



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

Instrument Calibration and Technical Services, Inc.

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CALIBRATION

Valid to: November 11, 2012

Certificate Number: AC-1195

I. Electromagnetic - DC / Low Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage - Source	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	8 μV/V + 600 nV 7 μV/V + 1 μV 7 μV/V + 3.5 μV 7 μV/V + 6.5 μV 8 μV/V + 80 μV 9 μV/V + 500 μV	Fluke 5700A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
AC Voltage - Source	Up to 22 mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (22 to 220) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	550 μV/V + 4.5 μV 210 μV/V + 4.5 μV 105 μV/V + 4.5 μV 370 μV/V + 4.5 μV 850 μV/V + 7 μV 1.1 mV/V + 13 μV 1.7 mV/V + 25 μV 3.4 mV/V + 25 μV 550 μV/V + 13 μV 210 μV/V + 8 μV 105 μV/V + 8 μV 320 μV/V + 8 μV 850 μV/V + 25 μV 1.1 mV/V + 25 μV 1.7 mV/V + 35 μV 3.4 mV/V + 80 μV		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Source (cont.)	220 mV to 2.2 V		Fluke 5700A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
	(10 to 20) Hz	500 $\mu\text{V}/\text{V}$ + 80 μV		
	(20 to 40) Hz	160 $\mu\text{V}/\text{V}$ + 25 μV		
	40 Hz to 20 kHz	75 $\mu\text{V}/\text{V}$ + 6 μV		
	(20 to 50) kHz	120 $\mu\text{V}/\text{V}$ + 16 μV		
	(50 to 100) kHz	250 $\mu\text{V}/\text{V}$ + 70 μV		
	(100 to 300) kHz	430 $\mu\text{V}/\text{V}$ + 130 μV		
	(300 to 500) kHz	1.05 mV/V + 350 μV		
	500 kHz to 1 MHz	2.2 mV/V + 850 μV		
	(2.2 to 22) V			
	(10 to 20) Hz	500 $\mu\text{V}/\text{V}$ + 1 mV		
	(20 to 40) Hz	160 $\mu\text{V}/\text{V}$ + 300 μV		
	40 Hz to 20 kHz	75 $\mu\text{V}/\text{V}$ + 70 μV		
	(20 to 50) kHz	120 $\mu\text{V}/\text{V}$ + 200 μV		
	(50 to 100) kHz	250 $\mu\text{V}/\text{V}$ + 400 μV		
	(100 to 300) kHz	500 $\mu\text{V}/\text{V}$ + 1.7 mV		
	(300 to 500) kHz	1.25 mV/V + 5 mV		
500 kHz to 1 MHz	2.7 mV/V + 9 mV			
(22 to 220) V				
(10 to 20) Hz	500 $\mu\text{V}/\text{V}$ + 8 mV			
(20 to 40) Hz	160 $\mu\text{V}/\text{V}$ + 2.5 mV			
40 Hz to 20 kHz	80 $\mu\text{V}/\text{V}$ + 800 μV			
(20 to 50) kHz	220 $\mu\text{V}/\text{V}$ + 3.5 mV			
(50 to 100) kHz	500 $\mu\text{V}/\text{V}$ + 8 mV			
(100 to 300) kHz	1.5 mV/V + 90 mV			
(300 to 500) kHz	4.7 mV/V + 90 mV			
500 kHz to 1 MHz	11.5 mV/V + 190 mV			
(220 to 330) V				
(45 to 50) Hz	190 $\mu\text{V}/\text{V}$ + 2 mV	Fluke 5520A		
50 Hz to 1 kHz	80 $\mu\text{V}/\text{V}$ + 3.5 mV	Fluke 5700A		
(1 to 10) kHz	200 $\mu\text{V}/\text{V}$ + 6 mV	Fluke 5520A		
(10 to 20) kHz	250 $\mu\text{V}/\text{V}$ + 6 mV			
330 V to 1.02 kV				
(45 to 50) Hz	300 $\mu\text{V}/\text{V}$ + 10 mV			
50 Hz to 1 kHz	80 $\mu\text{V}/\text{V}$ + 3.5 mV	Fluke 5700A		
(1 to 5) kHz	250 $\mu\text{V}/\text{V}$ + 100 mV	Fluke 5520A		
(5 to 10) kHz	300 mV/V + 10 mV			
(1.02 to 1.1) kV				
50 Hz to 1 kHz	80 $\mu\text{V}/\text{V}$ + 3.5 mV	Fluke 5700A		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Current – Source	Up to 220 µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 100) mA	50 µA/A + 8 nA 50 µA/A + 8 nA 50 µA/A + 80 nA 60 µA/A + 800 µA + (200 x I ²) µA/A	Fluke 5700A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
	(22 to 220) mA 220 mA to 1 A 220 mA to 2.2 A (2.2 to 3) A (3 to 11) A (11 to 20.5) A	60 µA/A + 800 µA 60 µA/A + 800 µA 80 µA/A + 25 µA + (10 x I ²) µA/A 80 µA/A + 25 µA 380 µA/A + 40 µA 500 µA/A + 500 µA 1 mA/A + 750 µA	Fluke 5520A	
AC Current – Source	Up to 220 µA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 µA to 2.2 mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	700 µA/A + 25 nA 350 µA/A + 20 nA 140 µA/A + 16 nA 600 µA/A + 40 nA 1.6 mA/A + 80 nA 700 µA/A + 40 nA 350 µA/A + 35 nA 140 µA/A + 35 nA 600 µA/A + 400 nA 1.6 mA/A + 800 nA 700 µA/A + 400 nA 350 µA/A + 350 nA 140 µA/A + 350 nA 600 µA/A + 4 µA 1.6 mA/A + 8 µA 700 µA/A + 4 µA 350 µA/A + 3.5 µA 140 µA/A + 3.5 µA 600 µA/A + 40 µA 1.6 mA/A + 80 µA	Fluke 5700A	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Power – Source (cont.) @ (45 to 65) Hz PF = 1	(33 to 330) mV (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 11) A 330 mV to 1.02 kV (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 11) A	1.4 mA/A 1 mA/A 1.4 mA/A 1 mA/A 1.3 mA/A 1.1 mA/A 1.3 mA/A 1.1 mA/A 1.2 mA/A 800 µA/A 1.2 mA/A 800 µA/A 1.1 mA/A 900 µA/A 1.2 mA/A 1 mA/A	Fluke 5520A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Capacitance – Source 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 to 50) Hz (0 to 20) Hz	190 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF 330 nF to 1.1 µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF 330 µF to 1.1 mF	5 mF/F + 10 pF 5 mF/F + 10 pF 2.5 mF/F + 10 pF 2.5 mF/F + 100 pF 2.5 mF/F + 300 pF 2.5 mF/F + 1 nF 2.5 mF/F + 3 nF 2.5 mF/F + 10 nF 4 mF/F + 30 nF 4.5 mF/F + 100 nF 4.5 mF/F + 300 nF 4.5 mF/F + 1 µF		
DC Voltage – Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	11 µV/V + 300 nV 10 µV/V + 300 nV 10 µV/V + 500 nV 12 µV/V + 30 µV 12 µV/V + 100 µV	HP 3458A	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure	Up to 10 mV		HP 3458A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
	40 Hz to 1 kHz	202 $\mu\text{V/V} + 1.1 \mu\text{V}$		
	(1 to 20) kHz	302 $\mu\text{V/V} + 1.1 \mu\text{V}$		
	(20 to 50) kHz	1 $\text{mV/V} + 1.1 \mu\text{V}$		
	(10 to 100) mV			
	40 Hz to 1 kHz	702 $\mu\text{V/V} + 2 \mu\text{V}$		
	(1 to 20) kHz	142 $\mu\text{V/V} + 2 \mu\text{V}$		
	(20 to 50) kHz	302 $\mu\text{V/V} + 2 \mu\text{V}$		
	100 mV to 1 V			
	40 Hz to 1 kHz	702 $\mu\text{V/V} + 20 \mu\text{V}$		
	(1 to 20) kHz	142 $\mu\text{V/V} + 20 \mu\text{V}$		
	(20 to 50) kHz	302 $\mu\text{V/V} + 20 \mu\text{V}$		
DC Current - Measure	(1 to 10) V		HP 3458A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
	40 Hz to 1 kHz	702 $\mu\text{V/V} + 200 \mu\text{V}$		
	(1 to 20) kHz	142 $\mu\text{V/V} + 200 \mu\text{V}$		
	(20 to 50) kHz	302 $\mu\text{V/V} + 200 \mu\text{V}$		
	(10 to 100) V			
	40 Hz to 1 kHz	202 $\mu\text{V/V} + 2 \text{mV}$		
	(1 to 20) kHz	202 $\mu\text{V/V} + 2 \text{mV}$		
	(20 to 50) kHz	352 $\mu\text{V/V} + 2 \text{mV}$		
	100 V to 1 kV			
	40 Hz to 1 kHz	402 $\mu\text{V/V} + 20 \text{mV}$		
	(1 to 20) kHz	602 $\mu\text{V/V} + 20 \text{mV}$		
	(20 to 50) kHz	1.2 $\text{mV/V} + 20 \text{mV}$		
	100 nA to 1 μA	25 $\mu\text{A/A} + 40 \text{pA}$		
	(1 to 10) μA	25 $\mu\text{A/A} + 100 \text{pA}$		
	(10 to 100) μA	25 $\mu\text{A/A} + 800 \text{pA}$		
	100 μA to 1 mA	25 $\mu\text{A/A} + 5 \text{nA}$		
	(1 to 10) mA	25 $\mu\text{A/A} + 50 \text{nA}$		
	(10 to 100) mA	40 $\mu\text{A/A} + 500 \text{nA}$		
	100 mA to 1 A	115 $\mu\text{A/A} + 10 \mu\text{A}$		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Measure	Up to 100 μA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 100 μA to 1 mA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (1 to 10) mA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (10 to 100) mA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 100 mA to 1 A (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	1.5 mA/A + 30 nA 605 μ A /A + 30 nA 605 μ A /A + 30 nA 1.5 mA/A + 200 nA 605 μ A /A + 200 nA 305 μ A /A + 200 nA 1.5 mA/A + 2 μ A 605 μ A /A + 2 μ A 305 μ A /A + 2 μ A 1.5 mA/A + 20 μ A 605 μ A /A + 20 μ A 305 μ A /A + 20 μ A 1.6 mA/A + 200 μ A 805 μ A /A + 200 μ A 1 mA/A + 200 μ A	HP 3458A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Resistance - Measure	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω (100 to 300) M Ω	18 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 13 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 13 $\mu\Omega/\Omega$ + 5 m Ω 13 $\mu\Omega/\Omega$ + 50 m Ω 18 $\mu\Omega/\Omega$ + 2 Ω 53 $\mu\Omega/\Omega$ + 100 Ω 503 $\mu\Omega/\Omega$ + 1 k Ω 5 m Ω/Ω + 10 k Ω		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of Thermocouples				
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 1 000) °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		
Type K	(760 to 1 200) °C	0.23 °C		
	(-200 to -100) °C	0.33 °C		
	(-100 to -25) °C	0.18 °C		
	(-25 to 120) °C	0.16 °C	Fluke 5500A	
	(120 to 1 000) °C	0.26 °C		
	(1 000 to 1 372) °C	0.4 °C		
Type R	(0 to 250) °C	0.57 °C		
	(250 to 400) °C	0.35 °C		
	(400 to 1 000) °C	0.33 °C		
Type S	(1 000 to 1 767) °C	0.4 °C		
	(0 to 250) °C	0.47 °C		
	(250 to 1 000) °C	0.36 °C		
	(1 000 to 1 400) °C	0.37 °C		
Type T	(1 400 to 1 767) °C	0.46 °C		
	(-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		
Oscilloscopes				
Amplitude - DC				
Into 50 Ω	± (0 to 6.6) V	2.5 mV/V + 40 μV		
Into 1 MΩ	± (0 to 130) V	500 μV/V + 40 μV	Fluke 5520A SC1100	
Amplitude - Square Wave				
Into 50 Ω	1 mV to 6.6 V (p-p)	2.5 mV/V + 40 μV		
Into 1 MΩ	1 mV to 130 V (p-p)	1 mV/V + 40 μV		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Oscilloscopes (cont.) Leveled Sine Wave (ref 50 kHz)	50 kHz reference	20 mV/V + 300 μV	Fluke 5520A SC1100	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Amplitude	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	35 mV/V + 300 μV 40 mV/V + 300 μV 60 mV/V + 300 μV 70 mV/V + 300 μV		
Flatness	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	15 mV/V + 100 μV 20 mV/V + 100 μV 40 mV/V + 100 μV 50 mV/V + 100 μV		
Time Marker ⁶	5 s to 50 ms 20 ms to 1 ns	(25 + 1 000t) μs/s 2.5 μs/s		
Rise Time	≤ 300 ps	+0 ps/-100 ps		

II. Time & Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency - Source ³	10 MHz	5.78×10^{-08}	Datum 9390 GPS Receiver	GIDEP Sourced Procedures
Frequency - Measure ³	10 MHz	8.17×10^{-08}	HP 5316A	GIDEP Sourced Procedures



III. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Measure	(-38 to 0.1) °C (0.1 to 400) °C	0.10 °C 0.30°C	Hart Scientific w / PRTD	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Temperature Measuring Instruments	(-38 to 120) °C (120 to 400) °C	0.42°C 0.44°C	Hart Scientific w / PRTD Bath or Dry Block	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures

IV. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure Analog Gages Digital Gages	(0 to-14.5) psig (0 to 30) psig (30 to 300) psig (300 to 3 000) psig (3 000to 10 000) psig	0.006 psi 0.007 psi 0.075 psi 0.753 psi 2.575 psi	Druck DPI 610 Transducers	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Torque Tools	Up to 100 lbf·in Up to 100 lbf·ft (100 to 200) lbf·ft (200 to 300) lbf·ft (300 to 400) lbf·ft (400 to 500) lbf·ft	0.12 lbf·in 0.16 lbf·ft 0.25 lbf·ft 0.37 lbf·ft 0.48 lbf·ft 0.64 lbf·ft	AKO TDS-001 AKO TDS-511	
Force	Up to 50 lbf (50 to 500) lbf	0.001 lb + 0.6R 0.005 lb + 0.6R	Standard Weights	



V. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Micrometers ⁴	Up to 12 in	(57 + 5.1L) μin	Gage Blocks	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Calipers ⁴	Up to 36 in	(17 + 4.5L) μin	Gage Blocks	
Dial Indicators	Up to 1 in	290 μin	Bench Micrometer Gage Blocks	
Height Gages ⁴	Up to 24 in	(58 + 6L) μin	Gage Blocks	

Notes:

1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of $k=2$.
2. This laboratory offers in-laboratory calibration service as well as on-site calibrations at customer-designated locations. 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.
3. This capability is not available for on-site calibrations.
4. The use of (L) signifies Length in inches.
5. The use of (t) signifies Time in seconds.
6. This scope is part of and must be included with the Certificate of Accreditation No. AC-1195.



Vice President





SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

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CALIBRATION

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I. Electromagnetic - DC / Low Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage - Source	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	8 µV/V + 600 nV 7µV/V + 1 µV 7 µV/V + 3.5 µV 7 µV/V + 6.5 µV 8 µV/V + 80 µV 9 µV/V + 500 µV	Fluke 5700A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
AC Voltage - Source	Up to 22 mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (22 to 220) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	550 µV/V + 4.5 µV 210 µV/V + 4.5 µV 105 µV/V + 4.5 µV 370 µV/V + 4.5 µV 850 µV/V + 7 µV 1.1 mV/V + 13 µV 1.7 mV/V + 25 µV 3.4 mV/V + 25 µV 550 µV/V + 13 µV 210 µV/V + 8 µV 105 µV/V + 8 µV 320 µV/V + 8 µV 850 µV/V + 25 µV 1.1 mV/V + 25 µV 1.7 mV/V + 35 µV 3.4 mV/V + 80 µV		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Source (cont.)	220 mV to 2.2 V		Fluke 5700A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
	(10 to 20) Hz	500 $\mu\text{V}/\text{V}$ + 80 μV		
	(20 to 40) Hz	160 $\mu\text{V}/\text{V}$ + 25 μV		
	40 Hz to 20 kHz	75 $\mu\text{V}/\text{V}$ + 6 μV		
	(20 to 50) kHz	120 $\mu\text{V}/\text{V}$ + 16 μV		
	(50 to 100) kHz	250 $\mu\text{V}/\text{V}$ + 70 μV		
	(100 to 300) kHz	430 $\mu\text{V}/\text{V}$ + 130 μV		
	(300 to 500) kHz	1.05 mV/V + 350 μV		
	500 kHz to 1 MHz	2.2 mV/V + 850 μV		
	(2.2 to 22) V			
	(10 to 20) Hz	500 $\mu\text{V}/\text{V}$ + 1 mV		
	(20 to 40) Hz	160 $\mu\text{V}/\text{V}$ + 300 μV		
	40 Hz to 20 kHz	75 $\mu\text{V}/\text{V}$ + 70 μV		
	(20 to 50) kHz	120 $\mu\text{V}/\text{V}$ + 200 μV		
	(50 to 100) kHz	250 $\mu\text{V}/\text{V}$ + 400 μV		
	(100 to 300) kHz	500 $\mu\text{V}/\text{V}$ + 1.7 mV		
(300 to 500) kHz	1.25 mV/V + 5 mV			
500 kHz to 1 MHz	2.7 mV/V + 9 mV			
(22 to 220) V				
(10 to 20) Hz	500 $\mu\text{V}/\text{V}$ + 8 mV			
(20 to 40) Hz	160 $\mu\text{V}/\text{V}$ + 2.5 mV			
40 Hz to 20 kHz	80 $\mu\text{V}/\text{V}$ + 800 μV			
(20 to 50) kHz	220 $\mu\text{V}/\text{V}$ + 3.5 mV			
(50 to 100) kHz	500 $\mu\text{V}/\text{V}$ + 8 mV			
(100 to 300) kHz	1.5 mV/V + 90 mV			
(300 to 500) kHz	4.7 mV/V + 90 mV			
500 kHz to 1 MHz	11.5 mV/V + 190 mV			
(220 to 330) V				
(45 to 50) Hz	190 $\mu\text{V}/\text{V}$ + 2 mV	Fluke 5520A		
50 Hz to 1 kHz	80 $\mu\text{V}/\text{V}$ + 3.5 mV	Fluke 5700A		
(1 to 10) kHz	200 $\mu\text{V}/\text{V}$ + 6 mV	Fluke 5520A		
(10 to 20) kHz	250 $\mu\text{V}/\text{V}$ + 6 mV			
330 V to 1.02 kV				
(45 to 50) Hz	300 $\mu\text{V}/\text{V}$ + 10 mV			
50 Hz to 1 kHz	80 $\mu\text{V}/\text{V}$ + 3.5 mV	Fluke 5700A		
(1 to 5) kHz	250 $\mu\text{V}/\text{V}$ + 100 mV	Fluke 5520A		
(5 to 10) kHz	300 mV/V + 10 mV			
(1.02 to 1.1) kV				
50 Hz to 1 kHz	80 $\mu\text{V}/\text{V}$ + 3.5 mV	Fluke 5700A		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Power – Source (cont.) @ (45 to 65) Hz PF = 1	(33 to 330) mV (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 11) A 330 mV to 1.02 kV (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 11) A	1.4 mA/A 1 mA/A 1.4 mA/A 1 mA/A 1.3 mA/A 1.1 mA/A 1.3 mA/A 1.1 mA/A 1.2 mA/A 800 µA/A 1.2 mA/A 800 µA/A 1.1 mA/A 900 µA/A 1.2 mA/A 1 mA/A	Fluke 5520A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Capacitance – Source 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 to 50) Hz (0 to 20) Hz	190 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF 330 nF to 1.1 µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF 330 µF to 1.1 mF	5 mF/F + 10 pF 5 mF/F + 10 pF 2.5 mF/F + 10 pF 2.5 mF/F + 100 pF 2.5 mF/F + 300 pF 2.5 mF/F + 1 nF 2.5 mF/F + 3 nF 2.5 mF/F + 10 nF 4 mF/F + 30 nF 4.5 mF/F + 100 nF 4.5 mF/F + 300 nF 4.5 mF/F + 1 µF		
DC Voltage – Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	11 µV/V + 300 nV 10 µV/V + 300 nV 10 µV/V + 500 nV 12 µV/V + 30 µV 12 µV/V + 100 µV	HP 3458A	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure	<p>Up to 10 mV 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>(10 to 100) mV 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>100 mV to 1 V 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>(1 to 10) V 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>(10 to 100) V 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>100 V to 1 kV 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p>	<p>202 $\mu\text{V}/\text{V} + 1.1 \mu\text{V}$ 302 $\mu\text{V}/\text{V} + 1.1 \mu\text{V}$ 1 $\text{mV}/\text{V} + 1.1 \mu\text{V}$</p> <p>702 $\mu\text{V}/\text{V} + 2 \mu\text{V}$ 142 $\mu\text{V}/\text{V} + 2 \mu\text{V}$ 302 $\mu\text{V}/\text{V} + 2 \mu\text{V}$</p> <p>702 $\mu\text{V}/\text{V} + 20 \mu\text{V}$ 142 $\mu\text{V}/\text{V} + 20 \mu\text{V}$ 302 $\mu\text{V}/\text{V} + 20 \mu\text{V}$</p> <p>702 $\mu\text{V}/\text{V} + 200 \mu\text{V}$ 142 $\mu\text{V}/\text{V} + 200 \mu\text{V}$ 302 $\mu\text{V}/\text{V} + 200 \mu\text{V}$</p> <p>202 $\mu\text{V}/\text{V} + 2 \text{mV}$ 202 $\mu\text{V}/\text{V} + 2 \text{mV}$ 352 $\mu\text{V}/\text{V} + 2 \text{mV}$</p> <p>402 $\mu\text{V}/\text{V} + 20 \text{mV}$ 602 $\mu\text{V}/\text{V} + 20 \text{mV}$ 1.2 $\text{mV}/\text{V} + 20 \text{mV}$</p>	HP 3458A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
DC Current - Measure	<p>100 nA to 1 μA (1 to 10) μA (10 to 100) μA</p> <p>100 μA to 1 mA (1 to 10) mA (10 to 100) mA</p> <p>100 mA to 1 A</p>	<p>25 $\mu\text{A}/\text{A} + 40 \text{pA}$ 25 $\mu\text{A}/\text{A} + 100 \text{pA}$ 25 $\mu\text{A}/\text{A} + 800 \text{pA}$</p> <p>25 $\mu\text{A}/\text{A} + 5 \text{nA}$ 25 $\mu\text{A}/\text{A} + 50 \text{nA}$ 40 $\mu\text{A}/\text{A} + 500 \text{nA}$ 115 $\mu\text{A}/\text{A} + 10 \mu\text{A}$</p>		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Measure	Up to 100 μA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 100 μA to 1 mA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (1 to 10) mA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (10 to 100) mA (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 100 mA to 1 A (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	1.5 mA/A + 30 nA 605 μ A /A + 30 nA 605 μ A /A + 30 nA 1.5 mA/A + 200 nA 605 μ A /A + 200 nA 305 μ A /A + 200 nA 1.5 mA/A + 2 μ A 605 μ A /A + 2 μ A 305 μ A /A + 2 μ A 1.5 mA/A + 20 μ A 605 μ A /A + 20 μ A 305 μ A /A + 20 μ A 1.6 mA/A + 200 μ A 805 μ A /A + 200 μ A 1 mA/A + 200 μ A	HP 3458A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
	Resistance - Measure	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω (100 to 300) M Ω		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of Thermocouples				
Type E	(-250 to -100) °C	0.5 °C	Fluke 5500A	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
	(-100 to -25) °C	0.16 °C		
	(-25 to 350) °C	0.14 °C		
	(350 to 650) °C	0.16 °C		
	(650 to 1 000) °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 1 200) °C	0.23 °C		
Type K	(-200 to -100) °C	0.33 °C		
	(-100 to -25) °C	0.18 °C		
	(-25 to 120) °C	0.16 °C		
	(120 to 1 000) °C	0.26 °C		
	(1 000 to 1 372) °C	0.4 °C		
Type R	(0 to 250) °C	0.57 °C		
	(250 to 400) °C	0.35 °C		
	(400 to 1 000) °C	0.33 °C		
	(1 000 to 1 767) °C	0.4 °C		
Type S	(0 to 250) °C	0.47 °C		
	(250 to 1 000) °C	0.36 °C		
	(1 000 to 1 400) °C	0.37 °C		
	(1 400 to 1 767) °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		
Oscilloscopes				
Amplitude - DC			Fluke 5520A SC1100	
Into 50 Ω	± (0 to 6.6) V	2.5 mV/V + 40 μV		
Into 1 MΩ	± (0 to 130) V	500 μV/V + 40 μV		
Amplitude - Square Wave				
Into 50 Ω	1 mV to 6.6 V (p-p)	2.5 mV/V + 40 μV		
Into 1 MΩ	1 mV to 130 V (p-p)	1 mV/V + 40 μV		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Oscilloscopes (cont.) Leveled Sine Wave (ref 50 kHz)	50 kHz reference	20 mV/V + 300 μV	Fluke 5520A SC1100	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Amplitude	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	35 mV/V + 300 μV 40 mV/V + 300 μV 60 mV/V + 300 μV 70 mV/V + 300 μV		
Flatness	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	15 mV/V + 100 μV 20 mV/V + 100 μV 40 mV/V + 100 μV 50 mV/V + 100 μV		
Time Marker ⁶	5 s to 50 ms 20 ms to 1 ns	(25 + 1 000t) μs/s 2.5 μs/s		
Rise Time	≤ 300 ps	+0 ps/-100 ps		

II. Time & Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency - Source ³	10 MHz	5.78×10^{-08}	Datum 9390 GPS Receiver	GIDEP Sourced Procedures
Frequency - Measure ³	10 MHz	8.17×10^{-08}	HP 5316A	GIDEP Sourced Procedures



III. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Measure	(-38 to 0.1) °C (0.1 to 400) °C	0.10 °C 0.30°C	Hart Scientific w / PRTD	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Temperature Measuring Instruments	(-38 to 120) °C (120 to 400) °C	0.42°C 0.44°C	Hart Scientific w / PRTD Bath or Dry Block	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures

IV. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure Analog Gages Digital Gages	(0 to-14.5) psig (0 to 30) psig (30 to 300) psig (300 to 3 000) psig (3 000to 10 000) psig	0.006 psi 0.007 psi 0.075 psi 0.753 psi 2.575 psi	Druck DPI 610 Transducers	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Torque Tools	Up to 100 lbf·in Up to 100 lbf·ft (100 to 200) lbf·ft (200 to 300) lbf·ft (300 to 400) lbf·ft (400 to 500) lbf·ft	0.12 lbf·in 0.16 lbf·ft 0.25 lbf·ft 0.37 lbf·ft 0.48 lbf·ft 0.64 lbf·ft	AKO TDS-001 AKO TDS-511	
Force	Up to 50 lbf (50 to 500) lbf	0.001 lb + 0.6R 0.005 lb + 0.6R	Standard Weights	



V. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Micrometers ⁴	Up to 12 in	(57 + 5.1L) μin	Gage Blocks	OEM, ICTS, Customer-Specified, or GIDEP Sourced Procedures
Calipers ⁴	Up to 36 in	(17 + 4.5L) μin	Gage Blocks	
Dial Indicators	Up to 1 in	290 μin	Bench Micrometer Gage Blocks	
Height Gages ⁴	Up to 24 in	(58 + 6L) μin	Gage Blocks	

Notes:

1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of k=2.
2. This laboratory offers in-laboratory calibration service as well as on-site calibrations at customer-designated locations. 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.
3. This capability is not available for on-site calibrations.
4. The use of (L) signifies Length in inches.
5. The use of (t) signifies Time in seconds.
6. This scope is part of and must be included with the Certificate of Accreditation No. AC-1195.



Vice President

