

SCOPE OF ACCREDITATION TO ISO/IEC 17025-2005
 AND ANSI/NCSL Z540-1-1994
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 Calibration

Valid to: November 23, 2009

Certificate Number: 1725.01

In recognition of the successful completion of the ILAA evaluation process, accreditation is granted to this laboratory to perform the following measurements.¹

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
DC Voltage - Source	(0 to 320) mV (0 to 3.2) V 0 to 32) V (32 to 320) V (100 to 1020) V	60 µV/V + 1 µV 50 µV/V + 2 µV 50 µV/V + 20 µV 55 µV/V + 150 µV 55 µV/V + 1.5 mV	Fluke 5500A
DC Voltage - Measure	(0 to 100) mV (0.1 to 10) V (1 to 10) V (10 to 100) V (100 to 1000) V (0 to 2000) V (2000 to 40000) V	11 µV/V + 0.3 µV 10 µV/V + 0.3 µV 10 µV/V + 0.5 µV 12 µV/V + 30 µV 22 µV/V + 100 µV 0.04% + 0.4 V 0.04% + 8 V	HP 3458A Vitrek 4640A
DC Current - Source	(0 to 3.2) ma (3.2 to 32) ma (32 to 320) ma (0.32 to 2.1) A (2.1 to 11) A	0.013% + 0.05 µA 0.010% + 0.25 µA 0.010% + 3.35 µA 0.030% + 44 µA 0.060% + 330 µA	Fluke 5500A
DC Current - Measure	(10 to 100) µA (0.1 to 1) ma (1 to 10) ma (10 to 100) ma (0.1 to 1) A	22 µA/A + 0.8 nA 22 µA/A + 0.005 µA 22 µA/A + 0.05 µA 37 µA/A + 0.5 µA 110 µA/A + 10 µA	HP 3458A

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Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
AC Voltage – Source			
(1 to 33) 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	0.35 % + 20 μV 0.15 % + 20 μV 0.20 % + 20 μV 0.25 % + 20 μV 0.35 % + 33 μV 1.00 % + 60 μV	Fluke 5500A
(33 to 330) 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	0.25 % + 50 μV 0.05 % + 20 μV 0.10 % + 20 μV 0.16 % + 40 μV 0.24 % + 170 μV 0.7 % + 330 μV	
(0.33 to 3.3) V	(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	0.15 % + 250 μV 0.03 % + 60 μV 0.08 % + 60 μV 0.14 % + 300 μV 0.24 % + 1.7 mV 0.50 % + 3.3mμV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.15 % + 2.5 mV 0.04 % + 600 μV 0.08 % + 2.6 mV 0.19 % + 5.0 μ=mV 0.24 % + 17.0 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.05 % + 6.6 mV 0.08 % + 15 mV 0.09 % + 33 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.05 % + 80 mV 0.20 % + 100 mV 0.20 % + 500 mV	
AC Voltage – Measure			
10 mV	40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	0.02- % + 1.1 μV 0.030 % + 1.1 μV 0.1 % + 1.1 μV	HP 3458A
100 mV	40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	70 μV/V + 2 μV 0.14 % + 2 μV 0.030 % + 2 μV	
1 V	40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	70 μV/V + 200 μV 0.14 % + 200 μV 0.030 % + 200 μV	
10 V	40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	0.15 % + 200 μV 0.03 % + 200 μV 0.08 % + 200 μV	

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Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
AC Voltage – Measure (continue)			
100 V	40 Hz to 1 kHz	0.15 % + 200 μV	Vitrek 4640A
	(1 to 20) kHz	0.03 % + 200 μV	
	(20 to 50) kHz	0.08 % + 200 μV	
1000 V	40 Hz to 1 kHz	0.20 % + 2 mV	
	(1 to 20) kHz	0.20 % + 2 mV	
	(20 to 50) kHz	0.035 % + 2 mV	
2000 V	40 Hz to 1 kHz	0.040 % + 20 mV	
	(1 to 20) kHz	0.060 % + 20 mV	
	(20 to 50) kHz	0.12 % + 20 mV	
40000 V	(40 to 100) Hz	0.07 % + 2 V	
	(100 to 400) Hz	0.4 % + 4 V	
	(50 to 60) Hz	0.4 % + 60 V	
AC Current – Source			
(0.03 to 0.33) ma	(10 to 20) Hz	0.25% + 0.15 μA	Fluke 5500A
	(20 to 45) Hz	0.13% + 0.15 μA	
	45 Hz to 1 kHz	0.13% + 0.15 μA	
	(1 to 5) kHz	0.4% + 0.15 μA	
	(5 to 10) kHz	1.3% + 0.15 μA	
(0.33 to 3.3) ma	(10 to 20) Hz	0.2% + 0.3 μA	
	(20 to 45) Hz	0.1% + 0.3 μA	
	45 Hz to 1 kHz	0.09% + 0.3 μA	
	(1 to 5) kHz	0.2% + 0.3 μA	
	(5 to 10) kHz	0.6% + 0.3 μA	
(3.3 to 33) ma	(10 to 20) Hz	0.2% + 3.0 μA	
	(20 to 45) Hz	0.1% + 3.0 μA	
	45 Hz to 1 kHz	0.09% + 3.0 μA	
	(1 to 5) kHz	0.2% + 3.0 μA	
	(5 to 10) kHz	0.6% + 3.0 μA	
(33 to 330) ma	(10 to 20) Hz	0.2% + 30 μA	
	(20 to 45) Hz	0.1% + 30 μA	
	45 Hz to 1 kHz	0.09% + 30 μA	
	(1 to 5) kHz	0.2% + 30 μA	
	(5 to 10) kHz	0.6% + 30 μA	
(0.33 to 2.2) A	(10 to 45) Hz	0.2% + 300 μA	
	45 Hz to 1 kHz	0.1% + 300 μA	
	(1 to 5) kHz	0.75% + 300 μA	
(2.2 to 11) A	(45 to 65) Hz	0.06% + 2.0 ma	
	65 Hz to 500 Hz	0.1% + 2.0 ma	
	500 Hz to 1 kHz	0.33% + 2.0 ma	

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Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
AC Current – Measure			HP 3458A
100 µA	(20 to 45) Hz 45 Hz to 100 Hz 100 Hz to 1 kHz	0.15% + 0.03 µA 0.06% + 0.03 µA 0.06% + 0.03 µA	
1 ma	(20 to 45) Hz 45 Hz to 100 Hz 100 Hz to 1 kHz	0.15% + 0.2 µA 0.06% + 0.2 µA 0.03% + 0.2 µA	
10 ma	(20 to 45) Hz 45 Hz to 100 Hz 100 Hz to 1 kHz	0.15% + 2 µA 0.06% + 2 µA 0.03% + 2 µA	
100 ma	(20 to 45) Hz 45 Hz to 100 Hz 100 Hz to 1 kHz	0.15% + 0.02 ma 0.06% + 0.02 ma 0.03% + 0.02 ma	
1 A	(20 to 45) Hz 45 Hz to 100 Hz 100 Hz to 1 kHz	0.16% + 0.2 ma 0.08% + 0.2 ma 0.1% + 0.2 ma	
Capacitance - Source			Fluke 5500A
(0.33 to 11) nF	50 Hz to 1 kHz	0.5% + 0.01 nF	
(11 to 110) nF	50 Hz to 1 kHz	0.25% + 0.1 nF	
(110 to 330) nF	50 Hz to 1 kHz	0.25% + 0.3 nF	
(0.33 to 1.1) µF	50 Hz to 1 kHz	0.26% + 1 nF	
(1.1 to 3.3) µF	50 Hz to 1 kHz	0.35% + 3 nF	
(3.3 to 11) µF	(50 to 400) Hz	0.35% + 10 nF	
(11 to 33) µF	(50 to 400) Hz	0.40% + 30 nF	
(33 to 110) µF	(50 to 200) Hz	0.50% + 100 nF	
(110 to 330) µF	(50 to 100) Hz	0.70% + 300 nF	
(0.33 to 1.1) mF	(50 to 100) Hz	1.00% + 300 nF	
Resistance - Measure			Fluke 5500A
10 Ω		18 µΩ/Ω + 50 µΩ	
100 Ω		15 µΩ/Ω + 0.5 mΩ	
1 kΩ		13 µΩ/Ω + 0.5 mΩ	
10 kΩ		13 µΩ/Ω + 5 mΩ	
100 kΩ		13 µΩ/Ω + 0.05 Ω	
1 MΩ		18 µΩ/Ω + 2 Ω	
10 MΩ		53 µΩ/Ω + 100 Ω	
100 MΩ		0.050% + 1 kΩ	
300 MΩ		0.5% + 10 kΩ	

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Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Thermocouple Indicators And Simulators			Fluke 5500A
Type E	(-250 to -100) ° C	0.5 ° C	
	(-100 to -25) ° C	0.16 ° C	
	(-25 to 350) ° C	0.14 ° C	
	(350 to 650) ° C	0.16 ° C	
	(650 to 1000) ° C	0.21 ° C	
Type J	(-210 to -100) ° C	0.27 ° C	
	(-100 to -30) ° C	0.16 ° C	
	(-30 to 150) ° C	0.14 ° C	
	(150 to 760) ° C	0.17 ° C	
	(760 to 1200) ° C	0.23 ° C	
Type K	(-200 to -100) ° C	0.33 ° C	
	(-100 to 125) ° C	0.18 ° C	
	(-25 to 120) ° C	0.16 ° C	
	(120 to 1000) ° C	0.26 ° C	
	(1000 to 1372) ° C	0.40 ° C	
Type R	(0 to 250) ° C	0.57 ° C	
	(250 to 400) ° C	0.35 ° C	
	(400 to 1000) ° C	0.33 ° C	
	(1000 to 1372) ° C	0.40 ° C	
Type S	(0 to 250) ° C	0.47 ° C	
	(250 to 1000) ° C	0.36 ° C	
	(1000 to 1400) ° C	0.37 ° C	
	(1400 to 1767) ° C	0.46 ° C	
Type T	(-250 to -150) ° C	0.63 ° C	
	(-150 to 0) ° C	0.24 ° C	
	(0 to 120) ° C	0.16 ° C	
	(120 to 400) ° C	0.14 ° C	

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Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments
Oscilloscopes			Fluke 5500A w/SC600
Amplitude – DC 50 Ω 1 MΩ	(0 to 6.6) V (0 to 130) V	0.65 % + 40 μV 0.60 % + 40 μV	
Amplitude – Square 50 Ω 1 MΩ	1 mV to 6.6 V (p-p) 1 mV to 130 V (p-p)	0.65 % + 40 μV 0.61 % + 40 μV	
Leveled Sine Wave (ref 50 kHz)	50 kHz reference	2.1 % + 300 μV	
Amplitude	50 kHz to 100 MHz (100 TO 300) MHz (300 to 600) MHz	3.6 % + 300 μV 4 % + 300 μV 6 % + 300 μV	
Flatness	50 kHz to 100 MHz (100 TO 300) MHz (300 to 600) MHz	1.6 % + 100 μV 2.1 % + 100 μV 4 % + 100 μV	
Time Marker	5 s to 50 ms 20 ms to 1 ns	(3800 + 1000t) μs/s 3800 μs/s	
Rise Time	≤ 300 ps	3800 μs/s	
Frequency – Reference	10 MHz	1.0 part in 10 ⁹	Efratom M100 Rubidium Standard
Frequency – Source	(0.01 to 10) kHz 10 kHz to 1.2 MHz (1.2 to 2) MHz	25 μHz/Hz + 1 μHz 25 μHz/Hz + 15 μHz 25 μHz/Hz + 15 μHz	Fluke 5500A
Frequency – Measure	40 Hz to 10 MHz (0 to 1.3) GHz	100 μHz/Hz 1.0 part in 10 ⁹	HP 3458A Efratom M100 and HP 53132A
Dimensional			
Micrometers	(0 to 12) in	(60 + 5L) μin	Grade 2 Gage Blocks
Calipers	(0 to 12) in	150 μin	Grade 2 Gage Blocks
Dial Indicators	(0 to 6) in	(50 + 0.5L) μin	Supermicrometer & Grade 2 Gage Blocks
Plain Plug & Pin Gages	(0 to 8) in	(35 + 4L) μin	Supermicrometer & Grade 2 Gage Blocks
Threaded Set – Working Plug Gages, Pitch Diameter	(0 to 5) in	150 μin	Supermicrometer & Grade 2 Gage Blocks

Parameter/Equipment	Range	Best Uncertainty ² (±)	Comments	
Pressure	-0.3 to 0.3 PSI	0.00003 PSI	Mensor APC600	
	-5.0 to 5.0 PSI	0.0002 PSI		
	-10.0 to 10.0 PSI	0.0004 PSI		
	-14.7 to 75 PSI	0.0071 PSI		
	-14.7 to 100 PSI	0.006 PSI		
	Barometric	0.0015 PSI		
Flow	Gas (Air, O ₂)	(10 to 30) ml/min	0.09 sccm	GME Model 60
		(100 to 300) ml/min	0.55 sccm	
		(1 to 3) SLPM	0.01 SLPM	
		(10 to 30) SLPM	0.09 SLPM	
		(30 to 100) SLPM	0.19 SLPM	
		(100 to 300) SLPM	1.9 SLPM	
	Liquid (Water)	(1 to 5000) ml/Hr	0.2 %	Harvard PHD2000

- 1) This laboratory offers commercial, on-site calibration services.
- 2) "Best Uncertainty" is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine tests of nearly ideal measurement standards of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95% level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific test performed by the laboratory may be larger than the best uncertainty stated above due to the behavior and limitations of the customer's device, environmental conditions, and to influences due to the specific measurement method.

(ILAA Certificate Number 1725.01)

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