



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: December 31, 2024

Certificate Number: 4097.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,5}:

I. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Microscopes ³			Optical verification by stage micrometer
	Up to 120 µm	0.31 µm	100x - objectives
	Up to 90 µm	0.44 µm	80x - objectives
	Up to 210 µm	0.37 µm	60x - objectives
	(10 to 260) µm	0.37 µm	50x - objectives
	(10 to 450) µm	0.43 µm	30x - 40x - objectives
	(20 to 890) µm	0.60 µm	20x - objectives
	(40 to 1800) µm	0.93 µm	10x - 15x - objectives
	(50 to 1600) µm	1.9 µm	5x - objectives
	(100 to 4000) µm	3.4 µm	4x - objectives
	(200 to 2200) µm	3.9 µm	3x - objectives
	(150 to 7100) µm	2.9 µm	2.5x - objectives
	(800 to 7800) µm	5.2 µm	0.7x - objectives

II. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Direct Verification of Knoop & Vickers Hardness Testers ³			Direct verification method per ASTM: E384, E92; ISO: 6507, 4545.
Verification of the Test Force	(0 to 200) gf (200 to 1000) gf (1 to 150) kgf	0.16 % of range 0.12 % of range 0.12 % of range	Verification of the test force is by load cell per ASTM E4, ISO 7500
Verification of the Device for Measuring Indentation Diameters	(0 to 120) µm (0 to 90) µm (0 to 210) µm (10 to 260) µm (10 to 450) µm (20 to 890) µm (40 to 1800) µm (50 to 1600) µm (100 to 4000) µm (200 to 2200) µm (150 to 7100) µm (800 to 7800) µm (400 to 7800) µm (200 to 1800) µm	0.31 µm 0.44 µm 0.37 µm 0.37 µm 0.43 µm 0.60 µm 0.93 µm 1.9 µm 3.4 µm 3.9 µm 2.9 µm 5.2 µm 14 µm 4.8 µm	Optical verification by stage micrometer 100x - objectives 80x - objectives 60x - objectives 50x - objectives 30x - 40x - objectives 20x - objectives 10x - 15x - objectives 5x - objectives 4x - objectives 3x - objectives 2.5x - objectives 0.7x - objectives LowMag - handheld HighMag - handheld
Indirect Verification of Vickers Hardness Testers ³	(40 to 240) HV (240 to 600) HV > 600 HV	1.8 HV 5.1 HV 7.7 HV	Indirect verification method per ASTM E384, ASTM E92, ISO 6507 (Vickers)
Indirect Verification of Microindentation Hardness Testers (Knoop & Vickers) ³	(40 to 240) HV (240 to 600) HV > 600 HV (40 to 250) HK (250 to 650) HK > 650 HK	2.6 HV 6.6 HV 13 HV 2.7 HK 6.8 HK 10 HK	Indirect verification method per ASTM E384, ASTM E92, ISO 4545 (Knoop), ISO 6507 (Vickers)

Parameter/Equipment	Range	CMC ² (±)	Comments
Direct Verification of Brinell Hardness Testers ³			
Verification of the Test Force	HBW 1 (1 to 30) kgf	0.12 % of range	Verification of the test force is by load cell ASTM E4, ISO 7500
	HBW 2.5 (6.25 to 187.5) kgf	0.12 % of range	
	HBW 5 (25 to 750) kgf	0.12 % of range	
	HBW 10 (100 to 3000) kgf	0.12 % of range	
Verification of the Device for Measuring Indentation Diameters			Optical verification by stage micrometer
	(0 to 120) µm	0.31 µm	100x - Objectives
	(0 to 90) µm	0.44 µm	80x - Objectives
	(0 to 210) µm	0.37 µm	60x - Objectives
	(10 to 260) µm	0.37 µm	50x - Objectives
	(10 to 450) µm	0.43 µm	30x - 40x - objectives
	(20 to 890) µm	0.60 µm	20x - objectives
	(40 to 1800) µm	0.93 µm	10x - 15x - objectives
	(50 to 1600) µm	1.9 µm	5x - objectives
	(100 to 4000) µm	3.4 µm	4x - objectives
	(200 to 2200) µm	3.9 µm	3x - objectives
	(150 to 7100) µm	2.9 µm	2.5x - objectives
	(800 to 7800) µm	5.2 µm	0.7x - objectives
	(400 to 7800) µm	14 µm	LowMag - Handheld
	(200 to 1800) µm	4.8 µm	HighMag - Handheld
Indirect Verification of Brinell Hardness Testers ³ –			
HBW 10/3000	Low Medium High	1.7 HBW 5.1 HBW 8.4 HBW	Indirect verification method per ASTM E10, ASTM E110, ISO 6506
HBW 10/1500	Low High	1.2 HBW 2.8 HBW	
HBW 10/1000	Low High	1.2 HBW 2.6 HBW	
HBW 10/500	Low High	0.92 HBW 1.5 HBW	

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Brinell Hardness Testers ³ (cont) –			
HBW 10/250	Low Medium High	0.40 HBW 0.45 HBW 0.52 HBW	Indirect verification method per ASTM E10, ASTM E110, ISO 6506
HBW 10/100	Low Medium High	0.39 HBW 0.43 HBW 0.69 HBW	
HBW 5/750	Low Medium High	1.8 HBW 5.2 HBW 7.3 HBW	
HBW 5/250	Low High	1.9 HBW 2.3 HBW	
HBW 5/125	Low High	0.95 HBW 1.4 HBW	
HBW 5/62.5	Low	0.63 HBW	
HBW 2.5/187.5	Low Medium High	1.8 HBW 5.4 HBW 6.8 HBW	
HBW 2.5/62.5	Low High	1.5 HBW 2.1 HBW	
HBW 2.5/31.25	Low High	1.0 HBW 1.5 HBW	
HBW 2.5/15.625	Low	0.56 HBW	
HBW 1/30	Low Medium High	1.6 HBW 4.6 HBW 5.7 HBW	
HBW 1/10	Low High	1.3 HBW 2.3 HBW	
HBW 1/5	Low High	0.81 HBW 1.6 HBW	
HBW 1/2.5	Low	0.71 HBW	

Parameter/Equipment	Range	CMC ² (±)	Comments
Direct Verification of Rockwell Hardness Testers ³			Direct verification method per ASTM E18, ISO 6508
Verification of the Test Force –			
Rockwell	(10 to 150) kgf	0.12 % of range	Verification of the test force is by load cell ASTM E4, ISO 7500
Rockwell Superficial	(3 to 45) kgf	0.12 % of range	
Verification of the Depth Measuring Device –			
Rockwell	Up to 260 µm	0.15 HR	Kal rock depth measuring device
Rockwell Superficial	Up to 140 µm	0.31 HR	
Verification of the Machine Hysteresis	(100 & 130) HR	0.18 HR	Test blocks
Indirect Verification of Rockwell Hardness & Rockwell Superficial Hardness Testers ³ –	HRA: Low Medium High	0.56 HRA 0.29 HRA 0.22 HRA	Indirect verification method per ASTM E18, ASTM E110, ISO 6508
	HRBW: Low Medium High	1.4 HRBW 1.0 HRBW 0.67 HRBW	
	HRC: Low Medium High	0.48 HRC 0.44 HRC 0.40 HRC	
	HRD: Low Medium High	0.37 HRD 0.47 HRD 0.33 HRD	

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness & Rockwell Superficial Hardness Testers ³ (cont) –	HREW: Low Medium High	0.84 HREW 0.71 HREW 0.60 HREW	Indirect verification method per ASTM E18, ASTM E110, ISO 6508
	HRFW: Low Medium High	0.51 HRFW 0.59 HRFW 0.48 HRFW	
	HRGW: Low Medium High	1.3 HRGW 0.81 HRGW 0.60 HRGW	
	HRHW: Low High	0.47 HRHW 0.49 HRHW	
	HRKW: Low Medium High	0.93 HRKW 0.64 HRKW 0.60 HRKW	
	HRLW: Low High	1.1 HRLW 0.66 HRLW	
	HRMW: Low High	1.1 HRMW 0.60 HRMW	
	HRPW: Low High	0.92 HRPW 1.1 HRPW	
	HRRW: Low High	1.2 HRRW 1.2 HRRW	
	HRSW: Low High	1.1 HRSW 1.0 HRSW	
	HRVW: Low High	0.74 HRVW 0.32 HRVW	

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness & Rockwell Superficial Hardness Testers ³ (cont) –	HR15N: Low Medium High	0.59 HR15N 0.37 HR15N 0.45 HR15N	Indirect verification method per ASTM E18, ASTM E110, ISO 6508
	HR30N: Low Medium High	0.64 HR30N 0.50 HR30N 0.45 HR30N	
	HR45N: Low Medium High	0.65 HR45N 0.49 HR45N 0.50 HR45N	
	HR15TW: Low Medium High	0.73 HR15TW 0.68 HR15TW 0.59 HR15TW	
	HR30TW: Low Medium High	0.93 HR30TW 0.71 HR30TW 0.58 HR30TW	
	HR45TW: Low Medium High	1.1 HR45TW 0.94 HR45TW 0.65 HR45TW	
	HR15WW: Low High	0.71 HR15WW 0.84 HR15WW	
	HR30WW: Low High	0.95 HR30WW 0.83 HR30WW	
	HR45WW: Low High	0.77 HR45WW 0.95 HR45WW	
	HR15XW: Low High	0.44 HR15XW 0.46 HR15XW	
	HR30XW: Low High	0.34 HR30XW 0.39 HR30XW	

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness & Rockwell Superficial Hardness Testers ³ (cont) –	HR45XW: Low High HR15YW: Low High HR30YW: Low High HR45YW: Low High	0.54 HR45XW 0.58 HR45XW 0.68 HR15YW 0.77 HR15YW 0.46 HR30YW 0.61 HR30YW 0.68 HR45YW 0.64 HR45YW	Indirect verification method per ASTM E18, ASTM E110, ISO 6508 784 791
Force – Load Cell Compression			ASTM E74, ISO 376
(0 to 2) kgf	(0.005 to 0.01) kgf (0.01 to 0.05) kgf (0.05 to 2) kgf	1.1 % of rdg 0.14 % of rdg 0.064 % of rdg	Troemner Class 2 weights
(0 to 20) kgf	(0.005 to 0.01) kgf (0.01 to 0.1) kgf (0.1 to 0.3) kgf (0.3 to 3) kgf (3 to 6.25) kgf (6.25 to 20) kgf	3.4 % of rdg 0.67 % of rdg 0.12 % of rdg 0.066 % of rdg 0.035 % of rdg 0.019 % of rdg	
(0 to 50) kgf	(1.5 to 2.5) kgf (2.5 to 5) kgf (5 to 20) kgf (20 to 50) kgf	0.43 % of rdg 0.23 % of rdg 0.098 % of rdg 0.072 % of rdg	Morehouse UCM
(0 to 150) kgf	(5 to 10) kgf (10 to 50) kgf (50 to 75) kgf (75 to 150) kgf	0.46 % of rdg 0.087 % of rdg 0.071 % of rdg 0.080 % of rdg	
(0 to 1000) kgf	(50 to 100) kgf (100 to 400) kgf (400 to 700) kgf (700 to 1000) kgf	0.12 % of rdg 0.081 % of rdg 0.077 % of rdg 0.074 % of rdg	
(0 to 5000) kgf	(250 to 500) kgf (500 to 1250) kgf (1250 to 2000) kgf (2000 to 5000) kgf	0.25 % of rdg 0.14 % of rdg 0.088 % of rdg 0.070 % of rdg	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Force ³ – Measuring Equipment	(5 to 80) N (100 to 700) N	9 % of rdg 0.47 % of rdg	Verification by load cell per ASTM E4
Indenter Approach Velocity	(15 to 200) µm/s	0.51 µm/s	Digital stopwatch & dial indicator or gauge block

III. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Test Cycle – Direct Verification of Hardness Testers ³	(1 to 60) s	0.21 s	Digital stopwatch

¹ This laboratory offers commercial calibration service and field calibration service.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

⁴ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

⁵ This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

STRUERS LLC

Westlake, OH

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system *(refer to joint ISO-ILAC-IAF Communiqué dated April 2017)*.



Presented this 29th day of December 2022.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 4097.01
Valid to December 31, 2024

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.