



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.

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 2024
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
Ashley Bennett 520-744-8510

CALIBRATION

Valid to: **June 3, 2024**

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) μ A (0.22 to 2.2) mA (2.2 to 22 mA) (22 to 220) mA (0.22 to 2.2) A	74 μ A/A + 11 nA 76 μ A/A + 11 nA 77 μ A/A + 0.11 μ A 96 μ A/A + 0.73 μ A 0.16 mA/A + 14 μ A	Fluke 5700A Multiproduct Calibrator
DC Current – Measure	(0 to 100) mA (0.1 to 1) A	57 μ A/A + 0.48 μ A 0.17 mA/A + 9.7 μ A	Agilent 3458A-H01 8.5 Digit Multimeter
AC Current – Source	40 Hz to 1 kHz (0.01 to 220) μ 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 μ A 0.24 mA/A + 4 μ A 0.9 mA/A + 46 μ A	Fluke 5700A Multiproduct Calibrator
Resistance – Source (4-wire)	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω	69 $\mu\Omega$ 0.14 m Ω 0.26 m Ω 0.54 m Ω 0.99 $\mu\Omega$ 4.3 m Ω 8.2 m Ω	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
Resistance – Source (4-wire)	1 kΩ	41 mΩ	Fluke 5700A Multiproduct Calibrator
	1.9 kΩ	77 mΩ	
	10 kΩ	0.4 Ω	
	19 kΩ	0.76 Ω	
	100 kΩ	4.1 Ω	
	190 kΩ	7.8 Ω	
	1 MΩ	46 Ω	
	1.9 MΩ	88 Ω	
	10 MΩ	0.65 kΩ	
19 MΩ	1.5 kΩ		
Resistance – Source (2-wire)	100 MΩ	18 kΩ	Fluke 5700A Multiproduct Calibrator
Resistance – Measure (4-wire)	(1 to 10) Ω	0.31 mΩ	Agilent 3458A-H01 8.5 Digit Multimeter
	(10 to 100) Ω	2.9 mΩ	
	(0.1 to 1) kΩ	17 mΩ	
	(1 to 10) kΩ	170 mΩ	
	(10 to 100) kΩ	1.7 Ω	
	(0.1 to 1) MΩ	26 Ω	
Resistance – Measure (2-wire)	(10 to 100) MΩ	73 kΩ	Agilent 3458A-H01 8.5 Digit Multimeter
Resistance Simulation of RTD Measuring Devices – Source ²	Pt 385, 100 Ω (-200 to 650) °C	(0.33 + 0.000 18X) °C	Multifunction Calibrator
DC Voltage – Source	(0 to 220) mV	10 nV/V + 1 μV	Fluke 5700A Multiproduct Calibrator
	(0.22 to 2.2) V	9 μV/V + 1.9 μV	
	(2.2 to 11) V	9.2 μV/V + 4.9 μV	
	(11 to 22) V	9 μV/V + 17 μV	
	(22 to 220) V	11 μV/V + 0.16 mV	
	(220 to 1 000) V	12 μV/V + 1.8 mV	
DC Voltage – Measure	(0 to 100) mV	28 μV / V + 0.2 μV	Agilent 3458A-H01 8.5 Digit Multimeter
	(0.1 to 1) V	12 μV / V + 1.1 μV	
	(1 to 10) V	11 μV / V + 2.1 μV	
	(10 to 100) V	14 μV / V + 31 μV	
	(100 to 1 000) V	22 μV / V + 63 μV	
AC Voltage – Source	40 Hz to 20 kHz		Fluke 5700A Multiproduct Calibrator
	10 μV to 2.2 mV	0.27 mV/V + 6 μV	
	(2.2 to 22) mV	0.2 mV/V + 6 μV	
	(22 to 220) mV	0.16 mV/V + 8 μV	
	(0.22 to 2.2) V	95 μV/V + 17 μV	
(2.2 to 22) V	0.11 mV/V + 1.1 mV		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source	(20 to 50) kHz (22 to 220) V	0.3 mV/V + 4.6 mV	Fluke 5700A Multiproduct Calibrator
	50 Hz to 1 kHz (220 to 1 000) V	0.11 mV/V + 4.4 mV	
AC Voltage – Measure	(0.1 to 10) mV		Agilent 3458A-H01 8.5 Digit Multimeter
	40 Hz to 20 kHz	5.7 μ V	
	(20 to 100) kHz	61 μ V	
	(10 to 100) mV		
	40 Hz to 1 kHz	12 μ V	
	(1 to 20) kHz	21 μ 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		Multifunction Calibrator
	(-250 to -100) °C	0.39 °C	
	(-100 to -25) °C	0.16 °C	
	(-25 to 350) °C	0.15 °C	
	(350 to 650) °C	0.15 °C	
	(650 to 1 000) °C	0.19 °C	
	Type J		
	(-210 to -100) °C	0.23 °C	
	(-100 to -30) °C	0.17 °C	
	(-30 to 150) °C	0.15 °C	
	(150 to 760) °C	0.16 °C	
	(760 to 1 200) °C	0.21 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Measuring Devices – Source	Type K (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C	0.27 °C 0.17 °C 0.16 °C 0.22 °C 0.32 °C	Multifunction Calibrator
	Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.27 °C 0.18 °C 0.17 °C 0.23 °C	
Electrical Simulation of RTD Indicating Devices – Source	Pt 385, 100 Ω (-200 to 650) °C	0.006 8 % of reading + 0.13 °C	Multifunction Calibrator

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ² (Dial, Digital, and Vernier)	(0.1 to 12) in	(340 + 4.1L) μin	Gage Blocks
Height Gages ²	(0.1 to 24) in	(350 + 1.4L) μin	Gage Blocks
Indicators ² (Dial, Digital, and Test)	(0.1 to 4) in	(29 + 2.7L) μin	Gage Blocks
Micrometers ² (Outside and Depth)	(0.1 to 2) in	(37 + 6.5L) μin	Gage Blocks
	(2 to 12) in	(57 + 12L) μin	

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 (0 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

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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 μHz	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, 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. L = length in inches.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L2208.



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