National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200127-0**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

David L. Ellis Co., Incorporated 310 Old High Street, P.O. Box 592 Acton, MA 01720-0010 Mr. Robert A. Ellis Phone: 978-897-1795 Fax: 978-897-0844 E-mail: sales@hardness-testblocks.com URL: http://www.hardness-testblocks.com	**Fields of Calibration** Dimensional Mechanical This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)[Notes 1,2,11]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
DIMENSIONAL			
Length & Diameter; Step Gages (20/D05)			
Reference Block Calibration Brinell Hardness Laboratory Capability ASTM E10, ISO 6506	0 mm to 7 mm	0.0038 mm	Indentation Measurement
Reference Block Calibration Vickers Hardness Laboratory Capability ASTM E384, E92, ISO 6507	0 mm to 0.100 mm 1 mm to 0.200 mm	0.0003 mm 0.00036 mm	
Reference Block Calibration Knoop Hardness Laboratory Capability ASTM E384, ISO 4545	0 mm to 0.100 mm 1 mm to 0.200 mm	0.0003 mm 0.00036 mm	
Indenters Brinell Hardness Laboratory Capability ASTM E10, ISO 6506	1 mm to 10 mm	0.00025 mm	Grade 10 Ball
Length of Indenter Vickers, Knoop, Brinell Reference Block Calibration Vickers Hardness Laboratory	>0 mm to 3.0 mm	0.025 mm	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty Note 3	Remarks
Capability ASTM E92, ISO 6507, ASTM E384	136°	5 minutes	UKAS Vickers
Reference Block Calibration Vickers Hardness Laboratory Capability ASTM E384, ISO 4545	130° 172°	5 minutes 5 minutes	UKAS Knoop
Field Calibration Note 4 Brinell Hardness ASTM E10, ISO 6506	0 mm to 7 mm	0.028 mm	Indentation Measurement
Field Calibration Note 4 Vickers Hardness ASTM E92, ISO 6507, ASTM E384	0 mm to 0.500 mm	0.0014 mm	
Field Calibration Note 4 Vickers Hardness ASTM E384, ISO 6507	0 mm to 0.200 mm	0.001 mm	
Field Calibration Note 4 Knoop Hardness ASTM E384, ISO 4545	0 mm to 0.200 mm	0.001 mm	
Rockwell Hardness Testers Direct Laboratory And Field Calibrations Note 4 ASME E18, ISO 6508	0 mm to 3 mm	0.0003 mm	Direct verification of depth is valid only for United Tru-Blue II testers with a Heidenhain Metro Gage, over temperature range 10 ºC to 40 ºC
MECHANICAL			
FORCE (20/M06)			
Reference Block Calibration Brinell Hardness Laboratory Capability ASTM E10, ISO 6506	1 kgf 1.25 kgf 2.5 kgf	0.01 kgf 0.01 kgf 0.01 kgf	Applied Force

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
	5 kgf	0.02 kgf	
	6.25 kgf	0.02 kgf	
	7.81 kgf	0.02 kgf	
	10 kgf	0.03 kgf	
	15.62 kgf	0.04 kgf	
	25 kgf	0.06 kgf	
	30 kgf	0.08 kgf	
	31.25 kgf	0.16 kgf	
	62.5 kgf	0.32 kgf	
	100 kgf	0.25 kgf	
	125 kgf	0.31 kgf	
	187.5 kgf	0.95 kgf	
	250 kgf	1.3 kgf	
	500 kgf	2.6 kgf	
	750 kgf	0.63 kgf	
	1000 kgf	3.6 kgf	
	1500 kgf	5.8 kgf	
	2000 kgf	6.7 kgf	
	2500 kgf	7.8 kgf	
	3000 kgf	9.3 kgf	
Reference Block Calibration Vickers Hardness Laboratory Capability ASTM E92, ISO 6507, ASTM E384	1 kgf	0.003 kgf	Applied Force
	1.5 kgf	0.006 kgf	
	2 kgf	0.006 kgf	
	2.5 kgf	0.007 kgf	
	3 kgf	0.012 kgf	
	5 kgf	0.02 kgf	
	10 kgf	0.05 kgf	
	20 kgf	0.088 kgf	
	30 kgf	0.13 kgf	
	50 kgf	0.21 kgf	
	100 kgf	0.44 kgf	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
Reference Block Calibration Vickers Hardness Laboratory Capability ASTM E384, ISO 6507	10 gf 25 gf 50 gf 100 gf 200 gf 300 gf 400 gf 500 gf 1000 gf 2000 gf 3000 gf	1 gf 1 gf 1 gf 1 gf 1 gf 2.1 gf 2.1 gf 3.1 gf 5.5 gf 11 gf 16 gf	Applied Force
Reference Block Calibration Knoop Hardness Laboratory Capability ASTM E384, ISO 4545	10 gf 25 gf 50 gf 100 gf 200 gf 300 gf 400 gf 500 gf 1000 gf 2000 gf 3000 gf	1 gf 1 gf 1 gf 1 gf 1 gf 2.1 gf 2.1 gf 3.1 gf 5.5 gf 11 gf 16 gf	Applied Force
Field Calibration [Note 4] Brinell Hardness ASTM E10, ISO 6506	62.5 kgf 187.5 kgf 500 kgf 1000 kgf 1500 kgf 2000 kgf 2500 kgf	0.6 kgf 1.9 kgf 5.0 kgf 5.8 kgf 7.4 kgf 8.1 kgf 9.5 kgf	Applied Force

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
Field Calibration [Note 4] Vickers Hardness ASTM E92 ISO 6507, ASTM E384	3000 kgf	10 kgf	
	1 kgf	0.006 kgf	Applied Force
	2 kgf	0.012 kgf	
	5 kgf	0.030 kgf	
	10 kgf	0.060 kgf	
	20 kgf	0.12 kgf	
	30 kgf	0.18 kgf	
	50 kgf	0.30 kgf	
Field Calibration [Note 4] Vickers Hardness ASTM E384, ISO 6507	10 gf	1 gf	Applied Force
	25 gf	1 gf	
	50 gf	1 gf	
	100 gf	1 gf	
	200 gf	1 gf	
	300 gf	2.1 gf	
	500 gf	3.1 gf	
	1000 gf	5.5 gf	
Field Calibration [Note 4] Knoop Hardness ASTM E384, ISO 4545	10 gf	1 gf	Applied Force
	25 gf	1 gf	
	50 gf	1 gf	
	100 gf	1 gf	
	200 gf	1 gf	
	300 gf	2.1 gf	
	500 gf	3.1 gf	
	1000 gf	5.5 gf	
Rockwell Hardness Testers - Direct Laboratory & Field Calibration [Note 4] ASTM E4	3 kgf	10 gf	Applied Force
	10 kgf	10 gf	
	15 kgf	10 gf	
	30 kgf	10 gf	
	45 kgf	10 gf	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
	60 kgf	30 gf	
	100 kgf	30 gf	
	150 kgf	30 gf	
HARDNESS (20/M13)			
Calibration of Test Blocks Rockwell ASTM E18, ISO 6508			See notes 7, 8, and 9
HRA Scale	≥ 86	0.17	Uncertainty given in Rockwell points
	80 to 85	0.17	
	70 to 79	0.29	
	60 to 69	0.28	
HRB Scale	≥ 80	0.37	
	51 to 79	0.24	
	1 to 50	0.33	
HRC Scale	60 to 70	0.31	
	40 to 59	0.32	
	20 to 39	0.37	
HRD Scale	70 to 80	0.17	
	50 to 69	0.26	
	40 to 49	0.24	
HRE Scale	≥ 89	0.48	
	75 to 88	0.48	
	65 to 87	0.36	
HRF Scale	≥ 87	0.44	
	70 to 86	0.45	
	40 to 69	0.25	
HRG Scale	≥ 80	0.23	
	40 to 79	0.17	
	1 to 39	0.76	
HRH Scale	≥ 90	0.35	See notes 7, 8, and 9
	80 to 89	0.41	Uncertainty given in Rockwell points
	60 to 79	0.71	
HRK Scale	≥ 70	0.34	
	30 to 69	0.47	
	10 to 29	0.54	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HRL Scale	≥ 115	0.17	
	90 to 114	0.24	
HRM Scale	≥ 100	0.41	
	70 to 99	0.52	
HRP Scale	≥ 85	0.34	
	40 to 84	0.50	
HRR Scale	≥ 120	0.22	
	100 to 119	0.33	
HRS Scale	≥ 112	0.17	
	110 to 111	0.78	
HRV Scale	≥ 104	0.25	
	80 to 103	0.21	
HR15N Scale	90 to 95	0.50	
	80 to 89	0.40	
	40 to 79	0.39	
HR15T Scale	88 to 100	0.29	
	80 to 87	0.36	
	20 to 79	0.41	
HR15W Scale	89 to 100	0.42	
	80 to 88	0.24	
HR15X Scale	88 to 100	0.17	See notes 7, 8, and 9
	80 to 87	0.54	Uncertainty given in
HR15Y Scale	94 to 100	0.20	Rockwell points
	85 to 93	0.44	
HR30N Scale	77 to 85	0.52	
	60 to 76	0.45	
	40 to 59	0.26	
HR30T Scale	57 to 85	0.19	
	50 to 56	0.62	
	20 to 49	0.55	
HR30W Scale	65 to 100	0.31	
	40 to 64	0.81	
HR30X Scale	79 to 100	0.17	
	60 to 78	0.95	
HR30Y Scale	88 to 100	0.31	
	60 to 87	0.20	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HR45N Scale	67 to 75	0.17	
	50 to 66	0.21	
	10 to 49	0.47	
HR45T Scale	50 to 75	0.37	
	40 to 49	0.38	
	1 to 39	0.68	
HR45W Scale	49 to 100	0.28	
	10 to 47	0.75	
HR45X Scale	69 to 100	0.17	
	40 to 68	0.74	
HR45Y Scale	82 to 100	0.22	See notes 7, 8, and 9
	60 to 81	0.62	
Field Service [Note 4]			
Indirect Verification of Hardness Testing Machines			
Rockwell ASTM E18, ISO 6508			See notes 7 and 8. Range and uncertainty given in Rockwell points
HR15N Scale	90 to 95	0.50	
	80 to 89	0.41	
	40 to 79	0.40	
HR15T Scale	≥ 88	0.42	
	80 to 87	0.51	
	20 to 79	0.60	
HR15W Scale	≥ 89	0.61	
	80 to 88	.0.36	
HR15X Scale	≥ 88	0.18	
	80 to 87	0.55	
HR15Y Scale	≥ 94	0.22	
	85 to 93	0.45	
HR30N Scale	77 to 85	0.53	
	60 to 76	0.46	
	40 to 59	0.28	
HRT30T Scale	≥ 57	0.21	
	50 to 56	0.63	
	20 to 49	0.56	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HR30W Scale	≥ 65	0.33	
	40 to 64	0.82	
HR30X Scale	≥ 79	0.19	
	60 to 78	0.95	
HR30Y Scale	≥ 88	0.33	
	60 to 87	0.22	
HR45N Scale	67 to 75	0.19	
	50 to 66	0.23	
	10 to 49	0.48	
HR45T Scale	≥ 50	0.38	
	40 to 49	0.39	
	1 to 39	0.69	
HR45W Scale	≥ 48	0.30	
	10 to 47	0.76	
HR45X Scale	≥ 69	0.18	
	40 to 68	0.75	
HR45Y Scale	≥ 82	0.24	
	60 to 81	0.63	
HRA Scale	≥ 86	0.18	
	80 to 85	0.18	
	70 to 79	0.23	
	60 to 69	0.29	
HRB Scale	≥ 80	0.38	
	51 to 79	0.26	
	1 to 50	0.34	
HRC Scale	60 to 70	0.32	
	40 to 59	0.34	
	20 to 39	0.38	
HRD Scale	70 to 80	0.22	
	50 to 69	0.26	
	40 to 49	0.25	
HRE Scale	≥ 89	0.50	
	75 to 88	0.50	
	65 to 87	0.37	
HRF Scale	≥ 87	0.45	
	70 to 86	0.65	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
	40 to 69	0.27	
HRG Scale	≥ 80	0.25	
	40 to 79	0.20	
	1 to 39	0.77	
HRH Scale	≥ 90	0.36	
	80 to 89	0.42	
	60 to 79	0.72	
HRK Scale	≥ 70	0.35	
	30 to 69	0.48	
	10 to 29	0.55	
HRL Scale	≥ 115	0.19	
	90 to 114	0.26	
HRM Scale	≥ 100	0.42	
	70 to 99	0.53	
HRP Scale	≥ 85	0.35	
	40 to 84	0.51	
HRR Scale	≥ 120	0.24	
	100 to 119	0.34	
HRS Scale	≥ 112	0.18	
	110 to 111	0.77	
HRV Scale	≥ 104	0.21	
	80 to 103	0.61	
Rockwell Ball Indenters			
	Ball protrusion 1/16",1/8",1/4", 1/2"	0.004 mm	ASTM E18
	Hardness ball holder	1.2 HV10 (Vickers)	Conversion to HRC 25 range
	Performance 1/16" ball holder	0.25 HRBW	ASTM E18
	Performance 1/8" ball holder	0.30 HREW	ASTM E18
	Performance 1/4" ball holder	0.31 HRLW	ASTM E18
	Performance 1/2" ball holder	0.20 HRRW	ASTM E18

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
Calibrate Reference Test Blocks Brinell ASTM E10, ISO 6506 Brinell Scale			See notes 7, 8, and 10
HBW 1/1	45 to 200	0.54 HBW	Range in Brinell units
HBW 1/1.25	200 to 400	9.5 HBW	
HBW 1/2.5	8.0 to 54.5	0.1 HBW	
HBW 1/5	15.9 to 109	0.1 HBW	
HBW 1/10	31.8 to 218	0.2 HBW	
HBW 1/30	45 to 200	0.3 HBW	
HBW 1/30	200 to 400	2.2 HBW	
HBW 1/30	400 to 650	6.0 HBW	
HBW 2.5/6.25	3.2 to 21.8	0.1 HBW	
HBW 2.5/7.8	4.0 to 27.2	0.1 HBW	
HBW 2.5/15.625	8.0 to 54.5	0.1 HBW	
HBW 2.5/31.25	15.9 to 109	0.1 HBW	
HBW 2.5/62.5	31.8 to 218	0.2 HBW	
HBW 2.5/187.5	45 to 200	0.3 HBW	
HBW 2.5/187.5	200 to 400	1.3 HBW	
HBW 2.5/187.5	400 to 700	2.9 HBW	
HBW 5/25	3/2 to 21.8	0.1 HBW	
HBW 5/31.25	4.0 to 27.2	0.1 HBW	
HBW 5/62.5	7.96 to 54.5	0.1 HBW	
HBW 5/125	15.9 to 109	0.1 HBW	
HBW 5/250	31.8 to 218	0.2 HBW	
HBW 5/750	45 to 200	0.30 HBW	
HBW 5/750	200 to 400	1.8 HBW	
HBW 5/750	400 to 600	4.6 HBW	
HBW 10/100	3.2 to 21.8	0.1 HBW	
HBW 10/125	4.0 to 27.2	0.1 HBW	
HBW 10/250	8.0 to 54.5	0.1 HBW	
HBW 10/500	100 to 150	0.30 HBW	
HBW 10/1000	45 to 200	0.40 HBW	
HBW 10/1000	200 to 400	1.4 HBW	
HBW 10/1500	45 to 200	0.3 HBW	
HBW 10/1500	200 to 400	1.5 HBW	
HBW 10/1500	400 to 700	3.5 HBW	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HBW 10/2000	45 to 200	0.3 HBW	
HBW 10/2000	200 to 400	1.4 HBW	
HBW 10/2000	400 to 700	3.2 HBW	
HBW 10/2500	45 to 200	0.3 HBW	
HBW 10/2500	200 to 400	1.3 HBW	
HBW 10/2500	400 to 700	3.0 HBW	
HBW 10/3000	45 to 200	0.3 HBW	
HBW 10/3000	200 to 400	1.3 HBW	
HBW 10/3000	400 to 700	2.9 HBW	
Vickers: ASTM E92, ASTM E384			See notes 7, 8, and 10
HV 1	200 to 400	1.5 HV	Range in Vickers units
HV 1	400 to 700	3.6 HV	
HV 1	700 to 2 300	7.7 HV	
HV 1.5	25 to 200	0.1 HV	
HV 1.5	200 to 400	1.4 HV	
HV 1.5	400 to 700	3.2 HV	
HV 1.5	700 to 2 300	6.7 HV	
HV 2	25 to 200	0.1 HV	
HV 2	200 to 400	1.3 HV	
HV 2	400 to 700	3.0 HV	
HV 2	700 to 2 300	6.1 HV	
HV 2.5	25 to 200	0.1 HV	
HV 2.5	200 to 400	1.3 HV	
HV 2.5	400 to 700	2.9 HV	
HV 2.5	700 to 2300	5.7 HV	
HV 3	25 to 200	0.1 HV	
HV 3	200 to 400	1.3 HV	
HV 3	400 to 700	2.8 HV	
HV 3	700 to 2300	5.5 HV	
HV 5	25 to 200	0.1 HV	
HV 5	200 to 400	1.2 HV	
HV 5	400 to 700	2.6 HV	
HV 5	700 to 2300	5.0 HV	
HV 10	25 to 200	0.1 HV	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HV 10	200 to 400	1.2 HV	
HV 10	400 to 700	2.5 HV	
HV 10	700 to 2300	4.5 HV	
HV 20	25 to 200	0.1 HV	
HV 20	200 to 400	1.2 HV	
HV 20	400 to 700	2.4 HV	
HV 20	700 to 2300	4.3 HV	
HV 30	25 to 200	0.1 HV	
HV 30	200 to 400	1.2 HV	
HV 30	400 to 700	2.3 HV	
HV 30	700 to 2300	4.2 HV	
HV 50	25 to 200	0.1 HV	
HV 50	200 to 400	1.2 HV	
HV 50	400 to 700	2.3 HV	
HV 50	700 to 2300	4.0 HV	
HV 100	25 to 200	0.1 HV	
HV 100	200 to 400	1.1 HV	
HV 100	400 to 700	2.3 HV	
HV 100	700 to 2300	4.0 HV	
Calibrate Reference Test Blocks Vickers: ASTM E384, ISO 6507 Vickers Scale			See notes 7, 8, and 10
HV 0.01	25 to 200	0.5 HV	Range in Vickers units
HV 0.01	200 to 400	10 HV	
HV 0.01	400 to 700	28 HV	
HV 0.01	700 to 2300	64 HV	
HV 0.025	25 to 200	0.3 HV	
HV 0.025	200 to 400	6.4 HV	
HV 0.025	400 to 700	18 HV	
HV 0.025	700 to 2300	41 HV	
HV 0.05	25 to 200	0.2 HV	
HV 0.05	200 to 400	4.6 HV	
HV 0.05	400 to 700	13 HV	
HV 0.05	700 to 2300	29 HV	
HV 0.1	25 to 200	0.2 HV	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HV 0.1	200 to 400	3.3 HV	
HV 0.1	400 to 700	9.2 HV	
HV 0.1	700 to 2300	21 HV	
HV 0.2	25 to 200	0.2 HV	
HV 0.2	200 to 400	2.5 HV	
HV 0.2	400 to 700	6.7 HV	
HV 0.2	700 to 2300	15 HV	
HV 0.3	25 to 200	0.2 HV	
HV 0.3	200 to 400	2.2 HV	
HV 0.3	400 to 700	5.6 HV	
HV 0.3	700 to 2300	13 HV	
HV 0.4	25 to 200	0.2 HV	
HV 0.4	200 to 400	1.9 HV	
HV 0.4	400 to 700	5.0 HV	
HV 0.4	700 to 2300	11 HV	
HV 0.5	25 to 200	0.2 HV	
HV 0.5	200 to 400	1.8 HV	
HV 0.5	400 to 700	4.6 HV	
HV 0.5	700 to 2300	10 HV	
HV 1	25 to 200	0.2 HV	
HV 1	200 to 400	1.5 HV	
HV 1	400 to 700	3.6 HV	
HV 1	700 to 2300	7.7 HV	
Calibrate Reference Test Blocks and Indenters Knoop: ASTM E384, ISO 4545 Knoop Scale			See notes 7, 8, and 10
HK 0.01	25 to 200	0.5 HK	Range in Knoop units
HK 0.01	200 to 400	4.9 HK	
HK 0.01	400 to 700	12 HK	
HK 0.01	700 to 2300	24 HK	
HK 0.025	25 to 200	0.5 HK	
HK 0.025	200 to 400	4.2 HK	
HK 0.025	400 to 700	9.4 HK	
HK 0.025	700 to 2300	18 HK	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HK 0.05	25 to 200	0.5 HK	
HK 0.05	200 to 400	3.9 HK	
HK 0.05	400 to 700	8.5 HK	
HK 0.05	700 to 2300	16 HK	
HK 0.1	25 to 200	0.5 HK	
HK 0.1	200 to 400	3.8 HK	
HK 0.1	400 to 700	8.0 HK	
HK 0.1	700 to 2300	15 HK	
HK 0.2	25 to 200	0.5 HK	
HK 0.2	200 to 400	3.8 HK	
HK 0.2	400 to 700	7.7 HK	
HK 0.2	700 to 2300	14 HK	
HK 0.3	25 to 200	0.5 HK	
HK 0.3	200 to 400	3.7 HK	
HK 0.3	400 to 700	7.6 HK	
HK 0.3	700 to 2300	13 HK	
HK 0.5	25 to 200	0.5 HK	
HK 0.5	200 to 400	3.7 HK	
HK 0.5	400 to 700	7.6 HK	
HK 0.5	700 to 2300	13 HK	
HK 1	25 to 200	0.5 HK	
HK 1	200 to 400	3.7 HK	
HK 1	400 to 700	7.5 HK	
HK 1	700 to 2300	13 HK	
Indirect Field Service [Note 4] And Laboratory Calibration Brinell Hardness Testers ASTM E10, ISO 6506 Brinell Scale			See notes 7 and 8.
HBW 1/62.5	200 to 400	2 HBW	Range in Brinell units
HBW 1/62.5	400 to 600	4 HBW	
HBW 2.5/187.5	200 to 400	2 HBW	
HBW 2.5/187.5	400 to 600	4 HBW	
HBW 10/500	20 to 100	2 HBW	
HBW 10/500	100 to 150	4HBW	

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)[Notes 1,2,11]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HBW 5/1000	200 to 400	2 HBW	
HBW 5/1000	400 to 600	4 HBW	
HBW 10/1000	200 to 400	2 HBW	
HBW 10/1000	400 to 600	4 HBW	
HBW 10/1500	200 to 400	2 HBW	
HBW 10/1500	400 to 600	4 HBW	
HBW 10/2000	200 to 400	2 HBW	
HBW 10/2000	400 to 600	4 HBW	
HBW 10/2500	200 to 400	2 HBW	
HBW 10/2500	400 to 600	4 HBW	
HBW 10/3000	200 to 400	2 HBW	
HBW 10/3000	400 to 600	4 HBW	
Indirect Field Service [Note 4] And Laboratory Calibration Vickers Hardness Testers ASTM E92, ISO 6507, ASTM E384 Vickers Scale			See notes 7 and 8. Range in Vickers units
HV 1	200	8.7 HV	
HV 1	400	21 HV	
HV 1	700	44 HV	
HV 2	200	6.9 HV	
HV 2	400	16 HV	
HV 2	700	31 HV	
HV 5	200	3.9 HV	
HV 5	400	11 HV	
HV 5	700	20 HV	
HV 10	200	3.1 HV	
HV 10	400	7.7 HV	
HV 10	700	15 HV	
HV 20	200	2.5 HV	
HV 20	400	6.2 HV	
HV 20	700	11 HV	
HV 30	200	2 HV	
HV 30	400	4.4 HV	

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)[Notes 1,2,11]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
HV 30	700	9.3 HV	
HV 50	200	1.9 HV	
HV 50	400	3.5 HV	
HV 50	700	6.3 HV	
Indirect Field Service [Note 4] And Laboratory Calibration Vickers Hardness Testers ASTM E384, ISO 6507 Vickers Scale			See notes 7 and 8.
HV 0.01	200	10 HV	Range in Vickers units
HV 0.01	400	30 HV	
HV 0.01	700	40 HV	
HV 0.025	200	9 HV	
HV 0.025	400	20 HV	
HV 0.025	700	30 HV	
HV 0.05	200	8.5 HV	
HV 0.05	400	19 HV	
HV 0.05	700	27 HV	
HV 0.1	200	8 HV	
HV 0.1	400	18 HV	
HV 0.1	700	25 HV	
HV 0.2	200	7 HV	
HV 0.2	400	17 HV	
HV 0.2	700	20 HV	
HV 0.3	200	6 HV	
HV 0.3	400	16 HV	
HV 0.3	700	19 HV	
HV 0.5	200	5 HV	
HV 0.5	400	15 HV	
HV 0.5	700	17 HV	
HV 1	200	5 HV	
HV 1	400	10 HV	
HV 1	700	15 HV	

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)[Notes 1,2,11]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
Indirect Field Service [Note 4] And Laboratory Calibration Knoop Hardness Testers ASTM E384, ISO 4545 Knoop Scale			See notes 7 and 8.
HK 0.01	200	7 HK	Range in Knoop units
HK 0.01	400	16 HK	
HK 0.01	700	33 HK	
HK 0.025	200	7 HK	
HK 0.025	400	14 HK	
HK 0.025	700	22 HK	
HK 0.05	200	7 HK	
HK 0.05	400	14 HK	
HK 0.05	700	20 HK	
HK 0.1	200	7 HK	
HK 0.1	400	12 HK	
HK 0.1	700	19 HK	
HK 0.2	200	5 HK	
HK 0.2	400	8 HK	
HK 0.2	700	17 HK	
HK 0.3	200	5 HK	
HK 0.3	400	8 HK	
HK 0.3	700	17 HK	
HK 0.5	200	5 HK	
HK 0.5	400	7 HK	
HK 0.5	700	15 HK	
HK 1	200	5 HK	
HK 1	400	7 HK	
HK 1	700	15 HK	
Calibration of Durometer Blocks ASTM D2240 Hardness scale			
Shore A	0 to 100	0.8	Uncertainty given in
Shore D	0 to 100	0.8	Shore units

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)[Notes 1,2,11]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
Calibration of Durometers ASTM D2240 Spring Force			
Shore A	0 N to 8.9 N	0.0002 N	
Shore D	0 N to 44 N	0.006 N	
Indenter Extension	0 mm to 6.35 mm	0.005 mm	Tip shape verified for condition only. Indenter extension verified by use of gage blocks.
Calibration of Leebs Testers ASTM A956	400 LD to 900 LD	8.5 LD	
Calibration of Leebs Blocks ASTM A956	400 LD to 900 LD	9.3 LD	
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: Uncertainty 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.

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Notes

Note 7: Standardized test blocks used for verification are calibrated at the David L. Ellis Company, Inc. Hardness Calibration Laboratory in accordance with ASTM E10, E18, E92, E384, or ISO 4545, 6506, 6507, 6508 using NIST HRC Standard Reference Materials (SRM) 2810, 2811, 2812 and other primary reference standards from other National Metrology Institutes. Some Rockwell scales are traceable to David L. Ellis Co., Inc. hardness levels through laboratory standardizing machines. These standardizing machines are directly verified according to applicable ASTM or ISO procedures using devices that are traceable to NIST either directly or through a NVLAP-accredited laboratory.

Note 8: Where available, certified materials (NIST (USA), PTB (Germany), and IMGC (Italy)) are used to indirectly verify scales and hardness levels. All other scales and hardness ranges are traceable to directly verified testers with parameters traceable to NIST.

Note 9: The best uncertainty is shown at the highest part of the range and increases as Rockwell value decreases. The uncertainty of the lowest value in the range is equal to the uncertainty listed in the next lower range. Best uncertainty remains the same for all values higher than the ranges shown in each scale.

Note 10: The best uncertainty is shown for the lowest value in the range. The uncertainty increases in a non-linear manner to a value which equals the uncertainty of the next range. The highest value of uncertainty for the upper value is 2 to 3 times higher than value shown depending on type. Please contact the lab for a better estimation of uncertainty for these higher values.

Note 11: Calibrations for Rockwell hardness are performed at either David L. Ellis's Acton facility or their Maynard facility. Other calibrations are performed at Maynard only. Location of specific calibration will be noted on calibration certificate.

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