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Wilson® Indenters

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CERTIFICATE OF CALIBRATION

CERTIFICATE: 0085946

Item

Wilson Brale® Rockwell Regular Scales (HRC,A,D) Grade B Diamond Indenter complies with ASTM E18 – 14.
#9100-401

Identification

Indenter Serial Number: 0085946

Method Of Calibration

The above Rockwell Hardness Testing Indenter has been directly verified in a NVLAP accredited Hardness Calibration Laboratory, Lab Code 200538-0 using linear, angular & form calibration equipment. The performance of the Indenter under test has been compared with the performance of a Class A Diamond Indenter using a Standardizing machine and Standardized hardness test blocks. All measurements for the above stated indenter are traceable to National Standards.

Results

All the results herein contained pertain explicitly to the testing performed on indenter 0085946
Visual inspection accomplished in accordance with ASTM E18 - 14 A3.5.2.1
This Class B Diamond Indenter meets all the geometric Requirements of:

ASTM E18 - 14 A3.5.2					
Parameter measured in 4 spots at 45° Interval.	**Tip Mean Radius: (mm.)**	**Mean Included Cone Angle:**	**Local deviations from a true radius**	**Depth of penetration of Polished Cone**	
ASTM E18 - 14 Requirement	0.200 +/- 0.010; +/- 0.015 in any 1 spot	120° ± 0.35°	≤ 0.002 mm	≥ 0.30 mm	
Mean Measured Value	0.1985	119.93	0.00090	0.31	
Expanded Uncertainty K=2	0.0058	0.135	0.00159		

Mean Performance Results						
Indenter Used	HRC 60	HRC 25				
A Grade Master	61.88	24.63				
0085946	61.97	24.65				
u_{diff} Expanded Uncertainty K=2	0.21	0.14				

This Diamond Indenter was performance verified in accordance with ASTM E18 - 14 A3.5.3, on all the scales and ranges required for the indenter type, and performed within allowable tolerances relative to the Class A Qualifying Indenter, as shown in the Table above.

NVLAP®
NVLAP LAB CODE 200538-0

Environmental Conditions

Calibration performed at: 23° C +/- 3° C (73.4° F +/- 5.4° F)

All tests and observations performed in accordance with ASTME18 - 14 in NVLAP accredited Laboratory at 1231 County St. Attleboro, MA. 02703, NVLAP Lab Code 200538-0
Procedures, equipment, and methods all ISO / IEC 17025-2005 compliant.

Calibrated By Lab Tech RLM
Date 13-May-2014

Approved Signatory _____

M.L. Mihalec
R.J. Snow
M.K. Souza

RJSWI 130628

BUEHLER
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Wilson® Test Blocks

Solutions for Materials Preparation, Testing and Analysis

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CERTIFICATE: 14N74225

Buehler
41 Waukegan Road
Lake Bluff, IL 60044

ACCREDITED
Calibration Lab CERT# 2237.01

CERTIFICATE OF CALIBRATION

Item

25 HRC Rockwell Standardized Hardness Test Block To **ASTM E18-12** & **BS EN ISO 6508-3: 2005**.

Identification

Block Serial Number: 14N74225

Method Of Calibration

The above Rockwell Standardized Hardness Test Block has been examined and calibrated by Buehler at the Wilson Hardness Laboratory, 33 Lewis Road Binghamton NY at a temperature of 23 deg C +/- 3 deg C, using specialized dimensional & form measuring equipment and a Hardness Standardizing Machine with hardness scales traceable to N.I.S.T. by comparison with Standard Reference Materials 2810, 2811 & 2812. The findings and measurement results were compared with the requirements of ASTM E18-12 and BS EN ISO 6508-3: 2005.

Results

The geometric features of the block were found to be within the requirements specified in ASTM E18-12 Clause A4.3 and BS EN ISO 6508-3: 2005 Clause 3. The calibrated hardness values are given below and were found to be within the requirements of ASTM E18-12 and BS EN ISO 6508-3: 2005.

Mean Hardness Value:		**23.37**
Range:		0.80
Actuals:	(1)	23.29
	(2)	23.48
	(3)	23.55
	(4)	23.79
	(5)	22.99
	(6)	23.11
Uncertainty of measurement:	+/-	0.29 Rockwell Points

The maximum non-uniformity tolerance of the Standardized test block is: 1.00 Rockwell Points
Note: The tolerance engraved on the surface of the block is required by ASTM to be from Table A1.3 of ASTM E18-12 and may be larger than stated above.

The test block was calibrated on Standardized Laboratory Machine serial number LAB216 which is using load and depth devices traceable to National Standards through test/certificate numbers: 681/280652-11 & 681/280591-11

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k = 2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with appendix X.2 of ASTM E18-12 and A2LA requirements. The useful life of a test block is determined by the usage of the surface area per ASTM E18-12 sections 7.9.1 & 7.9.2. Only the surface engraved with the hardness value is standardized. No other surface can be used. The test cycle of the Standardizing machine used to calibrate the test blocks is as follows: Preliminary Test Force Dwell Time 3 seconds, Total Force Dwell Time 5 seconds, Elastic Recovery Dwell Time 4 seconds, Additional Force Application 2 seconds & Indenter Velocity < 1mm/s.

The International Laboratory Accreditation Cooperation, (ILAC), is an international cooperation of laboratory and inspection accreditation bodies which provide global laboratory mutual recognition for laboratories around the world. Further information and a complete list of ILAC recognized accrediting bodies is available at www.ilac.org

Calibrated By Vanessa Welch
Date May 12, 2014

Approved Signatory _____

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CERTIFICATE: 14E72612

Buehler
41 Waukegan Road
Lake Bluff, IL 60044

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Calibration Lab CERT# 2237.01

CERTIFICATE OF CALIBRATION

Item

45 HRC Rockwell Standardized Hardness Test Block To **ASTM E18-12** & **BS EN ISO 6508-3: 2005**.

Identification

Block Serial Number: 14E72612

Method Of Calibration

The above Rockwell Standardized Hardness Test Block has been examined and calibrated by Buehler at the Wilson Hardness Laboratory, 33 Lewis Road Binghamton NY at a temperature of 23 deg C +/- 3 deg C, using specialized dimensional & form measuring equipment and a Hardness Standardizing Machine with hardness scales traceable to N.I.S.T. by comparison with Standard Reference Materials 2810, 2811 & 2812. The findings and measurement results were compared with the requirements of ASTM E18-12 and BS EN ISO 6508-3: 2005.

Results

The geometric features of the block were found to be within the requirements specified in ASTM E18-12 Clause A4.3 and BS EN ISO 6508-3: 2005 Clause 3. The calibrated hardness values are given below and were found to be within the requirements of ASTM E18-12 and BS EN ISO 6508-3: 2005.

Mean Hardness Value:		**45.74**
Range:		0.12
Actuals:	(1)	45.66
	(2)	45.73
	(3)	45.74
	(4)	45.78
	(5)	45.76
	(6)	45.78
Uncertainty of measurement:	+/-	0.17 Rockwell Points

The maximum non-uniformity tolerance of the Standardized test block is: 1.00 Rockwell Points
Note: The tolerance engraved on the surface of the block is required by ASTM to be from Table A1.3 of ASTM E18-12 and may be larger than stated above.

The test block was calibrated on Standardized Laboratory Machine serial number LAB 214 which is using load and depth devices traceable to National Standards through test/certificate numbers: 681/280652-11 & 681/280591-11

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k = 2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with appendix X.2 of ASTM E18-12 and A2LA requirements. The useful life of a test block is determined by the usage of the surface area per ASTM E18-12 sections 7.9.1 & 7.9.2. Only the surface engraved with the hardness value is standardized. No other surface can be used. The test cycle of the Standardizing machine used to calibrate the test blocks is as follows: Preliminary Test Force Dwell Time 3 seconds, Total Force Dwell Time 5 seconds, Elastic Recovery Dwell Time 4 seconds, Additional Force Application 2 seconds & Indenter Velocity < 1mm/s.

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Calibrated By Vanessa Welch
Date April 24, 2014

Approved Signatory _____

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CERTIFICATE: 14E72904

Buehler
41 Waukegan Road
Lake Bluff, IL 60044

ACCREDITED
Calibration Lab CERT# 2237.01

CERTIFICATE OF CALIBRATION

Item

63 HRC Rockwell Standardized Hardness Test Block To **ASTM E18-12** & **BS EN ISO 6508-3: 2005**.

Identification

Block Serial Number: 14E72904

Method Of Calibration

The above Rockwell Standardized Hardness Test Block has been examined and calibrated by Buehler at the Wilson Hardness Laboratory, 33 Lewis Road Binghamton NY at a temperature of 23 deg C +/- 3 deg C, using specialized dimensional & form measuring equipment and a Hardness Standardizing Machine with hardness scales traceable to N.I.S.T. by comparision with Standard Reference Materials 2810, 2811 & 2812. The findings and measurement results were compared with the requirements of ASTM E18-12 and BS EN ISO 6508-3: 2005.

Results

The geometric features of the block were found to be within the requirements specified in ASTM E18-12 Clause A4.3 and BS EN ISO 6508-3: 2005 Clause 3. The calibrated hardness values are given below and were found to be within the requirements of ASTM E18-12 and BS EN ISO 6508-3: 2005.

Mean Hardness Value:		**63.63**
Range:		0.04
Actuals:	(1)	63.62
	(2)	63.62
	(3)	63.65
	(4)	63.61
	(5)	63.61
	(6)	63.64
Uncertainty of measurement:	+/-	0.16 Rockwell Points

The maximum non-uniformity tolerance of the Standardized test block is: 0.50 Rockwell Points
Note: The tolerance engraved on the surface of the block is required by ASTM to be from Table A1.3 of ASTM E18-12 and may be larger than stated above.

The test block was calibrated on Standardized Laboratory Machine serial number LAB 214 which is using load and depth devices traceable to National Standards through test/certificate numbers: 681/280652-11 & 681/280591-11

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k = 2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with appendix X.2 of ASTM E18-12 and A2LA requirements. The useful life of a test block is determined by the usage of the surface area per ASTM E18-12 sections 7.9.1 & 7.9.2. Only the surface engraved with the hardness value is standardized. No other surface can be used. The test cycle of the Standardizing machine used to calibrate the test blocks is as follows: Preliminary Test Force Dwell Time 3 seconds, Total Force Dwell Time 5 seconds, Elastic Recovery Dwell Time 4 seconds, Additional Force Application 2 seconds & Indenter Velocity < 1mm/s.

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Calibrated By Vanessa Welch
Date April 17, 2014

Approved Signatory _____

Order No:

RO-000467

Item No:

9100498

Description:

CALIB SET, C SCALE NIST

Serial No:

HARD-11166

HARD-11166

14 23 37 HRC +/- 1.0

14 46 74 HRC +/- 1.0