DAVID L. ELLIS COMPANY, INC.

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NVLAP Calibration 200127-0

Certificate of Calibration and Conformance for Microindentation Knoop Test Block

Certificate No. 168

Hardness	214	HK Ave	**Date Cal**	22-Jan-19	**Temp**	23 C	**Mag**	200X
Serial No.	168		**Code**	WEST	**Humidity**	40%		
g force	500		**Force N**	4.9035	**Tol+/-HK**	8.8		
			Operator	RAE	**Ave/Stdev µm**	182.2	1.34	
Unc block	7.4	HK	**Method**	E92-17, E384-17	**Tol+/-µm**	3.6		

Indent Map

Group 1

µm	HK
182.8	213
183.0	212
180.7	218
182.6	213
183.3	212

Group 2

µm	HK
184.2	210
182.6	213
181.9	215
184.4	209
180.5	218

Group 3

µm	HK
185.1	208
182.6	213
182.1	215
180.5	218
183.5	211

Group 4

µm	HK
182.1	215
182.6	213
180.5	218
180.2	219
180.2	219

Group 5

µm	HK
183.0	212
181.6	216
181.6	216
181.2	217
181.9	215

Group	Hardness	HK	Stdev	µm
Group 1	214	2.4	182.5	
Group 2	213	3.9	182.7	
Group 3	213	4.0	182.7	
Group 4	217	2.7	181.1	
Group 5	215	1.6	181.9	

Hardness	214	HK 0.5	**Uncertainty**	+/-	7.4 HK	K=2

The above calibration was verified with the following equipment, which is traceable to N.I.S.T.

Chatillon Digital Remote Gauge
Serial No.: 226

Stage Micrometer in mm
N.I.S.T. Test No.:NIST 5588

Mitutoyo Micro Hardness Tester MVK-H1
Serial Number 60594

N.I.S.T. SRM #1895 S/N B0456

The standardized test blocks are calibrated in accordance with ASTM E384 using NIST standard reference material (SRM) #1895. All other indenter/loads combinations are traceable to Ellis hardness levels through laboratory standardizing machines. The standardizing machines are directly verified according to ASTM E384 using devices that are traceable to NIST either directly or through an A2LA or NVLAP approved laboratory.

Expanded uncertainty uses coverage factor K=2, providing a confidence level of approximately 95%.

This test report is not to be used to claim product endorsement by the David L. Ellis Company Inc., A2LA, NVLAP or any government agency.

This block is calibrated according to A.S.T.M. E-384 standards, ANSI (NCSL) Z540-1, (ISO) 10012-1, ISO/IEC Guide 17025 and MIL-STD 45662A by David L Ellis Co., Inc. A2LA certificate number 1310.01 Calibration.

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Representative