



# CERTIFICATE OF ACCREDITATION

## The ANSI National Accreditation Board

Hereby attests that

**Southwest Metrology and Quality Services, Inc.**  
**1550 W. Wetmore Rd., Suite 250**  
**Tucson, AZ 85705**

Fulfills the requirements of

**ISO/IEC 17025:2017**

and national standard

**ANSI/NCSL Z540-1-1994 (R2002)**

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](http://www.anab.org).

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

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 03 June 2022  
Certificate Number: L2208



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  
AND ANSI/NCSL Z540-1-1994 (R2002)**

**Southwest Metrology and Quality Services, Inc.**

1550 W. Wetmore Rd., Suite 250

Tucson, AZ 85705

Dan Beard

520-744-8510

**CALIBRATION**

Valid to: **June 3, 2022**

Certificate Number: **L2208**

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Source	(0.01 to 220) $\mu$ A (0.22 to 2.2) mA (2.2 to 22 mA) (22 to 220) mA (0.22 to 2.2) A	74 $\mu$ A/A + 11 nA 76 $\mu$ A/A + 11 nA 77 $\mu$ A/A + 0.11 $\mu$ A 96 $\mu$ A/A + 0.73 $\mu$ A 0.16 mA/A + 14 $\mu$ A	Fluke 5700A Multiproduct Calibrator
DC Current – Measure	(0 to 100) mA (0.1 to 1) A	57 $\mu$ A/A + 0.48 $\mu$ A 0.17 mA/A + 9.7 $\mu$ A	Agilent 3458A-H01 8.5 Digit Multimeter
AC Current – Source	40 Hz to 1 kHz (0.01 to 220) $\mu$ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	0.21 mA/A + 23 nA 0.22 mA/A + 44 nA 0.22 mA/A + 0.44 $\mu$ A 0.24 mA/A + 4 $\mu$ A 0.9 mA/A + 46 $\mu$ A	Fluke 5700A Multiproduct Calibrator
Resistance – Source (4-wire)	0 $\Omega$ 1 $\Omega$ 1.9 $\Omega$ 10 $\Omega$ 19 $\Omega$ 100 $\Omega$ 190 $\Omega$ 1 k $\Omega$ 1.9 k $\Omega$ 10 k $\Omega$ 19 k $\Omega$ 100 k $\Omega$	69 $\mu\Omega$ 0.14 m $\Omega$ 0.26 m $\Omega$ 0.54 m $\Omega$ 0.99 $\mu\Omega$ 4.3 m $\Omega$ 8.2 m $\Omega$ 41 m $\Omega$ 77 m $\Omega$ 0.4 $\Omega$ 0.76 $\Omega$ 4.1 $\Omega$	Fluke 5700A Multiproduct Calibrator

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source (4-wire)	190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ	7.8 Ω 46 Ω 88 Ω 0.65 kΩ 1.5 kΩ	Fluke 5700A Multiproduct Calibrator
Resistance – Source (2-wire)	100 MΩ	18 kΩ	Fluke 5700A Multiproduct Calibrator
Resistance – Measure (4-wire)	(1 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ	0.31 mΩ 2.9 mΩ 17 mΩ 170 mΩ 1.7 Ω 26 Ω 0.78 kΩ	Agilent 3458A-H01 8.5 Digit Multimeter
Resistance – Measure (2-wire)	100 MΩ	73 kΩ	Agilent 3458A-H01 8.5 Digit Multimeter
Resistance Simulation of RTD Measuring Devices – Source <sup>2</sup>	Pt 385, 100 Ω (-200 to 650) °C	(0.33 + 0.000 18X) °C	Multifunction Calibrator
DC Voltage – Source	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1 000) V	10 nV/V + 1 μV 9 μV/V + 1.9 μV 9.2 μV/V + 4.9 μV 9 μV/V + 17 μV 11 μV/V + 0.16 mV 12 μV/V + 1.8 mV	Fluke 5700A Multiproduct Calibrator
DC Voltage – Measure	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	28 μV / V + 0.2 μV 12 μV / V + 1.1 μV 11 μV / V + 2.1 μV 14 μV / V + 31 μV 22 μV / V + 63 μV	Agilent 3458A-H01 8.5 Digit Multimeter
AC Voltage – Source	40 Hz to 20 kHz 10 μV to 2.2 mV (2.2 to 22) mV (22 to 220) mV (0.22 to 2.2) V (2.2 to 22) V (20 to 50) kHz (22 to 220) V 50 Hz to 1 kHz (220 to 1 000) V	0.27 mV/V + 6 μV 0.2 mV/V + 6 μV 0.16 mV/V + 8 μV 95 μV/V + 17 μV 0.11 mV/V + 1.1 mV 0.3 mV/V + 4.6 mV 0.11 mV/V + 4.4 mV	Fluke 5700A Multiproduct Calibrator



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**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(0.1 to 10) mV		Agilent 3458A-H01 8.5 Digit Multimeter
	40 Hz to 20 kHz	5.7 $\mu$ V	
	(20 to 100) kHz	61 $\mu$ V	
	(10 to 100) mV		
	40 Hz to 1 kHz	12 $\mu$ V	
	(1 to 20) kHz	21 $\mu$ V	
	(20 to 100) kHz	0.1 mV	
	(0.1 to 1) V		
	40 Hz to 1 kHz	0.12 mV	
	(1 to 20) kHz	0.21 mV	
	(20 to 50) kHz	0.39 mV	
	(50 to 100) kHz	0.98 mV	
	(1 to 10) V		
	40 Hz to 1 kHz	1.3 mV	
	(1 to 20) kHz	2.1 mV	
	(20 to 50) kHz	4 mV	
(50 to 100) kHz	9.7 mV		
(10 to 100) V			
40 Hz to 1 kHz	27 mV		
(1 to 20) kHz	29 mV		
(20 to 50) kHz	46 mV		
(50 to 100) kHz	0.15 V		
(100 to 1 000) V			
40 Hz to 1 kHz	0.5 V		
Electrical Simulation of Thermocouple Measuring Devices – Source	Type E (-234 to 1 000) °C	0.37 °C	Multifunction Calibrator
	Type J (-200 to 1 200) °C	0.37 °C	
	Type K (-200 to 1 372) °C	0.37 °C	
	Type T (-200 to 400) °C	0.37 °C	

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers <sup>2</sup> (Dial, Digital, and Vernier)	Up to 12 in	(340 + 4L) $\mu$ in	Gage Blocks
Height Gages <sup>2</sup>	Up to 24 in	(290 + 7.9L) $\mu$ in	Gage Blocks



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**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Indicators <sup>2</sup> (Dial, Digital, and Test)	Up to 4 in	(30 + 1.1L) μin	Gage Blocks
Micrometers <sup>2</sup> (Outside and Depth)	Up to 2 in (2 to 12) in	(38 + 6.6L) μin (57 + 11.7L) μin	Gage Blocks
Cylindrical Pins/Plug Gages <sup>2</sup>	(0.01 to 1) in	(27 + 9.2L) μin	Length Measuring Machine, Gage Blocks

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure Measuring Devices	(-14.5 to 14.5) psig Up to 580 psig (580 to 3 000) psig	0.006 % of reading + 0.000 9 psi 0.096 psi 0.33 psi	Fluke 6270 Pressure Controller/Calibrator
	(3 000 to 10 000) psig	2.5 psi	Comparison to Fluke 700RG31 Reference Pressure Gage
Torque Drivers/Wrenches	(4 to 400) ozf·in (5 to 50) lbf·in (40 to 400) lbf·in (100 to 1 000) lbf·in (25 to 250) lbf·ft (60 to 600) lbf·ft	0.38% of reading + 1.2 ozf·in 0.34% of reading + 0.2 lbf·in 0.55% of reading + 0.2 lbf·in 0.47% of reading + 1.6 lbf·in 0.51% of reading + 0.3 lbf·ft 0.3% of reading + 2.9 lbf·ft	Torque Calibration System
Torque Analyzers, Torque Transducers, Torque Meters	(5 to 400) ozf·in (10 to 1 000) lbf·in (5 to 250) lbf·ft	0.14% of reading + 0.03 ozf·in 0.14% of reading + 0.02 lbf·in 0.14% of reading + 0.000 3 lbf·ft	NIST Class F Weights, Torque Arms, Torque Wheels

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source	10 Hz to 1 MHz	0.12 mHz/Hz + 32 $\mu$ Hz	Fluke 5700A Multiproduct Calibrator

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.  $X$  = temperature in degrees C ( $^{\circ}$ C);  $L$  = length in inches.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L2208.



R. Douglas Leonard Jr., VP, PILR SBU

