



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

International Process Solutions
1300 Industrial Road, Suite 22
San Carlos, CA 94070

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: 22 June 2023

Certificate Number: AC-1400



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)**

International Process Solutions

1300 Industrial Road, Suite 22
San Carlos, CA 94070
Thomas Main 650-595-7890 ext. 105 tmain@ips-us.com

CALIBRATION

Valid to: **June 22, 2023**

Certificate Number: **AC-1400**

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Voltage – Source ²	(0 to 329.999 9) mV (0 to 3.299 999) V (0 to 32.999 99) V (30 to 329.999 9) V (100 to 1 020) V	63.6 nV/mV + 5.8 μV 53.8 μV/V + 27.3 μV 54.7 μV/V + 0.24 mV 69 μV/V + 3.44 mV 71.1 μV/V + 10.7 mV	Fluke 5502A Multiproduct Calibrator
DC Voltage – Measure	(10 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	53 nV/V + 0.3 μV 6.7 μV/V + 0.3 μV 14 μV/V + 0.5 μV 27.9 μV/V + 30 μV 0.12 mV/V + 0.1 mV	HP 3458A, Opt 002 8.5 Digit Multimeter
AC Voltage – Source ² (Sine)	(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	1.5 μV/mV + 30.8 μV 1 μV/mV + 25.2 μV 1.6 μV/mV + 25 μV 2.1 μV/mV + 29.6 μV 3.7 μV/mV + 45.5 μV 10.7 μV/mV + 93.8 μV 0.4 μV/mV + 0.97 mV 0.31 μV/mV + 0.35 mV 0.8 μV/mV + 0.35 mV 1.1 μV/mV + 0.63 mV 2.6 μV/mV + 0.21 mV 5.5 μV/mV + 4.5 mV	Fluke 5502A Multiproduct Calibrator



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage – Source ² (Sine)	(0.33 to 3.299 99 V)		Fluke 5502A Multiproduct Calibrator
	(10 to 45) Hz	0.4 mV/V + 0.8 mV	
	45 Hz to 10 kHz	0.31 mV/V + 0.21 mV	
	(10 to 20) kHz	0.77 mV/V + 0.2 mV	
	(20 to 50) kHz	1.1 mV/V + 0.23 mV	
	(50 to 100) kHz	2.6 mV/V + 0.49 mV	
	(100 to 500) kHz	5.4 mV/V + 2.3 mV	
	(3.3 to 32.999 9 V)		
	(10 to 45) Hz	0.4 mV/V + 8 mV	
	45 Hz to 10 kHz	0.31 mV/V + 2 mV	
	(10 to 20) kHz	0.77 mV/V + 2 mV	
	(20 to 50) kHz	1.1 mV/V + 2.6 mV	
	(50 to 100) kHz	2.6 mV/V + 5.4 mV	
	(33 to 329.999 V)		
	45 Hz to 1 kHz	0.53 mV/V + 21.4 mV	
	(1 to 10) kHz	0.88 mV/V + 27.4 mV	
(10 to 20) kHz	1 mV/V + 27.4 mV		
(20 to 50) kHz	1.3 mV/V + 55 mV		
AC Voltage – Measure	(330 to 1 020) V		HP 3458A, Opt 002 8.5 Digit Multimeter
	45 Hz to 1 kHz	0.39 mV/V + 0.26 V	
	(1 to 5) kHz	0.88 mV/V + 0.68 V	
	(5 to 10) kHz	1 mV/V + 0.73 V	
	(1 to 10) mV		
	1 Hz to 1 kHz	0.52 μV/mV + 1.1 μV	
	(1 to 20) kHz	0.71 μV/mV + 1.1 μV	
	(20 to 100) kHz	5.3 μV/mV + 1.1 μV	
	(100 to 300) kHz	41.4 μV/mV + 2 μV	
	(10 to 100) mV		
1 Hz to 1 kHz	1 μV/mV + 2 μV		
(1 to 20) kHz	1.3 μV/mV + 2 μV		
(20 to 100) kHz	1.6 μV/mV + 2 μV		
(100 to 300) kHz	3.2 μV/mV + 10 μV		
100 mV to 1V			
1 Hz to 1 kHz	82.4 μV/V + 20 μV		
(1 to 20) kHz	0.16 mV/V + 20 μV		
(20 to 50) kHz	0.33 mV/V + 20 μV		
(50 to 100) kHz	0.84 mV/V + 20 μV		
(100 to 300) kHz	3.1 mV/V + 0.1 mV		
(300 to 500) kHz	10.4 mV/V + 0.1 mV		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage – Measure	(1 to 10) V		HP 3458A, Opt 002 8.5 Digit Multimeter
	(10 to 40) Hz	93.5 μ V/V + 0.4 mV	
	40 Hz to 1 kHz	0.22 mV/V + 0.2 mV	
	(1 to 20) kHz	0.26 mV/V + 0.2 mV	
	(20 to 50) kHz	0.39 mV/V + 0.2 mV	
	(50 to 100) kHz	0.86 mV/V + 0.2 mV	
	(100 to 300) kHz	3.1 mV/V + 1 mV	
	(300 to 500) kHz	10.3 mV/V + 1 mV	
	500 kHz to 1 MHz	10.4 mV/V + 1 mV	
	(10 to 100) V		
	40 Hz to 1 kHz	0.34 mV/V + 2 mV	
	(1 to 20) kHz	0.52 mV/V + 2 mV	
	(20 to 50) kHz	0.37V/V + 2 mV	
	(50 to 100) kHz	1.3 mV/V + 2 mV	
	(0.1 to 1) kV		
	40 Hz to 1 kHz	0.47 mV/V + 20 mV	
	ANALOG, 1V		
Up to 50 kHz	1.7 mV/V + 4 mV		
50 kHz to 1 MHz	51 mV/V + 0.2 V		
ANALOG, 10V			
Up to 10 Hz	4.1 mV/V + 2 mV		
(10 to 500) Hz	0.35 mV/V + 1 mV		
50 kHz	1.6 mV/V + 4 mV		
1 MHz	52 mV/V + 0.2 V		
Resistance – Source ²	Up to 10.999 Ω	58 $\mu\Omega/\Omega$ + 2.7 m Ω	Fluke 5502A Multiproduct Calibrator
	(11 to 32.999) Ω	70 $\mu\Omega/\Omega$ + 5.2 m Ω	
	(33 to 109.999) Ω	90 $\mu\Omega/\Omega$ + 3.4 m Ω	
	(110 to 329.999) Ω	96 $\mu\Omega/\Omega$ + 5.3 m Ω	
	(0.33 to 1.1) k Ω	88 $\mu\Omega/\Omega$ + 22 m Ω	
	(1.1 to 3.3) k Ω	93 $\mu\Omega/\Omega$ + 64.5 m Ω	
	(3.3 to 11) k Ω	88.5 $\mu\Omega/\Omega$ + 0.22 Ω	
	(11 to 33) k Ω	77.5 $\mu\Omega/\Omega$ + 0.6 Ω	
	(33 to 110) k Ω	0.11 m Ω/Ω + 2.2 Ω	
	(110 to 330) k Ω	0.13 m Ω/Ω + 6.6 Ω	
	(0.33 to 1.1) M Ω	0.16 m Ω/Ω + 20.3 Ω	
	(1.1 to 3.3) M Ω	0.13 m Ω/Ω + 21.9 Ω	
	(3.3 to 11) M Ω	0.67 m Ω/Ω + 4 Ω	
	(11 to 33) M Ω	1.1 m Ω/Ω + 6.14 k Ω	
	(33 to 110) M Ω	5.2 m Ω/Ω + 7.56 k Ω	
	(110 to 330) M Ω	5.5 m Ω/Ω + 0.24 M Ω	
	(0.33 to 1.1) G Ω	7.5 m Ω/Ω + 18.9 M Ω	



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Resistance – Measure (4-wire Configuration)	Up 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	35 μΩ/Ω + 10 μΩ 27 μΩ/Ω + 0.1 mΩ 15 μΩ/Ω + 0.1 mΩ 15 μΩ/Ω + 1 mΩ 15 μΩ/Ω + 10 mΩ 21 μΩ/Ω + 1 Ω 55 μΩ/Ω + 20 Ω	HP 3458A, Opt 002 8.5 Digit Multimeter
	Resistance – Measure (2-wire Configuration)	(10 to 100) MΩ	
DC Current – Source ²	(0 to 329.999) μA (0 to 3.299 99) mA (0 to 32.999 9) mA (0 to 329.999) mA (0 to 2.999 99) A (0 to 20.5) A	0.16 nA/μA + 28.3 nA 0.14 μA/mA + 0.11 μA 0.1 μA/mA + 0.86 μA 0.9 μA/mA + 13.7 μA 0.13 mA/A + 2.1 mA 1 mA/A + 4.6 mA	Fluke 5502A Multiproduct Calibrator
DC Current – Measure	Up to 100 μA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA 1 mA to 1 A	34 μA/A + 0.1 nA 30 μA/A + 1 nA 30 μA/A + 10 nA 39 μA/A + 0.1 μA 47 μA/A + 2 μA	HP 3458A, Opt 002 8.5 Digit Multimeter
AC Current – Source ²	(29 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	2 nA/μA + 0.22 μA 1.6 nA/μA + 0.13 μA 1.4 nA/μA + 0.12 μA 3.4 nA/μA + 0.18 μA 9.2 nA/μA + 0.23 μA 18.3 nA/μA + 0.49 μA 2.3 μA/mA + 0.27 μA 1.4 μA/mA + 0.3 μA 1.2 μA/mA + 0.16 μA 2.3 μA/mA + 0.21 μA 3.91 μA/mA + 81.2 mA 7.4 μA/mA + 18.8 μA	Fluke 5502A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment														
AC Current – Source ²	(3.3 to 32.999 9) mA		Fluke 5502A Multiproduct Calibrator														
	(10 to 20) Hz	1.8 μ A/mA + 13.8 μ A															
	(20 to 45) Hz	1 μ A/mA + 3.5 μ A															
	45 Hz to 1 kHz	0.42 μ A/mA + 3.5 μ A															
	(1 to 5) kHz	0.93 μ A/mA + 2.1 μ A															
	(5 to 10) kHz	2.3 μ A/mA + 5.4 μ A															
	(10 to 30) kHz	4.6 μ A/mA + 6.6 μ A															
	(33 to 329.999) mA																
	(10 to 20) Hz	1.8 μ A/mA + 0.11 mA															
	(20 to 45) Hz	1 μ A/mA + 35.1 μ A															
	45 Hz to 1 kHz	0.46 μ A/mA + 22 μ A															
	(1 to 5) kHz	1.1 μ A/mA + 70.1 μ A															
	(5 to 10) kHz	2.3 μ A/mA + 0.12 mA															
	(10 to 30) kHz	4.5 μ A/mA + 0.26 mA															
	(0.33 to 1.099 99) A																
	(10 to 45) Hz	2.1 μ A/A + 0.11 mA															
45 Hz to 1 kHz	0.4 μ A/A + 0.34 mA																
(1 to 5) kHz	6.8 mA/A + 1.2 mA																
(5 to 10) kHz	29 mA/A + 5.2 mA																
(1 to 2.999 99) A																	
(10 to 45) Hz	2 mA/A + 0.25 mA																
45 Hz to 1 kHz	0.61 mA/A + 0.4 mA																
(1 to 5) kHz	6.9 mA/A + 1.2 mA																
(5 to 10) kHz	29 mA/A + 5.3 mA																
(3 to 11) A																	
(45 to 100) Hz	0.46 mA/A + 5.4 mA																
100 Hz to 1 kHz	0.97 mA/A + 4.3 mA																
(1 to 5) kHz	35 mA/A + 4 mA																
(11 to 20.5) A																	
(45 to 100) Hz	0.63 mA/A + 30 mA																
(100 Hz to 1 kHz	1.6 mA/A + 7.3 mA																
(1 to 5) kHz	34 mA/A + 25 mA																
AC Current – Measure	Up to 1 kHz																
	(5 to 100) μ A	1.2 mA/A + 30 nA															
	100 μ A to 1 mA	0.63 mA/A + 0.2 μ A															
	(1 to 10) mA	0.63 mA/A + 2 μ A															
	(10 to 100) mA	0.63 mA/A + 20 μ A															
100 mA to 1 A	2 mA/A + 0.2 mA																



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Capacitance – Source ²	(220 to 399.9) pF (0.4 to 1.099 9) nF (1.1 to 3.299 9) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.99) nF (110 to 329.99) nF (0.33 to 1.099 9) μF (1.1 to 3.299 9) μF (3.3 to 10.999) μF (11 to 32.999) μF (33 to 109.99) μF (110 to 329.99) μF (0.33 to 1.099 9) mF (1.1 to 3.299 9) mF (3.3 to 10.999) mF (11 to 32.999) mF (33 to 110) mF	3.3 fF/pF + 14.4 pF 3.8 pF/nF + 14.4 pF 3.5 pF/nF + 20 pF 2.1 pF/nF + 22 pF 2.2 pF/nF + 0.14 nF 2.1 pF/nF + 0.22 nF 2.1 pF/nF + 0.67 nF 2.1 nF/μF + 2.2 nF 2 nF/μF + 7 nF 1.9 nF/μF + 25.7 nF 3.5 nF/μF + 78 nF 3.7 nF/μF + 0.32 μF 3.9 nF/μF + 0.89 μF 4.7 μF/mF + 1.8 μF 4.7 μF/mF + 5.2 μ 4.4 μF/mF + 21 μF 7.7 μF/mF + 71 μF 12.3 μF/mF + 0.17 mF	Fluke 5502A Multiproduct Calibrator
Electrical Simulation of Thermocouple Indicating Devices – Source ²	J-type (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C K-type (-210 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C T-type (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.32 °C 0.19 °C 0.17 °C 0.27 °C 0.32 °C 0.39 °C 0.22 °C 0.19 °C 0.35 °C 0.5 °C 0.73 °C 0.28 °C 0.19 °C 0.16 °C	Fluke 5502A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source ²	J-type		Fluke 5502A Multiproduct Calibrator
	(-210 to -100) °C	0.34 °C	
	(-100 to -30) °C	0.22 °C	
	(-30 to 150) °C	0.2 °C	
	(150 to 760) °C	0.23 °C	
	(760 to 1 200) °C	0.29 °C	
	K-type		
	(-210 to -100) °C	0.4 °C	
	(-100 to -25) °C	0.24 °C	
	(-25 to 120) °C	0.22 °C	
	(120 to 1 000) °C	0.32 °C	
	(1 000 to 1 372) °C	0.48 °C	
T-type			
(-250 to -150) °C	0.74 °C		
(-150 to 0) °C	0.3 °C		
(0 to 120) °C	0.22 °C		
(120 to 400) °C	0.2 °C		

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Outside Diameter (Pin and Plug Gages)	(0.01 in to 0.25) in	25 µin	Mitutoyo LSM-6100 Laser Scan Micrometer
	(0.25 in to 1) in	76 µin	Measurement Heads

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Temperature – Measure	(-196 to 0) °C (0 to 300) °C	0.000 9 % of reading + 0.027 °C 0.007 % of reading + 0.027 °C	GE Sensing 5690L Intelligent Probe
Relative Humidity – Generate @ 10 °C	10 %RH 30 %RH 50 %RH 70 %RH 80 %RH	0.08 %RH 0.21 %RH 0.32 %RH 0.43 %RH 0.54 %RH	Thunder Scientific 2500 RH/Temp Chamber

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Relative Humidity – Generate @ 21.11 °C	10 %RH	0.08 %RH	Thunder Scientific 2500 RH/Temp Chamber
	30 %RH	0.26 %RH	
	50 %RH	0.30 %RH	
	70 %RH	0.40 %RH	
	80 %RH	0.49 %RH	
Relative Humidity – Generate @ 50 °C	10 %RH	0.07 %RH	
	30 %RH	0.23 %RH	
	50 %RH	0.23 %RH	
	70 %RH	0.29 %RH	
	80 %RH	0.35 %RH	

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. Unless otherwise specified, 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. The expanded uncertainty of measurement expressed for this particular parameter is the standard uncertainty of the measurement multiplied by a coverage factor of 3 ($k=3$), corresponding to a confidence level of approximately 99%.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1400.



R. Douglas Leonard Jr., VP, PILR SBU