



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

AFFRI Inc.
850 Dillon Dr.
Wood Dale, IL 60191

Fulfills the requirements of

ISO/IEC 17025:2017

In the field of

CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

A handwritten signature in black ink, appearing to read 'R. Douglas Leonard Jr.', is written over a horizontal line.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 01 October 2023
Certificate Number: AC-3026



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
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).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AFFRI Inc.
850 Dillon Dr.
Wood Dale, IL 60191
Saverio Amerato
224-374-0931

CALIBRATION

Valid to: **October 1, 2023**

Certificate Number: **AC-3026**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical	(0 to 2) mV/V	0.000 24 mV/V	Rice Lake Ranger 3

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ¹	Up to 12 in	730 μin	Gauge Block Standards ASME B89.1.14-2018

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Reticles and Light Microscope Magnifications Stereo Microscope Objective 0.5x Objective 1x Objective 1.6x High Magnification Microscope Objective 10x Objective 20x Objective 40x Objective 50x Objective 60x Objective 100x	(0 to 40) mm (0 to 20) mm (0 to 10) mm (0 to 1 000) µm (0 to 500) µm (0 to 250) µm (0 to 200) µm (0 to 150) µm (0 to 100) µm	0.055 mm 0.027 mm 0.022 mm 1.6 µm 0.9 µm 0.71 µm 0.69 µm 0.66 µm 0.63 µm	E1951, Glass Scale ASTM E1951, ASTM E92, Stage Micrometer
Displacement Transducer ¹ Dimensional Calibrations	(0 to 12) in (0 to 40) in (0 to 12 mm)	600 µin 0.003 in 2.7 µm	Caliper ASTM-E2658 Heidenhain
Brinell Indentation Type A Microscope Type B Microscope	10X to 100X Mag 10X to 100X Mag	1.2 µm 14 µm	ASTM E10, E110 Glass Scale
Extensometer, Type 1 Strain Gauge Length	(0 to 0.2) in (>0.02 to 2) in	20 µin 160 µin 0.002 in	Extensometer Calibrator VHR 3590 ASTM-E83 ISO 9513 Digital Caliper

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Material Testing Machine: ¹ Displacement	(0.0 to 12) in (0.0 to 305) mm	0.001 7 in 0.043 mm	Caliper ASTM-E2309
	(12 to 40) in (304.8 to 1 000) mm	0.003 6 in 0.091 mm	Timer
Speed	(0.01 to 0.1) in/min (0.1 to 20) in/min (20 to 40) in/min	1.95% of reading 0.23% of reading 0.38% of reading	ASTM-E2658
Time Component	(0 to 30) min	0.2 s	Digital Stopwatch

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calibration of force ¹ testing machines and force measuring systems: Tension Compression	(10 g to 20 000 kgf)	0.25 % of reading	Working Standard ASTM E4 ISO 7500-1
	(10g to 305 914 kgf)	0.25 % reading	
Calibration of Torque testing machines CW/CCW	5 Nm to 1 000 Nm	0.25 % reading	Working Standard ASTM E2428/E2624 DIN 51309

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Differential Indentation Hardness Testers Indirect	HRBw Low HRBw Med HRBw High HRC Low HRC Med HRC High (0 to 400) HBW (400 to 600) HBW 200 HV 400 HV 700 HV	0.34 HRBw 0.26 HRBw 0.38 HRBw 0.38 HRC 0.34 HRC 0.32 HRC 2 HBW 4 HBW 3 HV 6 HV 11 HV	Hardness Test Blocks ASTM-E18, E10, E92/384 E3246 DIN 50157
Rubber Property Durometer Hardness Extension Force Direct and Indirect	(0 to 0.25) in (0 to 5) mm (0 to 45) N 0 to 100 Durometer Units	26 μ m 0.5 μ m 0.25% of reading 0.25% of reading	ASTM-D2240 Gage Blocks Durometer Scales A, B, C, D, D0,0,00, E, M,000,000-S ISO 21509
Direct Verification of Brinell Hardness ¹ Testing Machines: Verification of Test Force Verification of the Indentation Measuring System Ball Measurement	(1 to 3 000) kgf (0 to 1) mm (1 to 10) mm	0.25% reading 0.3 μ m 1.2 μ m	ASTM E10 ISO 6506-2 Working force standards Glass Scale Micrometer

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Direct Verification of Rockwell Hardness ¹ Testing Machines: Verification of Test Force Verification of the Indentation Measuring System Verification of Time	(3 to 150) kgf (0 to 12) mm (1 to 30) sec	0.25% reading 0.2 μm 0.25 sec Stopwatch	ASTM E18 ISO 6508-2 DIN 50157-2 Working force standards Heidenhain Std Computer Clock
Rockwell Hardness ¹ Testers Indirect verification	HRA Low HRA Med HRA High HRBw Low HRBw Med HRBw High HRC Low HRC Med HRC High HRD Low HRD Med HRD High HRE Low HRE Med HRE High	0.29 HRA 0.23 HRA 0.18 HRA 0.34 HRBW 0.26 HRBW 0.38 HRBW 0.38 HRC 0.34 HRC 0.32 HRC 0.25 HRD 0.26 HRD 0.22 HRD 0.37 HRE 0.50 HRE 0.50 HRE	Hardness test blocks ASTM E18/110 ISO 6508-2 DIN 50157-2



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Rockwell Hardness ¹ Testers Indirect verification	HRF Low	0.26 HRF	Hardness test blocks ASTM E18/110 ISO 6508-2 DIN 50157-2
	HRF Med	0.65 HRF	
	HRF High	0.45 HRF	
	HRG Low	0.77 HRG	
	HRG Med	0.20 HRG	
	HRG High	0.25 HRG	
	HRH Low	0.72 HRH	
	HRH Med	0.42 HRH	
	HRH High	0.36 HRH	
	HRK Low	0.55 HRK	
	HRK Med	0.48 HRK	
	HRK High	0.35 HRK	
	(90 to 114) HRL	0.26 HRL	
	(≥115 0) HRL	0.19 HRL	
	(70 to 99) HRM	0.53 HRM	
	(≥100) HRM	0.42 HRM	
	(40 to 84) HRP	0.51 HRP	
	(≥85) HRP	0.35 HRP	
	(100 to 119) HRR	0.34 HRR	
	(≥120) HRR	0.24 HRR	
	(110 to 111) HRS	0.77 HRS	
	(≥112) HRS	0.18 HRS	
	(80 to 103) HRV	0.61 HRV	
	(≥104) HRV	0.21 HRV	
HR15N Low	0.40 HR15N		
HR15N Med	0.41 HR15N		
HR15N High	0.50 HR15N		
HR30N Low	0.28 HR30N		
HR30N Med	0.46 HR30N		
HR30N High	0.53 HR30N		
HR45N Low	0.48 HR45N		
HR45N Med	0.23 HR45N		
HR45N High	0.19 HR45N		

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness ¹ Testers Indirect verification	HR15TW Low HR15TW Med HR15W High	0.60 HR15TW 0.51 HR15TW 0.42 HR15TW	Hardness test blocks ASTM E18/110 ISO 6508-2 DIN 50157-2
	HR45TW Low HR45TW Med HR45TW High	0.69 HR15TW 0.39 HR15TW 0.38 HR15TW	
	(80 to 88) HR15W (89 to 100) HR15W	0.36 HR15W 0.61 HR15W	
	(40 to 64) HR30W (65 to 100) HR30W	0.82 HR30W 0.33 HR30W	
	(10 to 47) HR45W (48 to 100) HR45W	0.76 HR45W 0.30 HR45W	
	(80 to 87) HR15X (88 to 100) HR15X	0.55 HR15X 0.18 HR15X	
	(60 to 78) HR30X (79 to 100) HR30X	0.95 HR30X 0.19 HR30X	
	(40 to 68) HR45X (69 to 100) HR45X	0.75 HR45X 0.18 HR45X	
	(85 to 93) HR15Y (94 to 100) HR15Y	0.45 HR15Y 0.22 HR15Y	
	(60 to 87) HR30Y (88 to 100) HR30Y	0.22 HR30Y 0.33 HR30Y	
	(60 to 81) HR45Y (82 to 100) HR45Y	0.63 HR45Y 0.24 HR45Y	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Brinell Hardness Testers ¹	(0 to 400) HBW	2 HBW	Brinell Test Blocks & Brinell Scope ASTM E10/110 ISO 6506-2
	(400 to 600) HBW	4 HBW	
	(0 to 400) HBW	6.2 HBW	
	(400 to 600) HBW	15 HBW	
	(0 to 400) HBW	2 HBW	
	(400 to 600) HBW	4 HBW	
	(0 to 100) HBW	2 HBW	
	(100 to 150) HBW	4 HBW	
	(0 to 400) HBW	2 HBW	
	(400 to 600) HBW	4 HBW	
	(0 to 400) HBW	2 HBW	
	(400 to 600) HBW	4 HBW	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Direct Calibration Vickers/Knoop Indentation	(0 to 1) mm (0 to 100) mm	0.1 μ m 1.0 μ m	ASTM E92/384 ISO 6507-2 Stage Micrometer Glass Scale
Force Time	(10 to 120 000) gf	0.25% of reading 0.2 s	Computer Clock
Indirect Calibration Vickers/Knoop Indentation			
Vickers ¹ , \geq 1 kgf HV 1 kgf	200 HV	4.1 HV	Hardness test blocks ASTM E92/384 ISO 6507-2
	400 HV	8 HV	
	700 HV	18 HV	
HV 2 kgf	200 HV	3 HV	
	400 HV	8 HV	
	700 HV	14 HV	
HV 5 kgf	200 HV	3 HV	
	400 HV	6 HV	
	700 HV	11 HV	
HV 10 kgf	200 HV	3 HV	
	400 HV	6 HV	
	700 HV	11 HV	
HV 20 kgf	200 HV	3 HV	
	400 HV	6 HV	
	700 HV	11 HV	
Vickers ¹ , \geq 1 kgf HV 30 kgf	200 HV	3 HV	
	400 HV	4 HV	
	700 HV	7 HV	
HV 50 kgf	200 HV	3 HV	
	400 HV	4 HV	
	700 HV	7 HV	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vickers ¹ , <1 kgf HV 10 gf	200 HV	10 HV	Hardness test blocks ASTM E92/384 ISO 6507-2
	400 HV	20 HV	
	700 HV	35 HV	
HV 25 gf	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
HV 50 gf	200 HV	10 HV	
	400 HV	20 HV	
	700 HV	35 HV	
HV 100 gf	200 HV	8 HV	
	400 HV	20 HV	
	700 HV	35 HV	
HV 200 gf	200 HV	8 HV	
	400 HV	18 HV	
	700 HV	35 HV	
HV 300 gf	200 HV	5 HV	
	400 HV	14 HV	
	700 HV	24 HV	
Vickers ¹ , <1 kgf HV 500 gf	200 HV	5 HV	
	400 HV	12 HV	
	700 HV	24 HV	
HV 1 000 gf	200 HV	4 HV	
	400 HV	8 HV	
	700 HV	17 HV	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Knoop ¹ Micro-Indentation Hardness Testers HK 10 gf HK 25 gf HK 50 gf HK 100 gf HK 200 gf and 300 gf HK 500 gf and 1 000 gf	200 HK	7 HK	Hardness test blocks ASTM E92/384 ISO 6507-2
	400 HK	16 HK	
	700 HK	33 HK	
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	22 HK	
	200 HK	7 HK	
	400 HK	14 HK	
	700 HK	20 HK	
	200 HK	7 HK	
	400 HK	12 HK	
	700 HK	19 HK	
	200 HK	5 HK	
	400 HK	8 HK	
	700 HK	17 HK	
	200 HK	5 HK	
	400 HK	7 HK	
	700 HK	15 HK	

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatch	0 min to 48 h	0.1 sec	NRC Time Signal Computer Clock

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-3026.



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