

National Institute
of Standards and Technology



National Voluntary
Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

Scope of Accreditation



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CALIBRATION LABORATORIES

NVLAP LAB CODE 200301-0

INSTRON CALIBRATION LABORATORY

100 Royall Street
Canton, MA 02021
Mr. David Scanlon

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E-Mail: dave_scanlon@instron.com

URL: <http://www.instron.com>

DIMENSIONAL

NVLAP Code: 20/D05

Length

Range

Best Uncertainty (\pm)^{note 1}

Remarks

Field Service Calibration of Strain:

0.5 in (12.5 mm) to 4.0 in (100 mm)

0.5% of measured value but not less
than 50 μ in

Gage Length

>0 to 10 in (254 mm)

0.5% of measured value but not less
than 50 μ in

Displacement

March 31, 2005

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MECHANICAL

NVLAP Code: 20/M06

Force

In-house Application of Force ASTM E74

<i>Range</i>	<i>Best Uncertainty (\pm)^{notes 1,2,3}</i>	<i>Remarks</i>
Applied Force in Pounds		
0.1 to 130000	0.005 %	Primary Standard
130000 to 240000	0.005 %	Secondary Standard

NVLAP Code: 20/M06

Field Service Calibration of Force - ASTM E4

<i>Range</i>	<i>Best Uncertainty (\pm)^{note 1}</i>	<i>Remarks</i>
1 gram to 500 ton (0.01 N to 5MN)	0.125 % of applied force	Compression
1 gram to 500 ton (0.01 N to 5MN)	0.125 % of applied force	Tension

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NVLAP Code: 20/M13

Field Service Indirect Verification of Hardness Testing Machines.

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

93	0.05
91	0.08
85	0.13

HRA Steel Scale

83	0.07
63	0.11

HRB Scale

95	0.14
70	0.23
40	0.38

HRC Scale

63	0.16
45	0.18
25	0.18

HRD Scale

73	0.04
59	0.10
43	0.11

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HRE Scale

92	0.11
81	0.13

HRF Scale

98	0.12
80	0.13

HRG Scale

77	0.14
56	0.26
23	0.39

HRH Scale

100	0.13
91	0.14

HRK Scale

91	0.17
75	0.17
57	0.32

HRL Scale

124	0.05
116	0.08
106	0.13

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HRM Scale

120	0.06
105	0.10
90	0.23

HR15N Scale

91	0.07
83	0.09
71	0.09

HR30N Scale

80	0.12
46	0.16

HR45N Scale

70	0.13
49	0.14
24	0.19

HRP Scale

108	0.14
99	0.19
88	0.21

HRR Scale

121	0.10
119	0.10
116	0.10

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HRS Scale

114	0.12
109	0.13
106	0.14

HR15T Scale

90	0.05
83	0.22
76	0.13

HRT30T Scale

70	0.17
43	0.24

HR45T Scale

67	0.08
23	0.17

HRV Scale

106	0.18
98	0.20
95	0.21

HR15W Scale

94	0.10
88	0.10
84	0.12

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HR30W Scale

88	0.10
75	0.12
69	0.21

HR45W Scale

82	0.17
50	0.18

HR15X Scale

97	0.23
95	0.23
90	0.24

HR30X Scale

93	0.12
80	0.12

HR45X Scale

90	0.10
82	0.11
71	0.16

HR15Y Scale

97	0.10
92	0.10

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HR30Y Scale

94	0.11
91	0.17
83	0.34

HR45Y Scale

91	0.11
75	0.12

NVLAP Code: 20/M13

Hardness - Field Service Hardness

<i>Measured Quantity</i>	<i>Best Uncertainty (\pm)</i> ^{notes 1,11,12,13}	<i>Remarks</i>
Brinell Microscope	1 micron	10X - 100X magnification
Micro/Macro-Indentation Microscope	0.14 microns	30X - 1000X magnification
Direct Verification of Wilson 2000 Series Rockwell Testing Machines		
Test Force (3KG -150KG)	0.125%	
Depth Measuring Device	0.05 microns	In accordance with ASTM E18-02 Section 13.1.3
Testing Time Cycle	0.13 seconds	In accordance with ASTM E18-02 Sections 7.4 - 7.6.4
Test Machine Level	0.0005 in/ft elevation	

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Hardness - Wilson Harness Calibration Laboratory
Rockwell Diamond Testing Indenters

<i>Measured Quantity</i>	<i>Best Uncertainty (\pm)^{notes 1,14}</i>	<i>Remarks</i>
Rockwell A steel, C, D, and N diamond indenters for testing machines	13 minutes	Cone Angle
	5 microns	Tip Radius
	13 minutes	Concentricity of Axis
	5 microns	Polished Flank
	4 microns	Deviation from a Truly Spherical Surface
	0.1 Rockwell units	Indenter Performance

NVLAP Code: 20/M13

Hardness - Wilson Hardness Calibration Laboratory
Rockwell Ball Indenters

<i>Measured Quantity</i>	<i>Best Uncertainty (\pm)^{notes 1,15,16,17}</i>	<i>Remarks</i>
Calibration of Steel and Carbide indenters for standardizing and testing machines	8 μ in	Ball Diameter
	0.56 μ in	Roundness
	0.47 μ in	Surface Finish
	1.15 μ in	Hardness

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NVLAP Code: 20/M13

Hardness - Wilson Hardness Calibration Laboratory
Vickers and Knoop Indenters

<i>Measured Quantity</i>	<i>Best Uncertainty (\pm)^{notes 1,18,19}</i>	<i>Remarks</i>
Calibration of Knoop & Vickers indenters for standardizing and testing machines		
Angular Measurements	31 seconds 32 seconds 20 seconds	Knoop 130° Angle Knoop 172° Angle Vickers 148° 6' 42" Angle
Indenter Offset	0.17 microns	Measured by Standardizing Machine Optics

NVLAP Code: 20/M13

Hardness - Wilson Hardness Calibration Laboratory
Vickers & Knoop Test Blocks & Field Service Indirect Verification of Hardness Testing Machines

<i>Measured Quantity</i>	<i>Best Uncertainty (\pm)^{notes 1,20,21,22}</i>	<i>Remarks</i>
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	
Vickers Hardness (ASTM E92) Applied Forces of 1 KGF to 120 KGF	1 micron	

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Micro-indentation Hardness (ASTM E384) 0.40 microns
Knoop Indentation Hardness Applied Forces
of 10 GF to 1 KGF

Vickers Indentation Hardness Applied Forces 0.40 microns
of 50 GF to 1 KGF

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Hardness

Shore Hardness

Durometer, IRHD, Test Blocks, Durocalibrator & Type 3 Operating Stands

Range	Best Uncertainty (\pm)^{note 1,23}	Remarks
0-100 D.P.	1.16 D.P.	Type A
0-100 D.P.	1.16 D.P.	Type B
0-100 D.P.	1.16 D.P.	Type C
0-100 D.P.	1.16 D.P.	Type D
0-100 D.P.	1.16 D.P.	Type DO
0-100 D.P.	1.24 D.P.	Type M
0-100 D.P.	1.16 D.P.	Type O
0-100 D.P.	1.20 D.P.	Type OO
0-100 D.P.	1.20 D.P.	Type OOO

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0-100 D.P.	1.16 D.P.	Type OOOS
0-100 D.P.	1.16 D.P.	Type T ^{note 27} Shore Calibration Laboratory Specifications
10-100 IRDH	see below	IRHD ^{note 28} ASTM D1415-88 (1999) & ISO 48 (1994)
.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
10 - 100 D.P.	0.31 D.P.	Type A ^{note 24,27} ASTM D2240 (03)
0 - 100 D.P.	0.13 D.P.	Type D ASTM D2240 (03) ^{note 25}
10 - 100 D.P. Type A	0.31 D.P.	TYPE AD ^{note 26,27} (Combined) ASTM D2240 (03)
0 - 100 D.P. Type D	0.13 D.P.	ASTM D2240 (03)

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0 - 3.2 mm/s

0.031 mm/sec

Type 3 operating stand
ASTM D2240 (03)

1. Represents an expanded uncertainty using a coverage factor, $k=2$.
2. Uncertainty of the voltage ratio is <0.1 microvolt per volt.
3. Uncertainty of the measured value is determined by the statistics of the test and the artifact tested but are typically better than $\pm 0.05\%$ for class AA instruments, $\pm 0.25\%$ for class A instruments and $\pm 0.1\%$ for class A1 instruments.
4. The standardized test blocks used for verification are calibrated at the Wilson Hardness Calibration Laboratory in accordance with ASTM E18-02 section C using N.I.S.T. Rockwell HRC standard reference materials (SRM) 2810, 2811, and 2812. All other Rockwell scales are traceable to Wilson hardness levels thru laboratory standardizing machines. The standardizing machines are directly verified according to ASTM E18-02 using devices that are traceable to N.I.S.T. either directly or through a NVLAP approved laboratory.
5. The HRC Hardness scale is traceable to the NIST, Rockwell HRC standards reference materials (SRM) 2810, 2811, 2812, and the IMGCC.
6. Standardized Rockwell test blocks calibrated by ball penetrators are traceable to traditional Wilson Hardness Levels and the IMGCC.
7. Standardized Rockwell test blocks calibrated for the HRA carbide hardness scale is 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 IMGCC.
9. The standardizing machines are directly verified according to ASTM E18-02 using devices that are traceable to NIST - either directly or through an NVLAP approved laboratory.
10. The stated measurement uncertainty is expanded with a coverage factor of $k=2$, representing a confidence level of approximately 95%. The measurement uncertainty reported is the actual

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10. The stated measurement uncertainty is expanded with a coverage factor of $k=2$, representing a confidence level 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 calibration using Laboratory Standardizing Machines at the Wilson Hardness Calibration Laboratory.
11. The calibration shall be in accordance with ASTM E10-01 section 15.1.3 for Brinell measuring microscope verification.
12. The calibration shall be in accordance with ASTM E384-99 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 E18-02. 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 E18-02 section 13.1.2.
15. The calibration shall be in accordance with ASTM E18-02 section 13.1.2.2 for Rockwell calibrations or ASTM E10-01 section 5.2 for Brinell calibrations.
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 E384-99 Section A1.2 for Knoop and Vickers micro-indentation indenters.
19. The calibration shall be in accordance with ASTM E92-97 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 E10-01 Test Method C for Brinell test block calibrations.
21. The calibration shall be in accordance with ASTM E92-97 Section C for Vickers Heavy load test block calibrations.

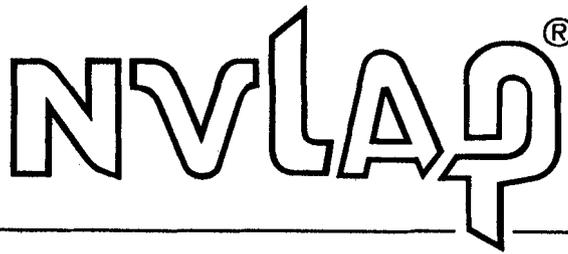
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22. The calibration shall be in accordance with ASTM E384-99 Section A2 for Knoop and Vickers micro-indentation test block calibrations.
23. D.P. = Durometer Points
24. Durocalibrator Calibrates A, B, O & T Type Durometers.
25. Durocalibrator Calibrates 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.

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