



CALIBRATION LABORATORIES

NVLAP LAB CODE 200301-0

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Notes 3,5,8}	Remarks
DIMENSIONAL			
ANGULAR (20/D01)			
Rotary Stroke – Clockwise and Counter-Clockwise Field calibrations only ^{Note 4}	0.5° to 360°	0.16°	Instron Internal Method with rotary encoder
Rotary Speed Field calibrations only ^{Note 4}	0.2 rpm to 120 rpm	0.00037 rpm + 0.00066 rpm/rpm	Comparison to time base oscillator
LENGTH and DIAMETER; STEP GAGES (20/D05)			
Alignment Electronics Calibration, in lab ^{Note 11}	Up to 2000 μ-strain	2.5 S, where S is reading in units of μ-strain	Instron Internal Method
Alignment Transducer Verification, in lab ^{Note 11}	Up to 2000 μ-strain	-0.00024 S % + 1.7 %	Instron Internal Method
Alignment of Materials Testing System Field calibrations only ^{Notes 4}	Up to 2000 μ-strain	0.0082 S % + 0.23 %	ASTM E1012, Nadcap AC7101, AC7122 specimen alignment (used in determination of % bend)
Extensometer Calibration Apparatus, in lab ^{Note 10}	0.01 mm to 60 mm	0.099 μm + 0.13 L μm	Internal Method

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

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Notes 3,5,8}	Remarks
Strain Field calibrations only ^{Note 4}			ASTM E83, ISO 9513, ISO 5893, ISO 527 or Internal Method
Gage length	0.1 in to 0.3 in > 0.3 in to 4.0 in > 4 in to 12 in > 12 in to 72 in	0.000074 in + 0.000024L in 0.0008 in + 0.0002L in 0.0024 in + 0.000027L in 0.017 in	Gage bars, rulers or digital calipers
Displacement	0.0002 in to 0.00475 in > 0.00475 in to 0.006 in > 0.006 in to 0.02 in > 0.02 in to 0.25 in > 0.25 in to 1.0 in > 1.0 in to 2.0 in > 0 in to 10 in > 10 in to 40 in	0.000012 in 0.000015 in 0.00002 in + 0.000071L in 0.000043 in + 0.00014L in 0.000053 in + 0.00021L in 0.000078 in + 0.00022L in 0.00026 in + 0.00015L in 0.000025 in + 0.00017L in	Linear displacement scales
Specimen Measuring Device (SMD) Field calibrations only ^{Note 4}			
Vertical			
Width	Up to 40 mm	0.00069 mm	Instron Internal Procedure using gage blocks
Thickness	Up to 15 mm	0.00063 mm	
Parallelism			
Width	Up to 1.3 mm	1.1 µm	Instron Internal Procedure using ball gage
Thickness	Up to 1.3 mm	0.95 µm	
Flatness			
Horizontal			
Width	Up to 40 mm	0.0012 mm	Instron Internal Procedure using optical parallels
Thickness	Up to 15 mm	0.00067 mm	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Notes 3,5,8}	Remarks
Material Testing System Crosshead Displacement or Actuator Stroke Field calibrations only ^{Note 4}	0 in to 10 in > 10 in to 40 in	0.00026 in + 0.00015L in 0.000025 in + 0.00017L in	ASTM E2309 or Internal Method with digital linear encoders
Material Testing System Crosshead/Actuator Speed Field calibrations only ^{Note 4}	Up to 1270 mm/min	0.00046 mm/min + 0.0012v mm/min, where v is measured value	ASTM E2658 or Internal Method with linear encoders and comparison to time base oscillator
Hardness XY Stage Micrometer Field calibrations only ^{Note 4}	Up to 1 in	0.00003 in + 0.00018L in	Internal Method, linear encoder
Rheological Testing System Speed Field calibrations only ^{Note 4}	Up to 600 mm/min 12 mm/s to 15708 mm/s	2.0 % 1.2 %	Caliper and stopwatch Caliper and tachometer
Impact Testing System Speed Field calibrations only ^{Note 4}	Up to 24 m/s	1.1 %	Caliper and oscilloscope
Linearity of C.O.D. Gauges Field calibrations only ^{Note 4}	0.01 in to 0.32 in	0.000025 in + 0.00012L in	Displacement ASTM E399
Rheological Equipment Field calibrations only ^{Note 4}			
Inside Diameter	2 mm to 2.5 mm 8 mm to 10 mm 9.5 mm to 12.7 mm > 12.7 mm to 16 mm > 16 mm to 20 mm	0.004 mm	Holematic Mark II or go/no-go gage Setting ring and bore gage
Outside Diameter	Up to 3 mm Up to 30 mm Up to 152 mm	0.08 mm 0.0027 mm 0.018 mm	12X eye loupe Micrometer calipers

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Notes 3,5,8}	Remarks
Linear Displacement	Up to 40.2 mm	0.037 mm	Gage blocks
Heat Deflection Machines (HDT & VICAT) Field calibrations only ^{Note 4}			
Linear Displacement	Up to 2 mm	0.012 mm	Gage blocks
Outside Diameter	Up to 30 mm	0.0027 mm	Micrometer
Impact Testers Field calibrations only ^{Note 4}			
Radius of Curvature	Up to 3 mm	0.08 mm	12 X eye loupe
Length	Up to 150 mm	0.027 mm	Caliper
Length, falling weight tester	Up to 2 m	2.0 mm	Tapes
Outside Diameter	Up to 30 mm	0.0027 mm	Micrometer
ELECTROMAGNETICS – DC/LOW FREQUENCY			
AC RESISTANCE AND CURRENT (20/E02)			
AC Current Field calibrations only ^{Note 4}	0 A to 10 A	0.3 A	Multimeter
DC VOLTAGE (20/E06)			
DC Voltage – Measure In lab ^{Note 9}	0 mV to 300 mV 0 V to 3 V	0.096 mV 0.14 mV	HP 3478A
Field calibrations ^{Note 4}	0.05 V to 1000 V	0.19 %	Multimeter
Ratio, in lab ^{Note 10}	200 μV/10 V to 40 mV/10 V	0.055 %	Signametrics SMX2060 Digital Multimeter
LF AC VOLTAGE (20/E09)			
AC Voltage Field calibrations only ^{Note 4}	400 V to 1000 V 1 kV to 6 kV	2.5 % of full scale 1.2 %	Multimeter Multimeter with HV probe

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Notes 3,5,8</small>	Remarks
TIME & FREQUENCY			
FREQUENCY DISSEMINATION (20/F01)			
Frequency Measure Field calibrations only <small>Note 4</small>	Up to 100 MHz	0.94 %	Oscilloscope
STOPWATCHES & TIMERS (20/F05)			
Timers Field calibrations only <small>Note 4</small>	0.7 ms to 5 ms Up to 500 s	0.94 % 0.22 s	Oscilloscope Stopwatch
MECHANICAL			
FORCE (20/M06)			
Force <small>Note 7</small> In lab <small>Note 11</small>	0.1 lbf to 130 000 lbf 130 000 lbf to 240 000 lbf 240 000 lbf to 1 000 000 lbf	0.005 % 0.01 % 0.05 %	ASTM E74, ISO 376, and internally developed methods Primary standard Secondary standard
Field calibrations <small>Note 4</small>	1 gf to 500 000 kgf (0.01 N to 5 MN) 1 gf to 500 000 kgf (0.01 N to 5 MN)	0.12 % 0.12 %	ASTM E4, ISO 7500-1, ISO 7500-2, and internally developed methods Compression Tension
Falling Weight Impact Tester, in lab <small>Note 9</small>	1 kN to 25 kN 1 kN to 222 kN	0.7 % of full scale 0.11 %	Interface 9840 and load cell
Rheological Equipment Field calibrations only <small>Note 4</small>	Up to 250 g	0.31 %	Interface 9840 & load cell
Heat Deflection Equipment Field calibrations only <small>Note 4</small>	Up to 250 g	0.31 %	Interface 9840 & load cell

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Notes 3,5,8</small>	Remarks
HARDNESS (20/M13)			
Hardness Indirect verification of Rockwell Hardness testing machines Field calibrations only <small>Note 4</small>			
HRA Carbide	93 Rockwell Points 91 Rockwell Points 85 Rockwell Points	0.07 Rockwell Points 0.11 Rockwell Points 0.17 Rockwell Points	ASTM B294 Annex A3
HRA Steel Scale	83 Rockwell Points 73 Rockwell Points 63 Rockwell Points	0.10 Rockwell Points 0.27 Rockwell Points 0.15 Rockwell Points	ASTM E18 Annex A4 & ISO 6508-1 & -2
HRBW Scale	95 Rockwell Points 70 Rockwell Points 40 Rockwell Points	0.17 Rockwell Points 0.31 Rockwell Points 0.48 Rockwell Points	
HRC Scale	63 Rockwell Points 45 Rockwell Points 25 Rockwell Points	0.16 Rockwell Points 0.18 Rockwell Points 0.18 Rockwell Points	
HRD Scale	73 Rockwell Points 59 Rockwell Points 43 Rockwell Points	0.05 Rockwell Points 0.13 Rockwell Points 0.14 Rockwell Points	
HREW Scale	92 Rockwell Points 87 Rockwell Points 81 Rockwell Points	0.11 Rockwell Points 0.24 Rockwell Points 0.14 Rockwell Points	
HRFW Scale	98 Rockwell Points 91 Rockwell Points 80 Rockwell Points	0.11 Rockwell Points 0.16 Rockwell Points 0.13 Rockwell Points	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Notes 3,5,8</small>	Remarks
HRGW Scale	77 Rockwell Points	0.18 Rockwell Points	
	56 Rockwell Points	0.28 Rockwell Points	
	23 Rockwell Points	0.45 Rockwell Points	
HRHW Scale	100 Rockwell Points	0.16 Rockwell Points	
	97 Rockwell Points	0.22 Rockwell Points	
	91 Rockwell Points	0.16 Rockwell Points	
HRK Scale	91 Rockwell Points	0.20 Rockwell Points	
	75 Rockwell Points	0.21 Rockwell Points	
	57 Rockwell Points	0.39 Rockwell Points	
HRLW Scale	124 Rockwell Points	0.05 Rockwell Points	
	116 Rockwell Points	0.10 Rockwell Points	
	106 Rockwell Points	0.15 Rockwell Points	
HRM Scale	120 Rockwell Points	0.07 Rockwell Points	
	105 Rockwell Points	0.13 Rockwell Points	
	90 Rockwell Points	0.30 Rockwell Points	
HR15N Scale	91 Rockwell Points	0.08 Rockwell Points	
	83 Rockwell Points	0.09 Rockwell Points	
	71 Rockwell Points	0.09 Rockwell Points	
HR30N Scale	80 Rockwell Points	0.15 Rockwell Points	
	64 Rockwell Points	0.23 Rockwell Points	
	46 Rockwell Points	0.16 Rockwell Points	
HR45N Scale	70 Rockwell Points	0.13 Rockwell Points	
	49 Rockwell Points	0.12 Rockwell Points	
	24 Rockwell Points	0.19 Rockwell Points	
HRPW Scale	108 Rockwell Points	0.15 Rockwell Points	
	99 Rockwell Points	0.23 Rockwell Points	
	88 Rockwell Points	0.26 Rockwell Points	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Notes 3,5,8</small>	Remarks
HRRW Scale	121 Rockwell Points 119 Rockwell Points 116 Rockwell Points	0.12 Rockwell Points 0.12 Rockwell Points 0.12 Rockwell Points	
HRSW Scale	114 Rockwell Points 109 Rockwell Points 106 Rockwell Points	0.12 Rockwell Points 0.15 Rockwell Points 0.16 Rockwell Points	
HR15TW Scale	90 Rockwell Points 83 Rockwell Points 76 Rockwell Points	0.05 Rockwell Points 0.27 Rockwell Points 0.17 Rockwell Points	
HR30TW Scale	70 Rockwell Points 56 Rockwell Points 43 Rockwell Points	0.20 Rockwell Points 0.20 Rockwell Points 0.29 Rockwell Points	
HR45TW Scale	67 Rockwell Points 41 Rockwell Points 23 Rockwell Points	0.10 Rockwell Points 0.33 Rockwell Points 0.21 Rockwell Points	
HRVWW Scale	106 Rockwell Points 98 Rockwell Points 95 Rockwell Points	0.17 Rockwell Points 0.21 Rockwell Points 0.22 Rockwell Points	
HR15WW Scale	94 Rockwell Points 88 Rockwell Points 84 Rockwell Points	0.08 Rockwell Points 0.07 Rockwell Points 0.11 Rockwell Points	
HR30WW Scale	88 Rockwell Points 75 Rockwell Points 69 Rockwell Points	0.09 Rockwell Points 0.13 Rockwell Points 0.24 Rockwell Points	
HR45WW Scale	82 Rockwell Points 69 Rockwell Points 50 Rockwell Points	0.08 Rockwell Points 0.23 Rockwell Points 0.11 Rockwell Points	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Notes 3,5,8</small>	Remarks
HR15XW Scale	97 Rockwell Points 95 Rockwell Points 90 Rockwell Points	0.08 Rockwell Points 0.08 Rockwell Points 0.10 Rockwell Points	
HR30XW Scale	93 Rockwell Points 88 Rockwell Points 80 Rockwell Points	0.11 Rockwell Points 0.16 Rockwell Points 0.12 Rockwell Points	
HR45XW Scale	90 Rockwell Points 82 Rockwell Points 71 Rockwell Points	0.08 Rockwell Points 0.11 Rockwell Points 0.18 Rockwell Points	
HR15YW Scale	97 Rockwell Points 95 Rockwell Points 92 Rockwell Points	0.12 Rockwell Points 0.15 Rockwell Points 0.10 Rockwell Points	
HR30YW Scale	94 Rockwell Points 91 Rockwell Points 83 Rockwell Points	0.09 Rockwell Points 0.19 Rockwell Points 0.41 Rockwell Points	
HR45YW Scale	91 Rockwell Points 86 Rockwell Points 75 Rockwell Points	0.10 Rockwell Points 0.18 Rockwell Points 0.11 Rockwell Points	
Brinell, Knoop and Vickers hardness testing machines Field calibrations only <small>Note 4</small>			ASTM E10 & ISO 6506-1 & -2
Brinell Microscope Type A Microscope Type B Microscope	10X to 100X Magnification 10X to 100X Magnification	1.6 μ m 21 μ m	
Vickers and Knoop Microscope	30X to 1000X Magnification	0.9 μ m	ASTM E384, E92, or ISO 6507-1 & -2

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <small>Notes 3,5,8</small>	Remarks
Mid Hardness	321 HV/5 388 HV/0.5 395 HV/0.1 441 HV/100	3.9 HV 4.2 HV 6.4 HV 2.8 HV	ASTM E384 or E92
High Hardness	598 HV/30 611 HV/5 694 HV/0.5 697 HV/100 705 HV/0.2 719 HV/30	5.8 HV 3.5 HV 5.5 HV 5.5 HV 9.1 HV 3.6 HV	
Knoop Indentation Hardness Field calibrations only <small>Note 4</small> Applied forces of 10 gf to 1 kgf			
Low Hardness	112 HK/0.01 142 HK/0.1 238 HK/0.5	5.2 HK 2.3 HK 3.8 HK	
Mid Hardness	319 HK/0.2 516 HK/1 524 HK/0.1	3.5 HK 4.8 HK 5.8 HK	
High Hardness	637 HK/0.1 700 HK/0.025 741 HK/0.5	9.5 HK 13 HK 6.2 HK	

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

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Notes 3,5,8}	Remarks
Direct Verification of Rockwell testing machines Field calibrations only ^{Note 4} Testing Time Cycle Indenter Contact Velocity Preliminary Force Dwell Additional Force Application Total Force Dwell Elastic Recovery Dwell Test Force Depth Measuring Device Test Machine Level Machine Hysteresis	Up to 60 s 3 kgf to 150 kgf	0.13 s 0.13 s 0.13 s 0.13 s 0.13 s 0.13 % 0.05 µm 0.0005 in/ft elevation 0.01 Rockwell Points	ASTM E18 Annex A1 ISO 6508-1 & -2 Instron Internal Method ASTM E18 Annex A1 ISO 6508-1 & -2
Direct Verification of Brinell testing machines & measuring equipment Field calibrations only ^{Note 4} Test Force Time Length	From HB 10/3000 to 1/10	0.23 % 0.15 s 2.0 µm	ASTM E10 & ISO 6506-1 & -2
Direct Verification of Vickers testing machines & measuring equipment Field calibrations only ^{Note 4} Test Force Time Length	Vickers scales: HV 5 to HV 100 HV 0.1 to HV 3	0.23 % 0.15 s 2.0 µm	ASTM E92, ISO 6507-1 & -2

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Notes 3,5,8}	Remarks
TORQUE (20/M15)			
Torque – Calibration of Torque devices, Clockwise And Counter-Clockwise Field calibrations only ^{Note 4}	Up to 2 lbf-in Up to 200 lbf-in 1 lbf-in to 110 lbf-in 10 lbf-in to 2213 lbf-in 50 lbf-in to 50000 lbf-in	0.13 % 0.11 % 0.12 % 0.11 % 0.13 %	ASTM E2624 or Internal Method 2 in beam and deadweight 10 in beam and deadweight Torque transducers
IMPACT (20/M17)			
Impact Testing Machines Field calibrations only ^{Note 4}	(Absorbed energy in Joules)		
Charpy	0.5 J to 900 J	0.70 J	ASTM E23 or ISO 148 including proof testing using certified Specimens
Charpy – Plastics	0.5 J to 0.75 J 15 J 25 J 50 J	0.015 J 0.030 J 0.042 J 0.081 J	ISO 13802, ASTM D256, ISO 8256, ISO179-1, ISO 180, ISO 7628-2, ISO 9854-1, ASTM D6110, ASTM D1822
THERMODYNAMIC			
LABORATORY THERMOMETERS, DIGITAL and ANALOG (20/T03)			
In-situ Temperature Measurement Field calibrations only ^{Note 4}			
Temperature	-200 °C to -150 °C > -150 °C to -100 °C > -100 °C to 0 °C	1.3 °C 1.2 °C 1.1 °C	Type T thermocouple with Fluke 714

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

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Notes 3,5,8}	Remarks
Temperature	0 °C to 100 °C > 100 °C to 200 °C > 200 °C to 300 °C > 300 °C to 400 °C > 400 °C to 500 °C > 500 °C to 600 °C > 600 °C to 700 °C > 700 °C to 800 °C > 800 °C to 900 °C	0.7 °C 1.2 °C 2.1 °C 2.6 °C 3.2 °C 3.7 °C 4.7 °C 4.8 °C 5.3 °C	Type K Thermocouple with Fluke 714
PRESSURE INDICATORS (20/T05)			
Pressure Indicators Field calibrations only ^{Note 4}	0 bar to 300 bar 0 bar to 2000 bar	0.2 bar 1.1 bar	Pressure Gage and Hydraulic Pump
RESISTANCE THERMOMETRY (20/T07)			
Temperature Field calibrations only ^{Note 4}	-75 °C to 0 °C > 0 °C to 400 °C	0.11 °C 0.05 °C	PRT 100 and Hart Scientific Black Stack
HDT / Vicat Systems	0 °C to 500 °C	0.13 °C	
TEMPERATURE INDICATORS (20/T08)			
Thermocouple Simulation Field calibrations only ^{Note 4}	Type K Type J Type B Type E Type T Type R Type S Type U Type L	1.3 °C 0.9 °C 2.6 °C 0.9 °C 0.9 °C 2.4 °C 2.4 °C 0.9 °C 0.8 °C	Sensor substitution method using Fluke 714
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: For ASTM E74 the uncertainties of the measured value are determined by the statistics of the test and the artifact tested but are typically better than ± 0.05 % for class AA instruments, ± 0.25 % for class A instruments, and ± 0.1 % for class A1 instruments.

Note 8: Where L is the measured value, in same units as the range.

Note 9: These calibrations are only performed at our primary facility in Norwood.

Note 10: These calibrations are only performed at our facility at Coronation Road, High Wycombe, HP12 3SY, Buckinghamshire, UK.

Note 11: These calibrations can be performed at either laboratory facility: Norwood or High Wycombe.

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