



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

**TAI Technical Services
811 Pinnacle Drive, Suite D
Linthicum, MD 21090**

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. D. Leonard', is positioned above a horizontal line.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 09 June 2024

Certificate Number: AC-2055



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)

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CALIBRATION

Valid to: **June 09, 2024**

Certificate Number: **AC-2055**

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrolytic Conductivity ^{1,3} Measuring Equipment	5 µS/cm 10 µS/cm 100 µS/cm 1 000 µS/cm 10 000 µS/cm 100 000 µS/cm 150 000 µS/cm	0.6 µS/cm 0.6 µS/cm 2.1 µS/cm 5.2 µS/cm 50 µS/cm 437 µS/cm 829 µS/cm	Conductivity Solutions at 25 °C

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance Source	(0.4 to 1.099 9) nF (1.1 to 3.299 9) nF (3.3 to 10.999 9) nF (11 to 32.999 9) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099 9) µF (1.1 to 3.299 9) µF (3.3 to 10.999 9) µF	0.018 nF 0.32 nF 0.11 nF 0.35 nF 1.1 nF 3.3 nF 0.015 µF 0.32 µF 0.16 µF	Fluke 5522A Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance Source	(11 to 32.999 9) μF (33 to 109.999) μF (110 to 329.999) μF (0.33 to 1.099 99) mF (1.1 to 3.299 99) mF	0.35 μF 1.1 μF 3.3 μF 0.12 mF 0.34 mF	Fluke 5522A Multi Product Calibrator
DC Current Source	(0 to 329.999) μA (330 to 3.299 99) mA (3.3 to 32.999 9) mA (33 to 329.999) mA 330 mA to 1.099 99 A (1.1 to 2.999 99) A (0 to 10.999 9) A (11 to 20.5) A	5.2 nA 0.035 μA 0.91 μA 8.7 μA 0.043 mA 0.11 mA 1.3 mA 6.9 mA	Fluke 5522A Multi Product Calibrator
DC Current Measure	(0 to 200) μA (0.2 to 2) mA (2 to 20) mA (20 to 200) mA (0.2 to 2) A (2 to 20) A	3.1 nA 22 nA 0.54 μA 7.8 μA 0.04 mA 6.9 mA	Fluke 8508A Multimeter
AC Current Source LCOMP Off	(29.00 to 329.99) μA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (0.33 to 3.299 99) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (3.3 to 32.999 9) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.02 μA 0.03 μA 0.03 μA 0.03 μA 0.06 μA 0.34 μA 0.3 μA 0.23 μA 0.23 μA 0.25 μA 0.31 μA 0.7 μA 0.74 μA 3.6 μA 5.7 μA 0.01 mA 0.01 mA 0.01 mA	Fluke 5522A Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<p style="text-align: center;">AC Current Source LCOMP Off</p>	<p>(33 to 329.999) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (0.33 to 1.099 99) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (1.1 to 2.999 99) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 10.999 9) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz</p>	<p>0.05 mA 0.03 mA 0.03 mA 0.03 mA 0.04 mA 0.05 mA 0.14 mA 0.15 mA 0.36 mA 1.4 mA 0.28 mA 0.33 mA 0.85 mA 2 mA 1.6 mA 1.8 mA 16 mA 4.4 mA 4.8 mA 2.3 mA</p>	<p style="text-align: center;">Fluke 5522A Multi Product Calibrator</p>
<p style="text-align: center;">AC Current Source LCOMP On</p>	<p>(29.00 to 329.99) μA (10 to 100) Hz 100 Hz to 1kHz (0.33 to 3.2999 9) mA (10 to 100) Hz 100 Hz to 1 kHz (3.3 to 32.999 9) mA (10 to 100) Hz 100 Hz to 1 kHz (33 to 329.999) mA (10 to 100) Hz 100 Hz to 1 kHz (0.33 to 2.999 99) A (10 to 100) Hz 100 Hz to 440 Hz</p>	<p>0.03 μA 0.03 μA 0.24 μA 0.24 μA 0.9 μA 0.28 μA 28 μA 28 μA 0.29 mA 0.29 mA</p>	<p style="text-align: center;">Fluke 5522A Multi Product Calibrator</p>

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current Source LCOMP On	(3 to 10.999 9) A (10 to 100) Hz 100 Hz to 1 kHz (11 to 20.5) A (10 to 100) Hz 100 Hz to 1 kHz	1.6 mA 1.8 mA 4.3 mA 4.8 mA	Fluke 5522A Multi Product Calibrator
AC Current Measure	(0 to 200) μ A 10 Hz 10 kHz 30 kHz (0.2 to 2) mA 10 Hz 10 kHz 30 kHz (2 to 20) mA 10 Hz 10 kHz 30 kHz (20 to 200) mA 10 Hz 10 kHz 30 kHz (0.2 to 2) A 2 kHz 10 kHz (2 to 20) A 2 kHz 5 kHz	0.052 μ A 0.05 μ A 0.21 μ A 0.2 μ A 0.28 μ A 0.42 μ A 3.8 μ A 6.6 μ A 7.7 μ A 0.064 mA 0.028 mA 0.034 mA 0.14 mA 1.4 mA 4.8 mA 13 mA	Fluke 8508A Multimeter
Resistance Source	(0 to 10.999 9) Ω (11 to 32.999 9) Ω (33 to 109.999 9) Ω (110 Ω to 329.999 9) Ω 330 Ω to 1.099 999 k Ω (1.1 to 3.2999 99) k Ω (3.3 to 10.999 99) k Ω (11 to 32.999 99) k Ω (33 to 109.999 9) k Ω (110 to 329.999 99) k Ω 330 k Ω to 1.099 999 M Ω (1.1 to 3.299 999) M Ω	0.22 m Ω 0.2 m Ω 0.76 m Ω 2.4 m Ω 1.8 Ω 0.022 Ω 0.054 Ω 0.33 Ω 0.46 Ω 2.4 Ω 0.011 k Ω 0.037 k Ω	Fluke 5522A Multi Product Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Source	(3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.999 9) MΩ (110 to 329.999 9) MΩ (330 to 1 100) MΩ	0.14 kΩ 0.23 kΩ 0.024 MΩ 0.28 MΩ 0.48 MΩ	Fluke 5522A Multi Product Calibrator
Resistance Measure	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω (0.2 to 2) kΩ (2 to 20) kΩ (20 to 200) kΩ (0.2 to 2) MΩ (2 to 20) MΩ (20 to 200) MΩ (0.2 to 2) GΩ	1.6 mΩ 0.14 mΩ 0.83 Ω 6.9 mΩ 18 Ω 1.7 Ω 23 Ω 4.6 kΩ 0.27 MΩ 1.5 MΩ	Fluke 8508A Multimeter
DC Voltage Source	(0 to 329.999) mV 330 mV to 3.299 999 V (3.3 to 32.999 99) V (33 to 329.999 9) V (100 to 1 020) V	1.7 μV 67 μV 0.11 mV 0.87 mV 3.2 mV	Fluke 5522A Multi Product Calibrator
DC Voltage Measure	(0 to 200) mV (0.2 to 2) V (2 to 20) V (20 to 200) V (200 to 1 050) V	0.31 μV 6.2 μV 11 μV 1.7 mV 3.2 mV	Fluke 8508A Multimeter
AC Voltage Source	(1 to 32.999) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (33 to 329.999) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	2.2 μV 2.1 μV 2.3 μV 3.1 μV 4.8 μV 0.025 mV 9.4 nV 8.8 nV 9.7 nV 0.012 mV 0.02 mV 0.17 mV	Fluke 5522A Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Source	(0.33 to 3.299 99) V		Fluke 5522A Multi Product Calibrator
	(10 to 45) Hz	0.079 mV	
	45 Hz to 10 kHz	0.064 mV	
	(10 to 20) kHz	0.092 mV	
	(20 to 50) kHz	0.1 mV	
	(50 to 100) kHz	0.14 mV	
	(3.3 to 32.999 9) V		
	(10 to 45) Hz	0.86 mV	
	45 Hz to 10 kHz	0.81 mV	
	(10 to 20) kHz	0.84 mV	
	(20 to 50) kHz	1.8 mV	
	(50 to 100) kHz	2.8 mV	
	(33 to 329.999) V		
	45 Hz to 1 kHz	0.01 V	
	(1 to 10) kHz	0.01 V	
	(10 to 20) kHz	0.014 V	
	(20 to 50) kHz	0.031 V	
(50 to 100) kHz	0.074 V		
(330 to 1 020) V			
45 Hz to 1 kHz	0.032 V		
(1 to 5) kHz	0.04 V		
(5 to 10) kHz	0.035 V		
AC Voltage Measure	(0 to 200) mV		Fluke 8508A Multimeter
	10 Hz	3.1 μV	
	40 Hz	8.9 μV	
	100 Hz	270 mV	
	2 kHz	7.4 μV	
	10 kHz	8.1 μV	
	30 kHz	9.9 μV	
	100 kHz	20 μV	
	(0.2 to 2) V		
	10 Hz	0.79 mV	
	40 Hz	0.073 mV	
	100 Hz	0.073 mV	
	2 kHz	0.066 mV	
	10 kHz	0.059 mV	
	30 kHz	0.071 mV	
	100 kHz	0.14 mV	
	300 kHz	0.16 mV	
1 MHz	0.92 mV		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Measure	(2 to 20) V		Fluke 8508A Multimeter
	10 Hz	0.037 V	
	40 Hz	0.81 mV	
	100 Hz	0.81 mV	
	2 kHz	0.76 mV	
	10 kHz	0.72 mV	
	30 kHz	5.2 mV	
	100 kHz	2.8 mV	
	300 kHz	1.3 mV	
	1 MHz	0.036 V	
	(20 to 200) V		
	50 HZ	9.9 mV	
	100 Hz	10 mV	
	2 kHz	9.9 mV	
10 kHz	0.01 V		
30 kHz	0.012 V		
100 kHz	0.074 V		
Electrical Simulation of Thermocouple Indicators - Source and Measure ¹	Type B		Fluke 5522A Multi Product Calibrator
	(600 to 800) °C	0.36 °C	
	(800 to 1 000) °C	0.65 °C	
	(1 000 to 1 550) °C	0.3 °C	
	(1 550 to 1 820) °C	0.28 °C	
	Type C		
	(0 to 150) °C	0.26 °C	
	(150 to 650) °C	0.27 °C	
	(650 to 1 000) °C	0.17 °C	
	(1 000 to 1 800) °C	0.23 °C	
	(1 800 to 2 316) °C	0.66 °C	
	Type E		
	(-250 to -100) °C	0.38 °C	
	(-100 to -25) °C	0.16 °C	
	(-25 to 350) °C	0.16 °C	
	(350 to 650) °C	0.13 °C	
	(650 to 1 000) °C	0.2 °C	
	Type J		
	(-210 to -100) °C	0.24 °C	
(-100 to -30) °C	0.14 °C		
(-30 to 150) °C	0.17 °C		
(150 to 760) °C	0.17 °C		
(760 to 1 200) °C	0.21 °C		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicators - Source and Measure ¹	Type K		Fluke 5522A Multi Product Calibrator
	(-200 to -100) °C	0.28 °C	
	(-100 to -25) °C	0.15 °C	
	(-25 to 120) °C	0.2 °C	
	(120 to 1 000) °C	0.22 °C	
	(1 000 to 1372) °C	0.33 °C	
	Type L		
	(-200 to -100) °C	0.31 °C	
	(-100 to 800) °C	0.3 °C	
	(800 to 900) °C	0.69 °C	
	Type N		
	(-200 to -100) °C	0.33 °C	
	(-100 to -25) °C	0.17 °C	
	(-25 to 120) °C	0.2 °C	
	(120 to 410) °C	0.17 °C	
	(410 to 1 300) °C	0.24 °C	
	Type R		
	(0 to 250) °C	0.46 °C	
	(250 to 400) °C	0.32 °C	
	(400 to 1 000) °C	0.28 °C	
	(1 000 to 1 767) °C	0.22 °C	
Type S			
(0 to 250) °C	0.38 °C		
(250 to 1 000) °C	0.41 °C		
(1 000 to 1 400) °C	0.15 °C		
(1 400 to 1 767) °C	0.37 °C		
Type T			
(-250 to -150) °C	0.5 °C		
(-150 to 0) °C	0.22 °C		
(0 to 120) °C	0.22 °C		
(120 to 400) °C	0.5 °C		
Type U			
(-200 to 0) °C	0.45 °C		
(0 to 600) °C	0.24 °C		



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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gauge Pressure	(-13.200 to 1.000) psig (1.001 to 7.000) psig (7.001 to 15.000) psig	0.003 psi 0.003 psi 0.003 psi	Fluke PM600-A200K Pressure Module
Absolute Pressure	(2.6 to 100) psia	0.012 psi	Fluke PM600-A700K Pressure Module
Absolute Pressure	(10 to 100) psia (101 to 200) psia (201 to 300) psia (301 to 400) psia (401 to 500) psia	0.012 psi 0.012 psi 0.012 psi 0.018 psi 0.018 psi	Fluke PM600-A3.5M Pressure Module
Gauge Pressure	(0.0 to 300.0) psig (300.1 to 600) psig (600.1 to 900) psig (900.1 to 1 200) psig (1 200.1 to 1 500) psig	0.15 psi 0.13 psi 0.13 psi 0.15 psi 0.16 psi	Fluke PM600-A10M Pressure Module
Hydraulic Pressure	(200 to 5 000) psi (5 001 to 20 000) psi	0.76 psi 3.3 psi	Fluke P3116-PSI Deadweight Tester
Low Pressure	(0 to 10) inH ₂ O	0.05 inH ₂ O	Fluke 7250LP Pressure Controller/Calibrator

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature, Measure	(-197 to 0.010) °C (0.010 to 231.9) °C (231.9 to 420) °C	0.084 °C 0.073 °C 0.037 °C	Fluke 5628 Thermometer w/Metrology Baths and TPW

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Source	(0.01 to 119.99) Hz (120.0 to 1199.9) Hz (1.200 to 11.999) kHz (12.00 to 119.99) kHz (120.0 to 1199.9) kHz (1.200 to 2.000) MHz	2.1 mHz 19 mHz 0.19 Hz 8.2 Hz 0.19 kHz 0.52 kHz	Fluke 5522A Multi Product 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. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2055.



R. Douglas Leonard Jr., VP, PILR SBU

