop)	(4 to 20) mA	0.26 mA/A + 6.6 μA	Fluke 743B Process Calibrator
Resistance – Measure ¹	Up to 11 Ω Up to 110 Ω Up to 1.1 kΩ Up to 11 kΩ	0.62 mΩ/Ω + 50 mΩ 0.58 mΩ/Ω + 50 mΩ 0.59 Ω/Ω + 0.5 Ω 1.2 Ω/kΩ + 10 Ω	Fluke 743B Process Calibrator
Resistance – Source ¹	Up to 11 Ω Up to 110 Ω Up to 1.1 kΩ Up to 11 kΩ	0.17 mΩ/Ω + 20 mΩ 0.15 mΩ/Ω + 40 mΩ 0.25 Ω/Ω + 0.5 Ω 0.35 Ω/kΩ + 5 Ω	Fluke 743B Process Calibrator
Electrical Calibration of Thermocouple Indicating Devices – Source/Measure ¹	Type E (-20 to 1 000) °C Type J (-210 to 1 200) °C Type K (-200 to 1 372) °C Type N (-200 to 1 300) °C	0.3 °C 0.3 °C 0.4 °C 0.6 °C	Fluke 743B Process Calibrator

Electrical – DC/Low Frequency

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Calibration of Thermocouple Indicating Devices – Source/Measure ¹	Type T (-200 to 1 300) °C	0.4 °C	Fluke 743B Process Calibrator
	Type R (0 to 1 767) °C	1.1 °C	
	Type S (0 to 1 767) °C	1.1 °C	
Electrical Simulation of RTD Indicating Devices – Source ¹	Pt 385, 100 Ω (-200 to 0) °C	0.1 °C	Fluke 743B Process Calibrator
	(0 to 400) °C	0.2 °C	
	(400 to 800) °C	0.4 °C	
	Pt 385, 1 000 Ω (-200 to 0) °C	0.1 °C	
	(0 to 400) °C	0.2 °C	
	(400 to 800) °C	0.4 °C	
	Pt 3926, 100 Ω (-200 to 0) °C	0.1 °C	
	(0 to 630) °C	0.2 °C	
	Pt 3916, 100 Ω (-200 to 0) °C	0.1 °C	
	(0 to 630) °C	0.2 °C	

Length – Dimensional Metrology

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2}	Up to 24 in	$(289 + 7.3L) \mu\text{in}$	Gauge Blocks, Micrometer Setting Standards
Outside Micrometer ^{1,2}	Up to 6 in	$(32 + 14L) \mu\text{in}$	Grade 2 Gauge Blocks
Gauge Blocks ¹	Up to 4 in (200 mm)	40 μin (1 μm)	Grade 2 Gauge Blocks, Heidenhain MT25 Length Gauge
Length Gauges, Indicators ¹	50 μin resolution	(0 to 1) in 35 μin (0 to 2) in 50 μin	Gage Blocks, Comparator Stand
	100 μin resolution	(0 to 1) in 60 μin (0 to 2) in 70 μin	

Length – Dimensional Metrology

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length Gauges, Indicators ¹ (Mounted in stands or custom fixtures) 500 µin resolution 1 000 µin resolution	(0 to 1) in (0 to 1) in	335 µin 600 µin	Gauge Blocks
Measuring Microscope ¹	Up to 5 mm	0.96 µm	Stage Micrometer
Displacement Transducer ¹	Up to 5 in (5 to 40) in	600 µin 0.1 % of reading	Height Gauge
Optical Comparators ^{1,2} X-Y Length Angle	Up to 50 mm Up to 90°	5 µm 0.5'	Glass Scale Angle Blocks
Material Testing Machine ^{1,2} Displacement Speed	(0.01 to 0.4) in (0.4 to 40) in (0.01 to 20) in/min	600 µin (600 + 200L) µin 0.5 % of reading	ASTM E2309; Height Gauge, MT25B Heidenhain Length Gauge; ASTM E2658; Timer
Extensometer, Type 1 Strain ^{1,2}	Gauge length of 0.5 in : (0.06 to 1) in/in (0.002 to 0.06) in/in Gauge length of 1 in : (0.025 to 1) in/in (0.001 to 0.025) in/in Gauge length of 2 in : (0.000 5 to 0.5) in/in	(64 + 715L) µin/in 88 µin/in (27 + 300L) µin/in 40 µin/in (17 + 126L) µin/in	Extensometer Calibrator; ASTM E83
Extensometer, Type 1 Gauge Length ¹	(0.5 to 2) in	400 µin	Extensometer Calibrator; ASTM E83
Torque Drive Arms ¹ (2-point Dimensional Measurement)	(4 to 60) in	0.1 % of arm length	Height Gauge, 60 in Steel Rule, Length Standards
Protractors, Inclinometers ²	Up to 90°	0.5'	Angle Blocks, Surface Plate

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Testing Machines, Force Measuring Systems ^{1,4} Tension Compression	1 gf to 471 kgf (1 to 500 000) lbf 1 gf to 471 kgf (1 to 2 000 000) lbf	0.25 % of reading 0.25 % of reading	Loading Weights, Reference Standard Load Cells; ASTM E4
Force Gages, Crane Scales, Dynamometers, Load Cells, Tension Links ^{1,4} (Tension and Compression)	(1 to 100 000) lbf	0.25 % of reading	Calibration Load Frame, Reference Standard Load Cells; ASTM E4
Analytical Balances ^{1,3}	Up to 10 g (10 to 200) g 200 g to 35 kg 200 g to 220 kg	60 µg 0.12 mg 0.000 25 % of reading 0.000 2 % of reading	ASTM E617 Class 1, OIML Class F1, NIST Class F Weights and NIST Handbook 44 utilized for calibration of the weighting system.
Conventional Mass ¹ (non-integral weights) (SI)	1 g 2 g 3 g 5 g 10 g 20 g 30 g 100 g 200 g 300 g 1 kg 2 kg 3 kg 5 kg 10 kg 20 kg 25 kg 30 kg	10 µg 10 µg 20 µg 20 µg 20 µg 40 µg 50 µg 80 µg 0.12 mg 1.2 mg 1.4 mg 12 mg 13 mg 0.12 g 0.12 g 0.12 g 0.12 g 0.12 g	Electronic Balances; ASTM E617 Class 0 and Class 1 Weights



ANSI National Accreditation Board

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conventional Mass ¹ (Avoirdupois)	0.062 5 oz	10 µg	Electronic Balances; ASTM E617 Class 1 and OIML Class F1 Weights
	0.125 oz	20 µg	
	0.25 oz	30 µg	
	0.5 oz	30 µg	
	0.005 lb	10 µg	
	0.01 lb	20 µg	
	0.02 lb	30 µg	
	0.05 lb	40 µg	
	0.1 lb	0.1 mg	
	0.2 lb	0.13 mg	
	0.5 lb	1.2 mg	
	1 lb	1.2 mg	
	2 lb	1.5 mg	
	5 lb	12 mg	
10 lb	12 mg		
25 lb	0.12 g		
50 lb	0.12 g		
Pressure Calibrators ^{1,4}	(0.3 to 300) psig	0.015 % of reading	Ametek DWT (PK-854, HK-1000, R-50)
	(30 to 1 000) psig	0.015 % of reading	
	(1 000 to 10 000) psig	0.015 % of reading	
Pressure Indicators, Pressure Gauges ^{1,4}	(30 to 1 000) psig	0.015 % of reading	Ametek DWT (PK-854, HK-1000, R-50)
	(1 000 to 10 000) psig	0.015 % of reading	
Vacuum Devices ^{1,4}	(-14 to 0) psiv	0.05 psi	Fluke Pressure Calibrator, Fluke Vacuum Module
Torque Wrenches ¹	(8 to 300) lbf·in	0.75 % of reading	ASTM E2624; Torque Testers
	(22 to 651) lbf·ft	0.75 % of reading	
Direct Verification of Hardness Testing Machines ¹ Verification of Test Force	(1 to 3 000) kgf	0.25 % of reading	ASTM E10, ASTM E18, ASTM E92, ASTM E384 Working Force Standards
Verification of the Indentation Measuring System	(0.01 to 5) mm	1 µm	Stage Micrometer
Deflection Measuring System	(0.025 to 0.05) mm	0.1 µm	Gauge Blocks

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers ¹	(< 70) HRA	0.28 HRA	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(≥ 70 and < 80) HRA	0.17 HRA	
	(≥ 80) HRA	0.16 HRA	
	(< 60) HRBW	1.4 HRBW	
	(≥ 60 to < 88) HRBW	0.87 HRBW	
	(≥ 88) HRBW	0.42 HRBW	
	(< 35) HRC	0.4 HRC	
	(≥ 35 to < 60) HRC	0.36 HRC	
	(≥ 60) HRC	0.32 HRC	
	(< 51) HRD	0.27 HRD	
	(≥ 51 to < 71) HRD	0.26 HRD	
	(≥ 71) HRD	0.18 HRD	
	(< 84) HREW	0.54 HREW	
	(≥ 84 to < 93) HREW	0.54 HREW	
	(≥ 93) HREW	0.54 HREW	
	(< 80) HRFW	0.54 HRFW	
	(≥ 80 to < 94) HRFW	0.4 HRFW	
	(≥ 94) HRFW	0.4 HRFW	
	(< 55) HRGW	0.76 HRGW	
	(≥ 55 to < 80) HRGW	0.36 HRGW	
(≥ 80) HRGW	0.36 HRGW		
(< 96) HRHW	0.54 HRHW		
(≥ 96) HRHW	0.41 HRHW		
(< 65) HRKW	0.64 HRKW		
(≥ 65 to < 85) HRKW	0.4 HRKW		
(≥ 85) HRKW	0.4 HRKW		
(90 to 114) HRLW	0.36 HRLW		
(115 to 130) HRL W	0.36 HRLW		
(70 to 99) HRMW	0.56 HRMW		
(100 to 130) HRMW	0.56 HRMW		

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	(40 to 84) HRPW	0.91 HRPW	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(85 to 130) HRPW	0.65 HRPW	
	(100 to 119) HRRW	0.41 HRRW	
	(120 to 130) HRRW	0.24 HRRW	
	(110 to 111) HRSW	0.95 HRSW	
	(112 to 130) HRSW	0.2 HRSW	
	(80 to 103) HRVW	0.95 HRVW	
	(104 to 130) HRVW	0.2 HRVW	
	(< 78) HR15N	0.39 HR15N	
	(≥ 78 to < 90) HR15N	0.19 HR15N	
	(≥ 90) HR15N	0.19 HR15N	
	(< 55) HR30N	0.55 HR30N	
	(≥ 55 to < 77) HR30N	0.28 HR30N	
	(≥ 77) HR30N	0.28 HR30N	
	(< 37) HR45N	0.43 HR45N	
	(≥ 37 to < 66) HR45N	0.22 HR45N	
	(≥ 66) HR45N	0.19 HR45N	
	(< 81) HR15TW	0.37 HR15TW	
(≥ 81 to < 87) HR15TW	0.21 HR15TW		
(≥ 87) HR15TW	0.21 HR15TW		
(< 57) HR30TW	0.9 HR30TW		
(≥ 57 to < 70) HR30TW	0.66 HR30TW		
(≥ 70) HR30TW	0.39 HR30TW		
(< 33) HR45TW	0.73 HR45TW		
(≥ 33 to < 53) HR45TW	0.41 HR45TW		
(≥ 53) HR45TW	0.41 HR45TW		
(80 to 88) HR15WW	0.67 HR15WW		
(89 to 100) HR15WW	0.67 HR15WW		

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	(40 to 64) HR30WW (65 to 100) HR30WW	0.9 HR30WW 0.76 HR30WW	Indirect verification per ASTM E18, ASTM E110 using Rockwell Test Blocks
	(10 to 47) HR45WW (48 to 100) HR45WW	0.3 HR45WW 0.13 HR45WW	
	(80 to 87) HR15XW (88 to 100) HR15XW	0.62 HR15XW 0.33 HR15XW	
	(60 to 78) HR30XW (79 to 100) HR30XW	0.99 HR30XW 0.15 HR30XW	
	(40 to 68) HR45XW (69 to 100) HR45XW	0.81 HR45XW 0.35 HR45XW	
	(85 to 93) HR15YW (94 to 100) HR15YW	1.3 HR15YW 0.63 HR15YW	
	(60 to 87) HR30YW (88 to 100) HR30YW	0.82 HR30YW 0.37 HR30YW	
	(60 to 81) HR45YW (82 to 100) HR45YW	0.94 HR45YW 0.3 HR45YW	
Brinell Hardness Testers ¹	1/62.5 (200 to 400) HBW (400 to 600) HBW	9.5 HBW 25 HBW	Indirect verification per ASTM E10 using Brinell Test Blocks and Brinell Scope
	2.5/187.5 (200 to 400) HBW (400 to 600) HBW	6.2 HBW 15 HBW	
	10/500 (20 to 100) HBW (100 to 150) HBW	1 HBW 1.5 HBW	
	5/1 000 (200 to 400) HBW (400 to 600) HBW	4 HBW 8 HBW	
	10/1 000 (200 to 400) HBW (400 to 600) HBW	3.3 HBW 7 HBW	

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment		
Brinell Hardness Testers ¹	10/1 500 (200 to 400) HBW (400 to 600) HBW	2.7 HBW 6.5 HBW	Indirect verification per ASTM E10 using Brinell Test Blocks and Brinell Scope		
	10/2 000 (200 to 400) HBW (400 to 600) HBW	2.2 HBW 5.2 HBW			
	10/2 500 (200 to 400) HBW (400 to 600) HBW	2 HBW 4.4 HBW			
	10/3 000 (200 to 400) HBW (400 to 600) HBW	1.9 HBW 4.9 HBW			
	Vickers Hardness Testers ¹ ≥ 1 kgf	HV 1 200 HV 400 HV 700 HV		4.1 HV 8 HV 18 HV	Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
		HV 2 200 HV 400 HV 700 HV		3 HV 8 HV 14 HV	
		HV 5 200 HV 400 HV 700 HV		3 HV 6 HV 11 HV	
		HV 10 200 HV 400 HV 700 HV		3 HV 6 HV 11 HV	
		HV 20 200 HV 400 HV 700 HV		3 HV 6 HV 11 HV	
HV 30 200 HV 400 HV 700 HV		3 HV 4 HV 7 HV			
HV 50 200 HV 400 HV 700 HV		3 HV 4 HV 7 HV			

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vickers Hardness Testers ¹ < 1 kgf	HV 0.01		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.025		
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.05		
	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.1		
	200 HV	8 HV	
	400 HV	20 HV	
	700 HV	35 HV	
	HV 0.2		
	200 HV	8 HV	
	400 HV	18 HV	
	700 HV	35 HV	
	HV 0.3		
200 HV	5 HV		
400 HV	14 HV		
700 HV	24 HV		
HV 0.5			
200 HV	5 HV		
400 HV	12 HV		
700 HV	24 HV		
HV 1			
200 HV	4 HV		
400 HV	8 HV		
700 HV	17 HV		
Knoop Micro-Indentation Hardness Testers ¹	HK 0.01		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HK	7 HK	
	400 HK	16 HK	
	700 HK	33 HK	

Mass and Mass Related

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Knoop Micro-Indentation Hardness Testers ¹	HK 0.025		Indirect verification per ASTM E92, ASTM E384 using Hardness Test Blocks
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	22 HK	
	HK 0.05		
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	20 HK	
	HK 0.1		
	200 HK	7 HK	
	400 HK	12 HK	
	700 HK	19 HK	
	HK 0.2 and 0.3		
	200 HK	5 HK	
400 HK	8 HK		
700 HK	17 HK		
HK 0.5 and 1			
200 HK	5 HK		
400 HK	7 HK		
700 HK	15 HK		
Leeb's Hardness Tester ¹	(600 to 670) LD	9 LD	Indirect verification per ASTM A956 using Hardness Test Blocks
Durometer ¹ (Types A, B, C, D, DO, E, M, O, OO) Force Indenter Deflection	Up to 44.5 N Up to 3.57 mm	0.06 N 2.3 µm	Partial Direct Verification per ASTM D2240 using Balance Gauge Blocks, Transducer

Thermodynamic

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Source ¹	0 °C	0.01 °C	Ice Bath, Secondary Standard PRT, Instrulab 4312A Thermometer

Thermodynamic

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Source ¹	(> 0.01 to 90) °C	0.1 °C	Baths, Secondary Standard PRT, Instrulab 4312A Thermometer
Temperature – Source ¹	(> 90 to 660) °C	1.2 °C	Dry Block, Fluke Process Calibrator Thermocouple Probe
Temperature – Measure ¹	(-78 to 200) °C	0.05 °C	Secondary Standard PRT, Instrulab 4312A Thermometer
Temperature – Measure ¹	(200 to 660) °C	1.2 °C	Type N Thermocouple Probe, Fluke 744 Process Calibrator
PRT/RTD Probes ¹	(> 0.01 to 90) °C	0.1 °C	Ice Bath, Liquid Baths, Dry Block Calibrator, Secondary Standard PRT, Instrulab 4312A Thermometer
Thermocouples ¹	(> 90 to 660) °C	0.5 °C	
Liquid-in-Glass Thermometers ¹	(> 0.01 to 90) °C	0.1 °C	
Radiation (Infrared) Thermometers ¹	0 °C 100 °C 200 °C 300 °C 400 °C 500 °C	0.34 °C 0.7 °C 1.1 °C 1.3 °C 1.7 °C 2 °C	Radiometric Method using Blackbody Calibrator (Flat Plate) $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
Humidity – Measure ¹	(11 to 90) %RH	1 %RH	Vaisala Humidity Transmitter

Time and Frequency

Burnaby, BC

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Timers ¹	1 min to 24 h	0.25 s	NRC Time Signal

Time and Frequency

Burnaby, BC

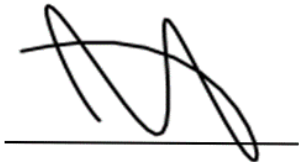
Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	(1 to 109.99) Hz (110 to 1 099.9) Hz (1.1 to 10.999) kHz (11 to 50) kHz	0.11 mHz/Hz + 50 mHz 0.1 mHz/Hz + 0.5 Hz 0.75 Hz/kHz + 50 Hz 0.22 Hz/kHz + 50 Hz	Fluke 743 Process Calibrator
Frequency – Source ¹	Up to 10.99 Hz (11 to 109.99) Hz (110 to 1 099.9) Hz (1 100 to 21 999) Hz (22 to 50) kHz	1.1 mHz/Hz + 10 mHz 0.54 mHz/Hz + 0.1 Hz 0.1 mHz/Hz + 0.1 Hz 45 μHz/Hz + 2 Hz 0.1 Hz/kHz + 5 Hz	Fluke 743 Process Calibrator

[Return to Site Listings \(top\)](#)

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. L = length in inches; ' = arc-minute; l = length in mm.
3. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
4. The resolution will be included in the reported measurement uncertainty at the time of calibration.
5. This scope is formatted as a part of a single document including Certificate of Accreditation No. AC-1402. Site specific sections are identified by the city and state above each table.



Jason Stine, Vice President