

CALIBRATION LABORATORIES

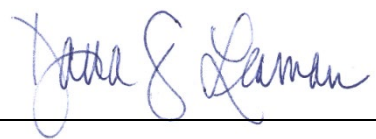
NVLAP LAB CODE 200311-0

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

<p>United Testing Sys. Canada, Ltd. 225 Bradwick Drive, #21 Concord Ontario L4K 1K7 CANADA Mr. David Fleming Phone: 905-669-5327 Fax: 905-738-5051 E-mail: service@utscanada.com URL: http://www.utscanada.com</p>	<p>Fields of Calibration Dimensional Mechanical Electromagnetics – DC/Low Frequency</p> <p>This laboratory is compliant to ANSI/NC SL Z540-1-1994; Part 1. (20/A01)</p>
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3, 5}	Remarks
DIMENSIONAL			
LENGTH & DIAMETER; STEP GAGES (20/D05)			
Extensometer Field calibrations available ^{Note 4}	Up in to 1.0 in Up mm to 25.4 mm	7.5 μm + 14L μm ^{Note 7} 0.19 μm + 0.014L μm ^{Note 8}	ASTM E83, ISO 9513 using linear calibrator
Extensometer Gage Length Field calibrations available ^{Note 4}	0.5 in 1.0 in 2.0 in	8.4 μm 17 μm 32 μm	ASTM 83, ISO 9513 using gage blocks
	0 in to 4 in 0 mm to 102 mm	0.001 in 26 μm	ASTM E83, ISO 9513 using caliper
	0 in to 12 in 0 mm to 305 mm	0.0010 in 26 μm	ASTM E83, ISO 9513 using caliper
Crosshead / Actuator Travel / Position Transducer Field calibrations available ^{Note 4}	0 in to 24 in 0 mm to 601 mm	0.0015 in 38 μm	ASTM E2309 using caliper
	Up in to 2 in Up mm to 50.8 mm	0.00010 in 2.6 μm	ASTM E2309 using micrometer head
	0 in to 12 in 0 mm to 305 mm	0.0010 in 26 μm	ASTM E2309 using caliper



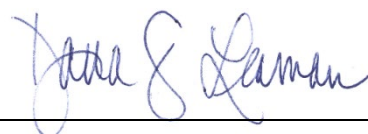
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3, 5}	Remarks
Crosshead Speed / Actuator Speed	0.1 in to 1 in 2.54 mm to 25.4 mm	7.5 μin + 14L μin ^{Note 7} 0.19 μm + 0.014L μm ^{Note 8}	ASTM E2309 using linear calibrator
	0.010 in/min to 40 in/min 0.10 mm/min to 1000 mm/min	0.25 % 0.25 %	ASTM E2658
Microscope Reticules & Measuring Systems	0 mm to 1.0 mm > 1.0 mm to 5 mm > 5.0 mm to 50 mm > 0.2 in to 2.0 in	0.17 μm (0.015 + 0.031L) μm (0.00011 + 0.000047L) mm (0.00041+0.000050L) in	ASTM E1951 using stage micrometer
Displacement Gauge (Clip Gauge) for Fracture Crack Measurement Field calibrations available ^{Note 4}	Up to 1 in Up to 25.4 mm	7.5 μin + 14L μin ^{Note 7} 0.19 μm + 0.014L μm ^{Note}	ASTM E399, ASTM E561 and ASTM E1820 using linear calibrator
Time	15 s to 10 min	0.16 s	Comparison to digital stopwatch
ELECTROMAGNETICS – DC/LOW FREQUENCY			
DC RESISTANCE AND CURRENT (20/E05)			
DC Current – Measure	0.1 mA to 20 mA	0.028 %	Comparison to DMM
DC VOLTAGE (20/E06)			
DC mV/V Voltage Ratio	0.1mV/V to 5 mV/V	0.01 %	Comparison to transducer simulator
DC Voltage	0.1 V to 20 V	0.01 %	Comparison to DMM
MECHANICAL			
FORCE (20/M06)			
Alignment – Testing Frame and Specimen Alignment	1.00 % to 100 % bending	3.8 % bending	ASTM E1012



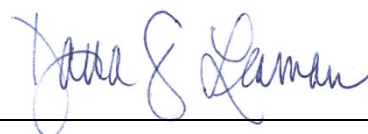
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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Note 3, 5</small>	Remarks
Force Measuring Instruments	0.0022 lbf to 112 404 lbf	0.025 %	ASTM E74, ISO 376, and internally developed methods
Tension/Compression	0.0022 lbf to 300 000 lbf	0.05 %	
Force – Mechanical Testing Machines Tension/Compression Field calibrations available <small>Note 4</small>	0.022 lbf to 1 000 000 lbf	0.12%	
HARDNESS (20/M13)			
Durometers – types A, B, C, D, DO, E, M, O, OO, OOO, OOO-S Indenter Tip Extension	0 mm to 6.35 mm 0 in to 0.25 in	0.66 μm 26 μin	Partial Calibration per ASTM D2240: using gage blocks
Force	0.1 N to 45 N 1 Durometer Units to 100 Durometer Units	0.12 % 0.12 %	
Rockwell hardness testers Field calibrations available <small>Note 4</small>			ASTM E18: Direct verification/ calibration
Force	3 kgf to 150 kgf	0.12 %	Direct verification/ calibration of force is applicable to all Rockwell testers
Depth	0 mm to 12 mm	0.0002 mm	Direct verification/ calibration of depth is limited to United True Blue II model hardness testers.
Time	Up to 60 s	0.16 s	Comparison to digital stopwatch



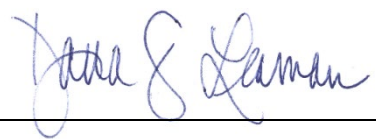
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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Note 3, 5</small>	Remarks	
Rockwell hardness Field calibrations available <small>Note 4</small>			Indirect verification/ calibration of Rockwell hardness testers and Rockwell superficial hardness testers per test methods below: ASTM E18, ISO 6508-2, ASTM E110	
Low	20 HRA to 60 HRA	0.42 HRA		
Medium	60 HRA to 80 HRA	0.29 HRA		
High	80 HRA to 100 HRA	0.18 HRA		
Low	20 HRBW to 50 HRBW	1.0 HRBW		
Medium	50 HRBW to 80 HRBW	0.28 HRBW		
High	≥ 80 HRBW	0.40 HRBW		
Low	20 HRC to 50 HRC	0.39 HRC		
Medium	40 HRC to 60 HRC	0.33 HRC		
High	60 HRC to 70 HRC	0.31 HRC		
Low	40 HRD to 55 HRD	0.12 HRD		ASTM E18, ISO 6508-2, ASTM E110
Medium	55 HRD to 65 HRD	0.10 HRD		
High	65 HRD to 77 HRD	0.09 HRD		
Low	50 HREW to 80 HREW	0.36 HREW		
Medium	80 HREW to 90 HREW	0.20 HREW		
High	90 HREW to 100 HREW	0.56 HREW		
Low	60 HRFW to 70 HRFW	0.54 HRFW		
Medium	70 HRFW to 85 HRFW	0.47 HRFW		
High	85 HRFW to 100 HRFW	0.45 HRFW		
Low	27 HRGW to 80 HRGW	0.68 HRGW		
Medium	80 HRGW to 94 HRGW	0.18 HRGW		
Low	80 HRHW to 95 HRHW	0.39 HRHW		
Medium	95 HRHW to 100 HRHW	0.38 HRHW		
High	100 HRHW to 105 HRHW	0.39 HRHW		
Low	40 HRKW to 60 HRKW	0.63 HRKW		
Medium	60 HRKW to 85 HRKW	0.64 HRKW		



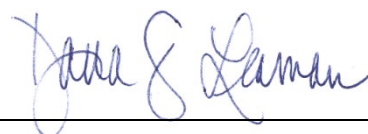
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3, 5}	Remarks
High	85 HRKW to 100 HRKW	0.64 HRKW	
Low	100 HRLW to 120 HRLW	0.17 HRLW	
Medium	120 HRLW to 130 HRLW	0.12 HRLW	
Low	80 HRMW to 100 HRMW	0.53 HRMW	
Medium	100 HRMW to 110 HRMW	0.49 HRMW	
High	110 HRMW to 120 HRMW	0.41 HRMW	
Low	58 HRPW to 100 HRPW	0.56 HRPW	
Medium	100 HRPW to 112 HRPW	0.34 HRPW	
Low	100 HRRW to 115 HRRW	0.28 HRRW	
Medium	115 HRRW to 125 HRRW	0.32 HRRW	
High	100 HRRW to 130 HRRW	0.21 HRRW	
Low	100 HRSW to 120 HRSW	0.78 HRSW	
Medium	120 HRSW to 125 HRSW	0.25 HRSW	
Low	100 HRVW to 110 HRVW	0.24 HRVW	
Medium	110 HRVW to 121 HRVW	0.25 HRVW	
Low	70 HR15N to 80 HR15N	0.43 HR15N	
Medium	70 HR15N to 90 HR15N	0.20 HR15N	
High	90 HR15N to 94 HR15N	0.21 HR15N	
Low	42 HR30N to 60 HR30N	0.30 HR30N	
Medium	60 HR30N to 77.5 HR30N	0.29 HR30N	
High	77.5 HR30N to 86 HR30N	0.27 HR30N	
Low	20 HR45N to 45 HR45N	0.48 HR45N	
Medium	45 HR45N to 66.5 HR45N	0.13 HR45N	
High	66.5 HR45N to 77 HR45N	0.16 HR45N	
Low	67 HR15TW to 75 HR15TW	0.27 HR15TW	



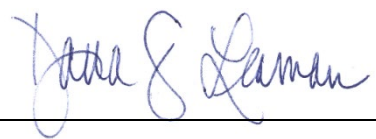
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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3, 5}	Remarks
Medium	75 HR15TW to 85 HR15TW	0.26 HR15TW	
High	86 HR15TW to 93 HR15TW	0.32 HR15TW	
Low	25 HR30TW to 50 HR30TW	0.54 HR30TW	
Medium	50 HR30TW to 70 HR30TW	0.34 HR30TW	
High	70 HR30TW to 82 HR30TW	0.32 HR30TW	
Low	1 HR45TW to 30 HR45TW	0.47 HR45TW	
Medium	30 HR45TW to 50 HR45TW	0.43 HR45TW	
High	50 HR45TW to 75 HR45TW	0.41 HR45TW	
Low	70 HR15WW to 90 HR15WW	0.33 HR15WW	
Medium	90 HR15WW to 100 HR15WW	0.26 HR15WW	
Low	60 HR30WW to 80 HR30WW	0.40 HR30WW	
Medium	80 HR30WW to 95 HR30WW	0.40 HR30WW	
Low	25 HR45WW to 60 HR45WW	0.75 HR45WW	
Medium	60 HR45WW to 95 HR45WW	0.37 HR45WW	
Low	80 HR15XW to 90 HR15XW	0.38 HR15XW	
Medium	90 HR15XW to 100 HR15XW	0.09 HR15XW	



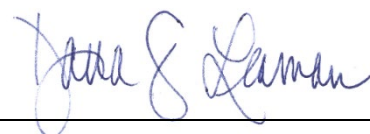
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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3, 5}	Remarks
Low	65 HR30XW to 85 HR30XW	0.83 HR30XW	Direct verifications: ASTM E92, ASTM E384 using stage micrometer using ASTM Class A load cell Comparison to digital stopwatch
Medium	85 HR30XW to 100 HR30XW	0.12 HR30XW	
Low	50 HR45XW to 85 HR45XW	0.54 HR45XW	
Medium	85 HR45XW to 95 HR45XW	0.11 HR45XW	
Low	85 HR15YW to 91 HR15YW	0.46 HR15YW	
Medium	91 HR15YW to 96 HR15YW	0.45 HR15YW	
High	96 HR15YW to 100 HR15YW	0.46 HR16YW	
Low	75 HR30YW to 90 HR30YW	0.18 HR30YW	
Medium	90 HR30YW to 100 HR30YW	0.22 HR30YW	
Low	65 HR45YW to 85 HR45YW	0.45 HR45YW	
Medium	85 HR45YW to 100 HR45YW	0.16 HR45YW	
Vickers Hardness Scale Field calibrations available ^{Note 4} Tester parameter:			
Indentation Measuring System	0 mm to 7 mm >1 mm to 5 mm	0.17 μm (0.15 + 0.031L) μm	
Force	10 gf to 120 000 gf	0.12 %	
Time	Up to 60 s	0.16 s	



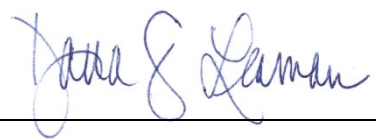
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Note 3, 5</small>	Remarks
Vickers hardness testers at specified load			Indirect verification/ calibration using ASTM E92, ISO 6507-2, ASTM E384
1 kgf	278 HV	4.3 HV	
1 kgf	565 HV	11 HV	
2 kgf	710 HV	9.8 HV	
2.5 kgf	172 HV	4.5 HV	
2.5 kgf	253 HV	7.2 HV	
2.5 kgf	479 HV	6.4 HV	
3 kgf	447 HV	6.2 HV	
5 kgf	189 HV	3.0 HV	
5 kgf	552 HV	4.9 HV	
5 kgf	717 HV	11 HV	
10 kgf	224 HV	2.0 HV	
10 kgf	443 HV	4.6 HV	
10 kgf	754 HV	10.5 HV	
15 kgf	179 HV	3.4 HV	
15 kgf	495 HV	8.8 HV	
15 kgf	752 HV	11 HV	
30 kgf	176 HV	3.6 HV	
30 kgf	475 HV	4.0 HV	
30 kgf	749 HV	14 HV	
50 kgf	174 HV	1.6 HV	
50 kgf	482 HV	4.7 HV	
50 kgf	792 HV	5.9 HV	



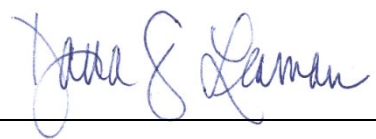
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Note 3, 5</small>	Remarks
Knoop Hardness Scale Field calibrations available <small>Note 4</small> Knoop micro hardness testers at specified load 25 gf 50 gf 100 gf 100 gf 200 gf 200 gf 300 gf 300 gf 500 gf 500 gf 1000 gf 1000 gf	 235 HK 225 HK 334 HK 814 HK 317 HK 736 HK 217 HK 579 HK 211 HK 554 HK 205 HK 557 HK	 31 HK 18 HK 9.8 HK 26. HK 9.8 HK 17 HK 6.5 HK 15 HK 6.3 HK 12 HK 7.0 HK 16 HK	Indirect verification/ calibration per: ASTM E92, ASTM E384, ISO 4545
Vickers hardness scale Field calibrations available <small>Note 4</small> Vickers micro hardness testers at specified load 25 gf 50 gf 100 gf 100 gf 200 gf 200 gf	 218 HV 219 HV 200 HV 333 HV 193 HV 472 HV	 10 HV 8.0 HV 8.6 HV 9.8 HV 8.7 HV 13 HV	Indirect verification/ calibration per: ASTM E92, ASTM 384, ISO 6507-2



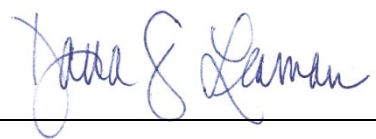
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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3, 5}	Remarks
300 gf	232 HV	6.4 HV	Direct verification/ calibration per ASTM E10, ISO 6506-2: using load cells calibrated per ASTM E74, ISO 376 using stage micrometer Comparison to digital stopwatch Indirect verification/ calibration per: ASTM E10, ISO 6506-2, ASTM E110
300 gf	596 HV	15 HV	
500 gf	232 HV	14 HV	
500 gf	593 HV	8.7 HV	
1000 gf	232 HV	6.6 HV	
1000 gf	592 HV	12 HV	
Brinell hardness machine parameters Field calibrations available ^{Note 4}			
Force	1.0 kgf to 3000 kgf	0.12 %	
Indentation Measuring System	0 mm to 7 mm >4 mm to 7 mm	1 µm 1.5 µm	
Time	Up to 60 s	0.16 s	
Brinell hardness scale Field calibrations available ^{Note 4}			
Brinell hardness testers at specified load			
HBW 1/62.5	200 HBW to 400 HBW	2 HBW	
HBW 1/62.5	400 HBW to 600 HBW	4 HBW	
HBW 2.5/62.5	50 HBW to 100 HBW	1.7 HBW	
HBW 2.5/62.5	100 HBW to 600 HBW	4.7 HBW	
HBW 2.5/187.5	100 HBW to 400 HBW	3.5 HBW	
HBW 2.5/187.5	400 HBW to 600 HBW	25 HBW	
HBW 10/500	50 HBW to 150 HBW	2 HBW	
HBW 10/500	150 HBW to 600 HBW	2.3 HBW	
HBW 5/1000	200 HBW to 400 HBW	2 HBW	
HBW 5/1000	400 HBW to 600 HBW	4 HBW	
HBW 10/1000	100 HBW to 225 HBW	2.6 HBW	
HBW 10/1000	225 HBW to 400 HBW	4 HBW	



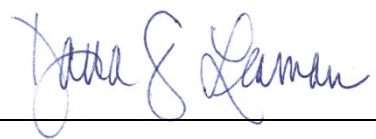
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HBW 10/1500 HBW 10/1500 HBW 10/2000 HBW 10/2500 HBW 10/2500 HBW 10/3000 HBW 10/3000	100 HBW to 200 HBW 200 HBW to 600 HBW 200 HBW to 400 HBW 200 HBW to 400 HBW 400 HBW to 600 HBW 200 HBW to 400 HBW 400 HBW to 600 HBW	2.2 HBW 4 HBW 2 HBW 2 HBW 4 HBW 1.8 HBW 4.6 HBW	
LEEB Hardness	Nominal: 770 HLD to 790 HLD	16 HLD	ASTM A956
Portable hardness testing devices using ultrasonic contact impedance method	Nominal: (55 to 60) HRC	0.41 HRC	ASTM A1038
TORQUE (20/M15)			
Torque Measurement Standards – Clockwise/Counterclockwise	N·m to 5000 N·m 0.5 lbf·in to 50 000 lbf·in	0.05 % 0.05 %	ASTM E2428, DIN 51309 and internally developed methods
Torque Testing Machines – Clockwise/Counterclockwise Field calibrations available ^{Note 4}	0.1 N·m to 5000 N·m	0.25 %	ASTM E2624, DIN 51309 and internally developed methods
WEIGHING INSTRUMENTS (20/M16)			
Scales and Balances Field calibrations available ^{Note 4} Readability (≥): 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg	(1 to 100) mg 200 mg 500 mg 1000 mg 2000 mg 5 g 10 g 20 g 50 g	0.22 mg 0.23 mg 0.24 mg 0.25 mg 0.27 mg 0.32 mg 0.4 mg 0.56 mg 1.0 mg	ASTM E898 using OIML Class F1 standards



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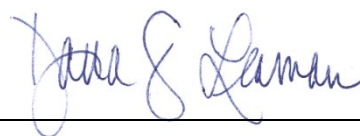
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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3, 5}	Remarks
0.1 mg	100 g	2.0 mg	
1 mg	200 g	4.5 mg	
1 mg	500 g	10 mg	
1 mg	1 kg	20 mg	
1 mg	2 kg	39 mg	
10 mg	4 kg	60 mg	
10 mg	6 kg	64 mg	
END			

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Notes

Note 1: A Calibration and Measurement Capability (CMC) is a description of the best result of a calibration or measurement (result with the smallest uncertainty of measurement) that is available to the laboratory's customers under normal conditions, when performing more or less routine calibrations of nearly ideal measurement standards or instruments. The CMC is described in the laboratory's scope of accreditation by: the measurement parameter/device being calibrated, the measurement range, the uncertainty associated with that range (see note 3), and remarks on additional parameters, if applicable.

Note 2: Calibration and Measurement Capabilities are traceable to the national measurement standards of the U.S. or to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit.

Note 3: The uncertainty associated with a measurement in a CMC is an expanded uncertainty with a level of confidence of approximately 95 %, typically using a coverage factor of $k = 2$. However, laboratories may report a coverage factor different than $k = 2$ to achieve the 95 % level of confidence. Units for the measurand and its uncertainty are to match. Exceptions to this occur when marketplace practice employs mixed units, such as when the artifact to be measured is labeled in non-SI units and the uncertainty is given in SI units (Example: 5 lb weight with uncertainty given in mg).

Note 3a: The uncertainty of a specific calibration by the laboratory may be greater than the uncertainty in the CMC due to the condition and behavior of the customer's device and specific circumstances of the calibration. The uncertainties quoted do not include possible effects on the calibrated device of transportation, long term stability, or intended use.

Note 3b: As the CMC represents the best measurement results achievable under normal conditions, the accredited calibration laboratory shall not report smaller uncertainty of measurement than that given in a CMC for calibrations or measurements covered by that CMC.

Note 3c: As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under *normal conditions*. However, the laboratory may have the capability to offer special tests, employing special conditions, which yield calibration or measurement results with lower uncertainties. Such special tests are not covered by the CMCs and are outside the laboratory's scope of accreditation. In this case, NVLAP requirements for the labeling, on calibration reports, of results outside the laboratory's scope of accreditation apply. These requirements are set out in Annex A.5 of NIST Handbook 150, Procedures and General Requirements.

Note 4: Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.)

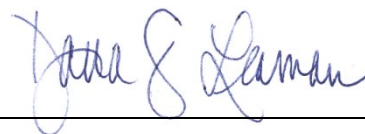
Note 5: Values listed with percent (%) are percent of reading or generated value unless otherwise noted.

Note 6: NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories.

Note 7: Where L is the length in inches of device under test.

Note 8: Where L is the length in mm of device under test.

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United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2017

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United Testing Sys. Canada, Ltd.

Concord ONT
Canada

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Calibration Laboratories

*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 January 2009).*

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Effective Dates



Dana S. Haman
For the National Voluntary Laboratory Accreditation Program