National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Instron Calibration Laboratory
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CALIBRATION LABORATORIES **NVLAP LAB CODE 200301-0**

NVLAP Code: 20/A01 ANSI/NCSL Z540-1-1994; Part 1 Compliant

DIMENSIONAL

NVLAP Code: 20/D05
Length

Range	***Best Uncertainty (±)*** [note 1]	***Remarks***
Field Service Calibration Strain – ASTM E83		
0.1 to 4.0 in	(0.0008 + 0.0002L) inch	Gage Length
0 to 1 in	(15 + 165L) microinch	Displacement
0 to 2 in	(30 + 165L) microinch	Displacement
0 to 10 in	(320 + 150L) microinch	Displacement

Length – Field Calibration

Range	***Best Uncertainty (±)*** [note 1]	***Remarks***
Material Testing System Crosshead Displacement or Actuator Stroke – ASTM E2309 or Internal Method		
0 in to 10 in	0.0003 + 0.00015L in	Digital Linear Encoders
Material Testing System Crosshead/Actuator Speed		
Up to 50 in/min	0.0003 + 0.00015L in	Displacement Component using Linear Encoders

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Up to 50 in/min	10 milliseconds	Time Component by Comparison to Time Base Oscillator

MECHANICAL

NVLAP Code: 20/M06
Force
In-house Application of Force – ASTM E74 and ISO 376

Range in lbf	***Best Uncertainty (±) in %*** *note 1, 2, 3*	***Remarks***
0.1 to 130 000	0.005	Primary Standard
130 000 to 240 000	0.010	Secondary Standard

Field Service Calibration of Force – ASTM E4 and ISO 7500-1

Range	***Best Uncertainty (±)*** *note 1*	***Remarks***
1 gram to 500 ton (0.01 N to 5 MN)	0.125 % of applied force	Compression
1 gram to 500 ton (0.01 N to 5 MN)	0.125 % of applied force	Tension

NVLAP Code: 20/M13
Hardness – Rockwell Test Blocks & Field Service
Indirect Verification of Hardness Testing Machines

Hardness Scale and Range	***Best Uncertainty (±)in Rockwell Points*** *notes 1, 4,5,6,7,8,9,10*	***Remarks***
HRA Carbide		ASTM B294 Section A.1 & ISO 3738-2
93	0.05	
91	0.08	
85	0.13	
HRA Steel Scale		ASTM E18 Section C
83	0.07	
63	0.11	
HRB Scale		ASTM E18 Section C
95	0.14	
70	0.23	

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40	0.38	
HRC Scale		ASTM E18 Section C
63	0.16	
45	0.18	
25	0.18	
HRD Scale		ASTM E18 Section C
73	0.04	
59	0.10	
43	0.11	
HRE Scale		ASTM E18 Section C
92	0.11	
81	0.13	
HRF Scale		ASTM E18 Section C
98	0.12	
80	0.13	
HRG Scale		ASTM E18 Section C
77	0.14	
56	0.26	
23	0.39	
HRH Scale		ASTM E18 Section C
100	0.13	
91	0.14	
HRK Scale		ASTM E18 Section C
91	0.17	
75	0.17	
57	0.32	
HRL Scale		ASTM E18 Section C
124	0.05	
116	0.08	

106	0.13	
HRM Scale		ASTM E18 Section C
120	0.06	
105	0.10	
90	0.23	
HR15N Scale		ASTM E18 Section C
91	0.07	
83	0.09	
71	0.09	
HR30N Scale		ASTM E18 Section C
80	0.12	
46	0.16	
HR45N Scale		ASTM E18 Section C
70	0.13	
49	0.14	
24	0.19	
HRP Scale		ASTM E18 Section C
108	0.14	
99	0.19	
88	0.21	
HRR Scale		ASTM E18 Section C
121	0.10	
119	0.10	
116	0.10	
HRS Scale		ASTM E18 Section C
114	0.12	
109	0.13	
106	0.14	
HR15T Scale		ASTM E18 Section C
90	0.05	

83	0.22	
76	0.13	
HR30T Scale		ASTM E18 Section C
70	0.17	
43	0.24	
HR45T Scale		ASTM E18 Section C
67	0.08	
23	0.17	
HR15V Scale		ASTM E18 Section C
106	0.18	
98	0.20	
95	0.21	
HR15W Scale		ASTM E18 Section C
94	0.10	
88	0.10	
84	0.12	
HR30W Scale		ASTM E18 Section C
88	0.10	
75	0.12	
69	0.21	
HR45W Scale		ASTM E18 Section C
82	0.17	
50	0.18	
HR15X Scale		ASTM E18 Section C
97	0.23	
95	0.23	
90	0.24	
HR30X Scale		ASTM E18 Section C
93	0.12	

80	0.12	
HR45X Scale		ASTM E18 Section C
90	0.10	
82	0.11	
71	0.16	
HR15Y Scale		ASTM E18 Section C
97	0.10	
92	0.10	
HR30Y Scale		ASTM E18 Section C
94	0.11	
91	0.17	
83	0.34	
HR45Y Scale		ASTM E18 Section C
91	0.11	
75	0.12	

Hardness – Field Service Hardness

Measured Quantity	***Best Uncertainty (±)*** [note 1,11,12,13]	***Remarks***
Brinell Microscope		
10X to 100 X Magnification Vickers and Knoop Microscope	1.6 micron	ASTM E10
30X to 1000 X Magnification	0.9 microns	ASTM E92 and E384

Direct Verification of Wilson 2000 Series Rockwell Testing Machines

Test Force (3 kg to 150 kg)	0.125 %	In accordance with ASTM E18 Section 13.1.1
Depth Measuring Device	0.05 microns	In accordance with ASTM E18 Section 13.1.3

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Testing Time Cycle Indenter Contact Velocity Preliminary Force Dwell Additional Force Application Total Force Dwell Elastic Recovery Dwell	0.13 seconds	In accordance with ASTM E18 Section 7.4 to 7.6.4
Test Machine Level	0.0005 in/ft elevation	Instron Internal Procedure
Measurement Hysteresis	99.5 to 100.5 Rockwell Points	Instron Internal Procedure

Hardness – Wilson Hardness Calibration Laboratory
Rockwell Diamond Testing Indenters

Measured Quantity	***Best Uncertainty (±)*** [note 1,14]	***Remarks***
Rockwell A, C, D, and N diamond indenters for testing machines		
Cone Angle	13 minutes	ASTM E18
Tip Radius	5 microns	ASTM E18
Concentricity of Axis	13 minutes	ASTM E18
Polished Flank	5 microns	ASTM E18
Indenter Performance	0.1 Rockwell Units	ASTM E18

Rockwell Ball Indenters

Measured Quantity	***Best Uncertainty (±) in µin*** [note 1, 15, 16, 17]	***Remarks***
Calibration of Steel and Carbide indenters for standardizing and testing machines		
Hardness	14 HV	ASTM E92 and ISO 6507

Vickers and Knoop Indenters

Measured Quantity	***Best Uncertainty (±)*** [notes 1, 18, 19]	***Remarks***
Calibration of Knoop & Vickers indenters for standardizing and testing machines		
Angular Measurement		
Knoop 130° Angle	31 seconds	ASTM E92 & ASTM E384
Knoop 172° 30′ Angle	32 seconds	ASTM E92 & ASTM E384
Vickers 148° 6′ 42″ Angle	20 seconds	ASTM E92 & ASTM E384

Indenter Offset determined on indent

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0.001 mm Vickers ASTM E92, 0.0005 mm Vickers ASTM E384, 0.001 Knoop ASTM E384	0.17 microns	ASTM E92 & ASTM E384 (Measured by Standardizing Optics)

Vickers and Knoop Test Blocks & Field Service Indirect Verification of Hardness Testing Machines

Measured Quantity	***Best Uncertainty (±)*** [notes 1, 20,21,22]	***Remarks***
Calibration of Brinell, Knoop & Vickers Standardized Test Blocks		
Brinell Hardness (ASTM E10) Applied Forces of 10 kgf to 3000 kgf Ball Diameter of 1 mm to 10 mm	3 microns	ASTM E10
Vickers Hardness (ASTM E92) Applied Forces 1 kgf to 120 kgf	1 micron	ASTM E92
Micro-indentation Hardness Knoop Indentation Hardness Applied Forces of 10 gf to 1 kgf	0.40 microns	ASTM E384
Vickers Indentation Hardness Applied Forces of 50 gf to 1 kgf	0.40 microns	ASTM E384
Hardness – Shore Hardness Durometers		

Parameter	***Range in D.P.***	***Best Uncertainty (±) in D.P.*** [notes 1, 25, 27]	***Remarks***
SI Durometers			
Type A	0 to 100	0.27	ASTM D2240 and DIN 53505
Type B	0 to 100	0.27	ASTM D2240
Type C	0 to 100	0.36	ASTM D2240
Type D	0 to 100	0.36	ASTM D2240 and DIN 53505
Type DO	0 to 100	0.36	ASTM D2240
Type M	0 to 100	0.50	ASTM D2240
Type O	0 to 100	0.27	ASTM D2240
Type OO	0 to 100	0.27	ASTM D2240

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Round Style Durometers			
Type A	0 to 100	1.16	ASTM D2240
Type B	0 to 100	1.16	ASTM D2240
Type C	0 to 100	1.16	ASTM D2240
Type D	0 to 100	1.16	ASTM D2240
Type DO	0 to 100	1.16	ASTM D2240
Type M	0 to 100	1.24	ASTM D2240
Type O	0 to 100	1.16	ASTM D2240
Type OO	0 to 100	1.20	ASTM D2240
Type OOO	0 to 100	1.20	ASTM D2240
Type OOOS	0 to 100	1.16	ASTM D2240
Type T	0 to 100	1.16	Shore Calibration Laboratory Specifications
Quad Style Durometers			
Type A	0 to 100	5.78	ASTM D2240
Type B	0 to 100	5.78	ASTM D2240
Type C	0 to 100	5.78	ASTM D2240
Type D	0 to 100	5.78	ASTM D2240
Type DO	0 to 100	5.78	ASTM D2240
Type O	0 to 100	5.78	ASTM D2240
Type OO	0 to 100	5.78	ASTM D2240
Type T	0 to 100	5.78	Shore Calibration Laboratory Specifications
Durotronic Style Durometers			
Type A	0 to 100	0.42	ASTM D2240
Type B	0 to 100	0.42	ASTM D2240
Type C	0 to 100	0.40	ASTM D2240
Type D	0 to 100	0.40	ASTM D2240
Type DO	0 to 100	0.40	ASTM D2240
Type O	0 to 100	0.50	ASTM D2240
Type M	0 to 100	0.60	ASTM D2240
Pencil Style Durometers			
Type A	0 to 100	5.78	ASTM D2240

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Hardness – Shore Hardness Calibration Laboratory – IRHD

Range	***Best Uncertainty (±)*** [notes 1, 28]	***Remarks***
10 to 100 IRHD	See Below	ASTM D1415 Type S2 & ISO 48 Method N
0.295 N	0.002 N	Minor Force on Ball
5.4 N	0.006 N	Major Force on Ball
5.7 N	0.006 N	Total Force on Ball
8.3 N	0.016 N	Force on Foot
6.0 mm	0.02 mm	Inside Diameter of Foot
20.0 mm	0.0204 mm	Outside Diameter of Foot
2.5 mm	0.0015 mm	Diameter of Ball

Hardness – Shore Hardness Calibration Laboratory
Test Blocks

Parameter	***Range in D.P.***	***Best Uncertainty (±) in D.P.*** [notes 1, 2, 29]	***Remarks***
Rubber Test Blocks			
Type A (S1)	30 to 90	0.27	Shore Calibration Laboratory Specifications
Type DO (S1)	50 to 80	0.36	Shore Calibration Laboratory Specifications
Type M (S1)	30 to 90	0.50	Shore Calibration Laboratory Specifications
Type O (S1)	40 to 90	0.27	Shore Calibration Laboratory Specifications
Type OO (S1)	80	0.27	Shore Calibration Laboratory Specifications

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Hardness – Shore Hardness Calibration Laboratory – Durocalibrator

Parameter	*Range in D.P.*	*Best Uncertainty (±) in D.P.* [notes 1, 24, 25, 26]	*Remarks*
Shore Durocalibrator			
Type A	0 to 100	0.13	ASTM D2240
Type D	10 to 100	0.31	ASTM D2240
Type AD (Combined)	0 to 100	0.13	ASTM D2240

Hardness – Shore Calibration Laboratory Type 3 Operating Stands

Range in mm/s	*Best Uncertainty (±) in mm/s* [note 1]	*Remarks*
0 to 3.2	0.031	ASTM D2240

THERMODYNAMIC

NVLAP Code: 20/T08
Temperature

Range	*Best Uncertainty (±)* [note 1]	*Remarks*
Insitu Temperature Measurement Type T Thermocouple		
-200 °C to -150 °C	1.3 °C	Type T Thermocouple with Fluke 714
-150 °C to -100 °C	1.2 °C	Type T Thermocouple with Fluke 714
-100 °C to -50 °C	1.1 °C	Type T Thermocouple with Fluke 714
-50 °C to 0 °C	1.1 °C	Type T Thermocouple with Fluke 714
Insitu Temperature Measurement Type K Thermocouple		
0 °C to 100 °C	0.7 °C	Type K Thermocouple with Fluke 714
100 °C to 200 °C	0.7 °C	Type K Thermocouple with Fluke 714
200 °C to 300 °C	1.2 °C	Type K Thermocouple with Fluke 714
300 °C to 400 °C	2.1 °C	Type K Thermocouple with Fluke 714
400 °C to 500 °C	2.6 °C	Type K Thermocouple with Fluke 714
500 °C to 600 °C	3.2 °C	Type K Thermocouple with Fluke 714
600 °C to 700 °C	3.7 °C	Type K Thermocouple with Fluke 714
700 °C to 800 °C	4.2 °C	Type K Thermocouple with Fluke 714
800 °C to 900 °C	4.8 °C	Type K Thermocouple with Fluke 714

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Thermocouple Simulation		
Type K	1.3 °C	Sensor substitution method using Fluke 714
Type J	0.9 °C	Sensor substitution method using Fluke 714
Type B	2.6 °C	Sensor substitution method using Fluke 714
Type E	0.9 °C	Sensor substitution method using Fluke 714
Type T	0.9 °C	Sensor substitution method using Fluke 714
Type R	0.9 °C	Sensor substitution method using Fluke 714
Type S	2.4 °C	Sensor substitution method using Fluke 714
Type U	0.9 °C	Sensor substitution method using Fluke 714
Type L	0.8 °C	Sensor substitution method using Fluke 714

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1. Represents an expanded uncertainty using a coverage factor, k = 2, at an approximate level of confidence of 95 %.
2. Uncertainty of the voltage ratio is < 0.1 microvolt per volt.
3. 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.
4. The standardized test blocks used for verification are calibrated at the Wilson Hardness Calibration Laboratory in accordance with ASTM E18 Section C using NIST Rockwell HRC standard reference materials (SRM) 2810, 2811, and 2812. All other Rockwell scales are traceable to Wilson hardness levels through laboratory standardizing machines. The standardizing machines are directly verified according to ASTM E18 using devices that are traceable to NIST either directly or through a NVLAP -approved laboratory.
5. The HRC Hardness scale is traceable to the NIST Rockwell HRC standard reference materials (SRM) 2810, 2811, 2812, and the IMGC.
6. Standardized Rockwell test blocks calibrated by ball penetrators are traceable to traditional Wilson Hardness Levels and the IMGC.
7. Standardized Rockwell test blocks calibrated for the HRA carbide hardness scale are traceable to the Cemented Carbide Producers Association (CCPA) through standard reference materials.
8. Standardized Rockwell test blocks calibrated for the HRA steel, HRD and HRN hardness scales are either traceable to traditional Wilson Hardness Levels or the IMGC.
9. The standardizing machines are directly verified according to ASTM E18 using devices that are traceable to NIST—either directly or through a NVLAP-approved laboratory.
10. The stated measurement uncertainty is expanded with a coverage factor of k = 2, representing a level of confidence of approximately 95 %. The measurement uncertainty reported is the actual measurement uncertainty for the calibration standards used during customer machine indirect verification. All standardized test blocks are calibrated using Laboratory Standardizing Machines at the Wilson Hardness Calibration Laboratory.
11. The calibration shall be in accordance with ASTM E10 Section 15.1.3 for Brinell measuring microscope verification.
12. The calibration shall be in accordance with ASTM E384 Section A1.3.5 for micro-indentation measuring device verification.
13. Direct verification of hardness testing machines shall be in accordance with Section 13 of ASTM E18. Measurement uncertainty reported is the actual measurement uncertainty of the calibration standards used during direct verification.
14. The calibration shall be in accordance with ASTM E18 Section 13.1.2.1.
15. The calibration shall be in accordance with ASTM E18 Section 13.1.2.2 for Rockwell calibrations or ASTM E10 Section 5.2 for Brinell calibrations.

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16. Ball Diameter, Roundness & Surface Finish are subcontracted calibration from an accredited laboratory recognized by the ILAC agreement.
17. Ball hardness is measured internally by Instron.
18. The calibration shall be in accordance with ASTM E384 Section A1.2 for Knoop and Vickers micro-indentation indenters.
19. The calibration shall be in accordance with ASTM E92 Section 4.2 for Vickers heavy load testing indenters or Section 15.1.2 for Vickers heavy load standardizing indenters.
20. The calibration shall be in accordance with ASTM E10 Test Method C for Brinell test block calibrations.
21. The calibration shall be in accordance with ASTM E92 Section C for Vickers heavy load test block calibrations.
22. The calibration shall be in accordance with ASTM E384 Section A2 for Knoop and Vickers micro-indentation test block calibrations.
23. D.P. = Durometer Points
24. Durocalibrator calibrates A, B, O & T type durometers.
25. Durocalibrator calibrates C, D, & DO type durometers.
26. Durocalibrator calibrates A, B, C, D, DO, O & T type durometers.
27. Shore T scale specified is certified to Shore Hardness Calibration Laboratory Procedures.
28. IRHD = International Rubber Hardness Degree
29. Best measurement uncertainty stated for rubber test blocks on scope assumes perfect test block uniformity. Actual test block non-uniformity will be calculated in overall measurement uncertainty calculation for each test block. The combined measurement uncertainty for each test block is reported on the calibration certificate.

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